Call for Applications for the admission to the PhD programmes of the University of Udine in the Academic Year 2023/2024, 39th cycle, under the funding of the National Recovery and Resilience Plan (PNRR) with reference to the following misures: Ministry's Decrees n. 117/ and 118 of March 2, 2023.

DISCLAIMER:
The official and legally binding Call for Applications is in Italian only.
This document cannot be used for legal purposes and it is only meant to provide information in English on the Call for applications (University Chancellor's Decree n. 570 of July 27, 2023).
Please refer to the official Call for Applications published on the official register (https://www.uniud.it/it/albo-ufficiale) and on the PhD website of the University of Udine.
Any changes and integrations will be made available on the mentioned above web pages. Therefore, no personal written communication shall be provided to applicants about examinations dates, competition results and deadlines regarding the enrollment.

ART. 1 – PhD PROGRAMMES

1. The University of Udine announces a Call for applications for assignement positions with scholarship bound to the fulfillment of specific research topics under the funding of the National Recovery and Resilience Plan (PNRR), as part of the PhD programmes activated by the University of Udine, 39th cycle:

- Accounting and Management (Table 1)
- Law and Innovation in the European Legal Space (Table 2)
- Computer Science and Artificial Intelligence (Table 3)
- Industrial and Information Engineering (Table 4)
- Molecular Medicine (Table 5)
- Food Science (Table 6)
- Environmental and Energy Engineering Science (Table 7)
- Agricultural and Biotechnological Sciences (Table 8)
- Mathematical and Physical Sciences (Table 9)
- Clinical and Translational Medical Sciences (Scheda 10)
- Art History, Film Studies, Media Studies and Music (Table 11)
- Linguistics and Literature (Table 12)

2. The PhD Programme positions listed in paragraph 1 last three years starting from the 30th of December 2023. They will start only after only after funding has been granted by the Ministry of University and Research (MUR) and, with reference to the Ministry's Decree 117/2023 after concluding agreements with the companies involved, in accordance with the procedures provided for by the regulatory provisions:

- Ministry's Decree n. 117/2023: Mission 4, component 2 "From research to business" – Investimento 3.3 "Innovative doctorate programmes to meet companies' innovation needs and promote the recruitment of researchers by enterprises".
- Ministry's Decree n. 118/2023: Mission 4, Component 1 "Strengthening the provision of education services: from nurseries to universities" – Investment 3.4 "Advanced university education and skills" e Investment 4.1 "Extension of the number of doctorates and innovative doctorates for Public Administration and cultural heritage".

In any case, they cannot be started after the 30th of December 2023, unless otherwise provided for by the Ministry of Universities and Research (MUR).

3. The doctorate positions with scholarship referred to in paragraph 1 are made available from the resources and in accordance with the regulatory provisions referred to in paragraph 2. There are no positions without scholarship, therefore waiver from the scholarship entails waiver from the PhD programme.

4. The doctoral paths will ensure compliance with the horizontal priorities and the DNSH principle (Do No Significant Harm) of the PNRR.

5. If limitations are introduced due to a sanitary or epidemiological emergency, the activities of the Ph. D. programmes could take place in a mixed modality, in-person and remotely. The methods of carrying out the activities will be communicated by the University of Udine when the programme will start.

6. In this document the titles referred to people, shown in male form only, refer indiscriminately to people of all genders.

ART. 2 – GENERAL PROVISIONS

1. This Call governs procedures and criteria to access to the PhD programmes listed in art. 1 with reference to the positions with scholarship listed in Tables 1-12.

2. Tables 1-12 are annexed to this Call for Applications and are integral part of it. They indicate for each of the PhD programmes: the administrative location and associated location(s) (if any); locations for training, teaching and research; the coordinator; programme duration; curricula (if available); positions available and research topics; the website of the PhD programme; admission requirements; documents and qualifications to be attached to the application; the Selection Committee; the period abroad if provided (optional or mandatory); the period at a third party if provided (optional or mandatory); admission procedure (conduct of examinations; evaluation criteria; tests schedules; publication date of the list of admitted applicants to the interview and the final ranking list).

3. In the presence of additional funding under the PNRR with reference to the actions listed in art. 1 paragraph 2, the available positions listed in Tables (1-12), may be increased with an integration of the Call for Applications and its annexes as specified in paragraph 5, without prejudice to the submission deadline for the admission to the competition mentioned in art. 6.

4. Positions with scholarship may be reduced as provided for in art. 1 par. 2 and art. 10 par. 2.

5. Any amendments and additions of this Call and its annexes are posted on the official register (https://www.uniud.it/it/albo-ufficiale) and on the PhD website of the University of Udine.

6. Only the Italian Call for applications has the value of notification for all purposes, including for the invitations to the examination tests, if any.

7. The submission of the application through the online procedure, as stated in art. 6, implies the acceptance by the applicant of the provisions contained in the Call for Applications and in the Internal Regulation of PhD Programmes available on the PhD website of the University of Udine.

8. Any personal communications concerning this competition are sent to the applicant's e-mail address provided during the registration process as stated in art. 6, paragraph 2.

9. The University assumes no liability for the non-receipt of communications due to incorrect personal contact details provided by the applicant, for failure or delay in communicating changes thereof, nor for postal or electronic mishaps at any stage of the present competition procedure.

Art. 3 – ADMISSION REQUIREMENTS

1. Applicants of any nationality may apply for the competition if they have one of the following academic degrees at the expiration date of the call:

a) “Laurea Specialistica” or “Laurea Magistrale” or “Laurea vecchio ordinamento[1]” or second level academic degree comparable to them;
b) foreign degree, issued by a foreign official institution, comparable in duration and level[2] to the degrees referred to in letter a), and in the foreign system allows the admission to PhD programmes.
Tables 1-12 specify for each PhD programme the type of degree required for participation in the competition and any additional requirements.

2. Applicants can apply for the competition, if they obtain the degree referred to paragraph 1 by December 29, 2023. Applicants who do not obtain the degree by December 29, 2023 will be excluded. Only for the PhD Programme in Law and Innovation in the European Legal Space a score less than 95/110 implies the exclusion. If applicants with the degree not yet obtained are winners, they are admitted and enrolled with reserve. They must certify their graduation in accordance with the provisions of art. 5 paragraph 5 no later than December 29, 2023.
The documentation must be submitted by filling in the form available on the website:
https://helpdesk.uniud.it/Login.jsp?manual=true&populateSR_id=42104

3. All applicants are admitted to the competition on the condition that they meet the requirements of the Call. The University reserves the right to carry out sample checks[3] and may exclude applicants at any time from the selection process if they fail to meet the requirements as set out in the present article, even after the PhD programmes has already started.

Art. 4 – ACADEMIC DEGREE OBTAINED ABR (art. 3 paragraph 1 letter b)
1. The suitability of the foreign degree is assessed by the Selection Committee (art. 7) for the only purpose of participating in the competition and the enrolment in the PhD programme in accordance with:
- the current legislation in Italy and in the country where the degree was issued;
- treaties or international agreements on recognition of the degrees for further studies.

The Selection Committee assesses the suitability of the foreign degree on the basis of the documentation attached through the online application for the admission to the competition (articles 5 and 6). The Selection Committee may, therefore, exclude the applicant whenever the documentation submitted does not provide sufficient evidence for the evaluation. Therefore applicant must attach all the documents in his/her possession relating to the degree held, in order to provide sufficient elements for the Selection Committee’s assessment.

2. Applicants with a degree obtained in a foreign university - if winners of the competition - must submit during the enrolment procedure (if they have not already submitted it during the online application), under penalty of exclusion from the PhD Programme, one of these documents:
For degrees issued by a European Union country:
Diploma Supplement in English.
For degrees issued by an EXTRA UE country: one of these options:
- Declaration of Local Value of the held degree and the certificate regarding the degree with exams and grades. The certificate in a language different than Italian or English must be accompanied by the translation in one of the two languages mentioned (the translation must be legalized by the diplomatic-consular competent authority or certified by an Italian Court).
- “Foreign Degree Statement of comparability - CIMEA” issued in accordance with the terms set in the website www.cimea.it.

If the Diploma Supplement or the Declaration of Local Value/Statement of comparability is not available by the enrolment procedure, the candidate must prove that he/she has applied for it by that date and submit them as soon as possible.

[1] Degree awarded under the ante Decree of the Ministry no. 509 of November 3, 1999, modified with Decree of the Ministry no. 270 of October 22, 2004.
[2] Master of Science/Art
[3] Under Article 71 of D.P.R. December 28, 2000, no. 445

Art. 5 – QUALIFICATIONS SUBJECT TO ASSESSMENT AND DOCUMENTS TO BE SUBMITTED

1. Applicants must submit the mandatory documents and qualifications specified for each PhD programme in Tables 1-12.

2. In Tables 1-12 are also listed optional documents and qualifications required by each PhD programme.

3. For a correct submission of the application, applicants are invited to use the forms attached which are integral part of the Call.

4. Documents and qualifications referred to in paragraphs 1 and 2 must be submitted in Italian or English, under penalty of not evaluation. Documents and qualifications, originally in a different language, must be accompanied by a translation into Italian or English made by the applicant. Any translation into these two languages is under the applicant's responsibility. The translation of the thesis can be an extended abstract in place of the complete thesis.

5. Italian and EU applicants who present qualifications referred to states and facts attested by Public Administrations, must use a self-certification.
Non-EU citizens, legally residing in Italy, may self-certify only information that can be verified or certified by Italian public entities. They can also use a substitute statement of certification, when it is provided by an international agreement between Italy and the applicant's country.
Non-EU citizens other than those above mentioned must refer to the provisions of art. 3 paragraphs 3 and 4 of the d.P.R.445/2000[4].

6. The only documents evaluated are those the applicant has submitted within the terms and the manners specified in art. 6 within the expiration date of the Call. Documents submitted in any other way are not be subjected to evaluation.

7. Failure to submit the mandatory documents listed in Tables 1-12 involves exclusion from the selection process.

Art. 6 – APPLICATION FOR ADMISSION

1. Entries to competitions begin on **Monday July 31, 2023 at 02:00 p.m. (Italian time)** and end on **Friday September 1, 2023 at 02:00 p.m. (Italian time)**.

2. **The application for admission to the competition must be completed, under penalty of exclusion, using the online procedure** that involves two stages:

- **Stage I – Registration at the University website** (https://uniud.esse3.cineca.it): it allows the applicant to obtain a username and password (credentials) in order to continue with the next stage[5];
- **Stage II – Completing the online application** (https://uniud.esse3.cineca.it): at the end of this stage applicant must print out the application form and keep it together with the receipt of the fees payment (paragraph 8 of this article) as proof of application for the competition.

3. Instructions for registration at the University website and for apply for admission to the competition are available on the PhD website of the University of Udine.

4. Documents, qualifications and publications as listed in art. 5, must be attached to the online application in electronic format (.pdf), except for the letters of reference. **Files and/or folders, compressed in RAR or ZIP format, cannot be larger than 5 MB**. The applicant can add, delete or modify the attached documents even after the conclusion of stage II, but before the expiry of the call

[4] Under the D.P.R. December 28, 2000, n. 445 and subsequent amendments and additions.
[5] If the applicant already owns the credentials to access the reserved area (e.g.: former student of University of Udine) this step should not be considered.

on **Friday September 1, 2023 at 02:00 p.m. (Italian time)**. The university administration assumes no liability if the documentation submitted is illegible because of damaged files or folders.

5. Every folder/file attached must be named as follows: surname of the applicant_PhD programme_document (e.g.: McDONALD_Food and Human Health_Curriculum).

6. Letters of reference, if provided by the PhD competition (Tables 1-12), must be uploaded directly by the referee via the online procedure at the candidate's reques. During the submission of the application, the applicant must enter the email address of the referee, who will receive an email notification with the instructions to proceed for uploading the letter. Applicant and referee receive a notification about the successful upload of the letter, which will be available only for the Area Servizi per la Ricerca – Ufficio Formazione per la Ricerca and for the Selection Committee. The applicant can make a reminder to the referee and replace his/her name with another one by the expiry date of the call (**September 1, 2023 at 02:00 p.m. Italian time**).
The referee must upload the letter of reference before **September 3, 2023.**

7. The admission to competition requires the payment of euro 25.00 (as a contribution for participating in the competition). Applicants must pay the fee by **Friday September 1, 2023.** Applicants who will not have paid the above-mentioned fee (euro 25.00) by the day before the date of the Selection Committee's preliminary meeting, will be excluded.
The dates of the Selection Committee's preliminary meeting will be posted by August 31, 2023 on the official register (https://www.uniud.it/it/albo-ufficiale) and on the PhD website of the University of Udine.

8. The amount referred to in paragraph 7 is not refundable for any reason and must be paid via PagoPA service using one of the following options:
- direct access from Esse3 to one of the payment methods available in PagoPA using the data contained in the "Avviso di pagamento" (Notice of Payment) issued at the end of the online application (available on the "Student Administration Office/Payments" of Esse3 portal personal area);
- payment at bank branches and receivers authorized to pay via PagoPA showing the "Avviso di pagamento" (Notice of Payment) issued at the end of the online application (available on the "Student Administration Office/Payments" of Esse3 portal personal area);
- from your account with online services (if activated by the bank) or with credit card or prepaid card with IBAN. For payments by credit or prepaid card refer to the circuit related to the card, NOT to the bank issuing the card. You need to print or save the "Avviso di pagamento" (Notice of Payment - available on the "Student Administration Office/Payments" of Esse3 portal personal area) to have the data required to make the payment.
Applicants who are abroad and don't have an Italian bank account can **exceptionally** make a bank transfer to University of Udine's bank account: INTESA SANPAOLO **IT59A0306912344100000046097 SWIFT/BIC BCITITMM** entering "PhD competition – Applicant's Name and Surname" as reason for payment. Only in this case, the receipt of the payment have to be attached to the online application.
The payment is subject to the fees applied by the payment service provider.

9. Applicants who wish to apply for several PhD programmes have to submit several applications, attaching the required documents to each one and paying the fee for each one (paragraph 7). However, the applicant cannot apply for more than one curriculum in the same PhD programme.

10. Applicants with certified disabilities or specific learning disorders, may notify during the online application (refer to paragraph 2 of this article):
- their situation attaching the certificate attesting the disability or the specific learning disorder;
- aids to conduct the examinations.
Applicants with disabilities or learning disorder, residing in foreign countries, who intend to take advantage of the measures described above, must present a certificate attesting to the state of disability or the learning disorder issued in their country of residence. The certificate has to be

accompanied by a sworn translation in Italian or English language. The university bodies in charge to check the certifications verify that foreign certificate attests a condition of disability or specific learning disorder recognized by Italian legislation.
The different ways of supporting the examinations will be defined by the Selection Committee after checking the documentation submitted. In particular, for students with specific learning disorder, an additional time of 30 per cent more than the time defined for the admission test, will be granted. In case of particular gravity, additional aids may be provided.
Further information can be obtained from Direzione didattica e Servizi agli Studenti (DIDS) – Servizio studenti con disabili o dsa, tel. +39 0432 556804 - email: servizi.disabili@uniud.it, dsa@uniud.it

11. The university administration assumes no liability for loss information due to an error that has not committed, due to inaccurate information provided by the candidate regarding his/her residence, postal address and e-mail address or due to failure or delay in communicating a change thereof.

12. Applicants are advised not to wait until the last days before the deadline of the online procedure. The University assumes no liability for any malfunctions due to technical problems and/or overloading of the communication line and/or application systems.

Art. 7 – SELECTION COMMITTEE
1. The Selection Committee of each PhD programme is specified in Tables 1-12.

2. Each Selection Committee appoints its own internal President and Secretary during the first meeting.

3. Before the qualifications assessment and before the start of the examinations, the Selection Committee establishes the evaluation criteria and the scores assigned to the qualifications and to the examinations, taking into account the criteria specified inTables 1-12.

4. The Selection Committee meetings can be held remotely.

5. The Selection Committee expresses the assessment of suitability with the aim of awarding scholarships indicated in art. 10, paragraph 2.

6. The Selection Committee's tasks finish with the drawing up of reports and final ranking lists.

Art. 8 – GENERAL COMPETITION
1. The applicants' selection involves the evaluation of the qualifications and the conduct of the examinations, in the manner and on the dates specified in Tables 1-12. Any changes or additions to the examinations schedule are posted only on the official register (https://www.uniud.it/it/albo-ufficiale) and on the PhD website of the University of Udine.

2. Evaluation of qualifications and examinations are held according to the following general provisions:
a. the maximum score for overall qualifications and examinations is 100 (100/100). The examinations of the PhD programmes with widely different curricula may be diversified;
b. the maximum score for qualifications is 30 (30/100), the minimum score to be admitted to the first examination (written or oral) is stated in each table;
c. the score assigned for the examinations is 70 points (70/100). Applicants are suitable if they obtain a score equal to or greater than 49 in the examinations;
d. the final ranking list is unique and is prepared, for only eligible applicants, by adding up the scores obtained in the evaluation of the qualifications and in the examinations.

3. In order to take the examination tests, candidates must present a valid identification document.

3. 4. Candidates who are unable to participate in the interview (if it is held in-person) at the Univerity of Udine, either because they are permanently resident abroad on the date of the test or for valid and well-documented reasons, may ask the Selection Committee to take the oral test remotely. They have to submit the request form during the on line application.
Detais of the interview by videoconference are notified to the candidates to the e-mail address provided during the registration procedure referred to in art. 6, paragraph 2. Candidate must be available on the day and at the time communicated. For the purposes of identification and under penalty of exclusion from the selection procedure, each candidate must identify him/herself before the interview begins by showing the same identity document attached to the on line application. Failure to provide a personal address, failure to be connected, candidate's unavailability on the appointed day or time or failure to produce the identification document, are grounds for exclusion from the selection procedure. These grounds for exclusion do not exist if the candidate, in possession of a valid identification document, appears on the day scheduled for the interview in order to take an in-person interview. The University accepts no liability in the event of technical problems that do not guarantee the proper conduct of the oral test.

5. The University reserves the right to manage the oral examination remotely if restrictions on mobility and aggregation are introduced due to health and epidemiological emergency. The University will make this procedure known on the official register (https://www.uniud.it/it/albo-ufficiale) and in the PhD website of the University of Udine. In this case, the provisions of the above paragraph 4 shall be applied, as they are compatible.

6. Oral examinations are public, including those which are conducted remotely.

Art. 9 – FINAL RANKING LIST
1. The final ranking is posted on the official register (https://www.uniud.it/it/albo-ufficiale) and on the PhD website of the University of Udine within the dates detailed for each PhD programme in Tables 1-12.

2. The university does not send out any communication to the applicants.

Art. 10 – ADMISSION TO THE PhD PROGRAMME
1. Applicants are admitted to each PhD programme according to the final ranking order and in accordance with the provisions of in this article.

2. Scholarship are awarded to eligible applicants as follows: according to the final ranking order and to the number of positions available, if the candidate has obtained the Selection Committee's assessment of suitability as to the consistency of his/her project and qualifications with the research topic of interest and with the criteria of the regulatory provisions listed in art. 1 par.2.
2.1 Failure to award scholarships entails a reduction in the number of positions with scholarship.
2.2 If merit and requirements are equal, the economic condition of the candidate's household shall be the criterion of preference for the allocation of positions with scholarship[6].

3. In the case of useful placement in more final ranking lists referred to different PhD programmes, the applicant must enrol in only one PhD programme.

Art. 11 – ENROLMENT
1. **Successful applicants must enrol using the appropriate online procedure according to the deadlines and conditions notified by email, under penalty of exclusion (art. 2 paragraph 8).**

[6] Current legislation about the right to study, ISEE.

2. Enrolment to the PhD programme is subject to the payment of the amount specified in art. 14 under penalty of exclusion from the programme.

3. The amount referred to in paragraph 2 is not refundable for any reason and the payment must be made via PagoPA service using one of the following options:
- direct access from Esse3 to one of the payment methods available in PagoPA using the data included in the “Avviso di pagamento” (notice of Payment) issued at the end of the online application (available on the “Student Administration Office/Payments” of Esse3 portal personal area);
- payment at bank branches and receivers authorized to pay via PagoPA showing the “Avviso di pagamento” (notice of Payment) issued at the end of the online application (available on the “Student Administration Office/Payments” of Esse3 portal personal area);
- from your account with online services (if activated by the bank) or with credit card or prepaid card with IBAN. For payments by credit or prepaid card refer to the circuit related to the card, NOT to the bank issuing the card. You need to print or save the “Avviso di pagamento” (notice of Payment - (available on the “Student Administration Office/Payments” of Esse3 portal personal area) to view the data required to make the payment.
Applicants who are abroad and don’t have an Italian bank account can **exceptionally** make a bank transfer to University of Udine’s bank account INTESA SANPAOLO: **IT59A0306912344100000046097 SWIFT/BIC BCITITMM** entering "Enrolment in PhD programme" as reason for payment. Only in this case, the receipt of the payment have to be attached to the online application.

4. Enrolment will be completed by the University of Udine only once the funding has been granted and the agreements are concluded as per art. 1, par. 2.

5. The amount referred to in paragraph 2 is refunded to the successful candidate if the funding is not granted by the Ministry of University and Research (MUR) if the agreement is not concluded, following the procedures provided for by the regulatory provisions referred to in art. 1 paragraph 2.

6. Non UE Citizens must comply with the rules on visas and residence permits. A copy of the residence permit or – pending the release – the receipt of the application for the residence permit must be submitted to Area Servizi per la Ricerca – Ufficio Formazione per la Ricerca, via Mantica, 31 – 33100 Udine.

7. The university administration assumes no liability for loss of communications due to any errors that cannot be attributed to it.

Art. 12 – REPLACEMENTS
1. 1. Candidates who do not enrol according to the deadlines referred to in art.11 are considered to have withdrawn. The positions that have become available are assigned to other applicants according to the final ranking list, taking into account provisions of art. 10.

2. The list of replacement applicants is posted on the official register (https://www.uniud.it/it/albo-ufficiale) and on the PhD website of the University of Udine.

3. The replacement applicants must enrol in the terms and manner which will be communicated by email (art. 2 p. 8), under penalty of exclusion from the programme.

4. Any further replacements positions will be notified directly to the relevant applicants.

Art. 13 – SCHOLARSHIPS
1. Scholarships are linked to specific research topics (Tables 1-12).

2. Scholarships are awarded in accordance with art.1 and art 10.

3. The scholarships have a duration of three years, subject to the provisions of art. 19 p. 3, art. 20 p. 2 and art. 24 of the Internal Regulations for the PhD Programmes. Scholarships are renewed annually on condition that the PhD student has completed the program of planned activities, as verified by the Teaching Board.

4. The annual gross amount of the scholarship is specified in Tables 1-12 and is subject to the social security tax (INPS a gestione separata). The scholarship is paid on monthly basis in the following month. The amount of the scholarship is increased for research activities abroad by a maximum of 50% for a total period specified in Tables 1-12, unless additional financial resources are available. In any case, the increase is only due to periods of continuous stay and longer than thirty days.

5. The scholarship cannot be allocated to those who have already received a scholarship to attend another PhD programme or an equivalent programme.

6. The scholarship cannot be combined with research grants or other scholarships awarded for any purpose, except for those awarded by national or foreign institutions useful to integrate the abroad research activity of the PhD students. Further incompatibilities are defined by the Internal Regulation for the PhD programmes.

7. In addition to the rights and duties provided for by the relevant legislation (art. 17), in line with the regulatory provisions of art. 1 paragraph 2, the winner accepting the scholarship:
- undertakes to carry out the planned period abroad and at the third party as specified in Tables 1-12, aware that the failure in carrying out this period, if it is mandatory, results in the revocation of the scholarship.
- undertakes to submit, according to the terms and conditions that will be communicated by the University of Udine and in line with the regulatory provisions listed in art. 1 paragraph 2 and with “Guidelines for Reporting on Investments in Doctoral Pathways of the NRRP”, the research activity report, which also specifies the time commitment (divided into months at a third party, on site, abroad).
- undertakes to ensure the compliance with the obligations regarding communication and information provided for by art. 34 of Regulation (EU) 2021/241, indicating in the project documentation that the Program is funded under the PNRR, with explicit reference to the funding from the European Union and the NextGenerationEU initiative (eg using the phrase "funded from the European Union - NextGenerationEU"), reporting in the project documentation the European Union’s symbol and providing adequate dissemination and promotion of the Program, even online, both web and social, in line with the provisions of the PNRR Communication Strategy;
- is aware that is aware that the modification of the activities, the project goals and the expected results, if not previously authorized by the MUR, entails the revocation of the scholarship;
- is aware that any negative judgement of the Teaching Board and the consequent non-admission to the following year of the PhD programme, the failure to obtain the degree and the withdrawal from the PhD Programme results in the revocation of the scholarship;
- is aware that he must comply with the principle “do not significant harm (DNSH)” to environmental objectives, pursuant to article 17 of Regulation (EU) 2020/852 and ensure consistency with the PNRR positively assessed by the ECOFIN Council Decision of July 13, 2021.
The University of Udine may therefore takes action against the beneficiary for the return of the amounts received in the event of revocation or waiver of the scholarship.

Art. 14 – ACADEMIC FEES

1. For the Academic Year 2023/2024 is foreseen the payment of maximum amount of euro 276,00:
- university contribution, euro 100.00;
- regional tax for the right to university study, from euro 120.00 to euro 160.00 (economic condition of the applicant's family nucleus[7]);

[7] Current legislation about the right to study, ISEE.

- duty stamp, euro 16.00.

The amount will be requested at the moment of the enrolment and any exemption will applied in accordance with the current legislation.

2. However, the university administration reserves to adopt different regulations for the following academic years.

Art. 15 – PERSONAL DATA

1. The personal data collected under the procedure referred to in art. 6 are necessary for the proper management of the selection procedure, for any subsequent career management and for purposes related to the management of the services provided to students during the university PhD programme. The University of Udine is the "Data Controller". At any time, you can request access, corrections and, according to the University institutional purposes, the cancellation and limitation of the processing or oppose the processing of your data. You can always submit a complaint to the Italian Authority for data protection. The complete information is available on the University of Udine website in the section "privacy" accessible from this link: https://www.uniud.it/it/it/pagine-speciali/guida/privacy

Art. 16 – HEAD OF PROCEDURE

1. The officer in charge of the proceedings is Dr. Sandra Salvador, Head of Area Servizi per la Ricerca of the University of Udine.
The PhD Office of the University of Udine is the Area Servizi per la Ricerca – Ufficio Formazione per la Ricerca, via Mantica n. 31 - 33100 Udine.

2. To request information, fill in the following forms available on the website of the University of Udine:
Information about the Call:
https://helpdesk.uniud.it/Login.jsp?manual=true&populateSR_id=42104
Information about Esse3:
https://helpdesk.uniud.it/Login.jsp?manual=true&populateSR_id=42094

Art. 17 – REFERENCE RULES

1. For matters not covered by this Call, please refer to the National legislation in the field of doctoral research mentioned in the introduction, to the Internal Regulations for the PhD programmes and to the Rules of Procedure relating to patents, the regulatory provisions listed in art. 1 paragraph 2 and in art. 13 available on the website dedicated to the PhD programmes of the University of Udine.

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TABLE 1 – PhD Programme in ACCOUNTING AND MANAGEMENT

THE PhD PROGRAMME	
Administrative location	University of Udine, Department of Economics and Statistics (DIES) - via Tomadini 30/A, 33100 Udine, ITALY (tel. +39 0432 249380)
Associated location	University of Verona (Department of Management) – Via Cantarane, 24 - 37129 Verona, ITALY
Location for training, teaching and research activity	Teaching and other training activities will take place primarily at the administrative programme location and at the associated programme location, or in other locations of the University of Udine and Verona or in other locations which participate to the doctoral project with which the PhD programme has teaching agreements. The research programme will be developed according to the section "Research tTopic Description".
Coordinator	Prof. Filippo Zanin (filippo.zanin@uniud.it).
Programme duration	3 years
Curriculum	-
Programme website	https://www.uniud.it/en/research/do-research/doctorate-res/our-ph-d-programmes/area-social-science-and-humanities/accounting-and-management-1/ph-d-programme/accounting-and-management?set_language=en

ADMISSION REQUIREMENTS	
Required degree	Italian Laurea (before DM 509/99) or Italian Laurea specialistica/magistrale (ex DM 509/1999 and DM 270/04). Foreign degrees and titles: refer to art. 3 and 4 of the Call.
Knowledge of the following foreign language	English

DOCUMENTS AND QUALIFICATIONS TO BE ATTACHED TO THE APPLICATION FOR ADMISSION	
<u>Compulsory</u> documents (art. 5 of the Call)	1. Certification or self-certification (refer to art. 5 paragraph 5 of the Call) of the academic title needed for admission to the PhD programme and list of the exams (with grades) passed during the Italian first level (bachelor) and the Laurea Specialistica/Magistrale programmes, or during the Italian programmes before D.M. 509/99, or during the foreign academic programmes; 2. Curriculum vitae et studiorum, dated and signed; 3. Copy of a valid identity document (citizens of countries not belonging to the European Union a copy of a valid passport, comprehensive of the pages containing the holder's photo, personal details, passport number, date and place of issue, date of expiry); 4. A research project, dated and signed, developed, developed in accordance with the topic of interest, which highlights the contribution that the candidate can offer to the development of the topic itself (approximate limit 10.000 characters, spaces included, in English language).
<u>Optional</u> documents (art. 5 of the Call)	1. Letters of reference (max 2), from university professors, scientific researchers or other experts in the field (art. 6 of the Call).

SELECTION COMMITTEE	
Appointed members	Filippo Zanin – associate professor – University of Udine Alessandra Sangoi – Vice - President CDA SAFIN S.p.a. - CEO SANGOI S.p.a. Josanco Floreani – associate professor – University of Udine
Substitute members	Eugenio Comuzzi – full professor – University of Udine Cinzia Battistella – associate professor – University of Udine

ADMISSION

GENERAL COMPETITION (art. 8 of the Call for Applications)

Posti disponibili: 2				
Detailed description	***N.***	***Funding***	***Annual gross amount***	***Research topic***
Positions WITH SCHOLARSHIP: 1	1	D.M. 117 of March 2, 2023 (NRRP Mission 4 Component 2 Investment/Subinvestment 3.3) and SAFIN Spa CUP G23C22001200003	€ 16,243.00	Topic 1.1 - Digital evolution of management control and treasury tools, methods and techniques for management support.

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TABLE 1 – PhD Programme in ACCOUNTING AND MANAGEMENT

Competition procedure and test schedule			
Evaluation of qualifications and oral examination. For the evaluation of applicants' attitude for scientific research and their basic skills to tackle the course program, the Selection Committee can attribute up to 100 points to each applicant: max 30 points to the titles and max 70 points to the oral examination. The applicant is admitted to the oral examination if his/her titles receive at least 21 points. The oral examination is passed with at least 49 points. The applicant is admitted to the PhD programme if he/she passes the oral examination. Only for eligible applicants, the points attained in in the oral examination will be added to the points of the titles. **DATE FOR THE PUBLICATION OF ADMITTED APPLICANTS TO THE ORAL EXAMINATION: within 12 September , 2023.** **DATE FOR THE PUBLICATION OF THE FINAL RANKING LIST: within September 26, 2023.**			
Foreign language that can be used for examination	English		
Evaluation Criteria of qualifications *During the preliminary meeting the Selection Committee may establish sub-criteria for the evaluation*	Curriculum vitae et studiorum		*10*
	Research project		*18*
	Letters of reference		*2*
Oral examination	**As all the classes are held in English, the oral examination will take place in English.**		
Calendar of the oral examination	**Date**	**September 15, 2023**	
	Time	**2:00 AM**	
	How to conduct the examination	ONLINE, via M TEAMS	
	Based on the number of applicants, the oral examination may take place in more than one day. Applicants must exhibit a valid ID for admission to the oral examination.		

Research Topics Description

Reaserch Topic 1.1: **Digital evolution of management control and treasury tools, methods and techniques for management support**
D.M. 117 of March 2, 2023 (NRRP "National Recovery and Resilience Plan" Mission 4 Component 2 Investment/Subinvestment 3.3)

Coherence of the proposed research with the PNRR fields of interest:
Consistency with the contents, models and methodological approaches of the theme: Digitalisation, innovation and competitiveness of the production system.

Objectives and expected results, proposed research activity, methodologies and content:
Premise. The digital evolution of management control tools, methods and techniques is now an essential requirement for having data and information relevant to business decisions, timely and truly capable of optimizing the performance of companies and corporate groups operating in dynamic competitive contexts and uncertain. The scarce reliability of market trend forecasts due to changing scenarios amplifies the complexity of the decisions to be taken. This occurs more and more often even over short-term horizons, generating disorientation
General objectives.
The general objective of the project is the design of digital methods and tools capable of producing data and information on the trend of external context variables and the main company performance measures that are reliable, timely and updated in real time (daily update). This in order to provide directors and management with managerial tools for adequate support for decisions and actions to be taken to maximize company performance in complex contexts.
Specific goals.
• Research and application of one-dimensional models for the representation of the corporate business model: dimensions, variables and causal links between variables
• Research and application of multi-dimensional models for the representation of the corporate business model: dimensions, variables and causal links between variables
• Research and identification of short, medium and long term forecasting tools and techniques, through the application of scenario-based approaches
• Research into the characteristics of effectiveness and efficiency of the tools and methods for managing the corporate information flow in support of management control activities, with particular emphasis on monetary control
• Research and identification of methodologies and tools to facilitate the digitization of the information flow supporting management control activities, with particular emphasis on monetary control.
Activity
• Bibliographic survey of national and international scientific production relating to the topic of strategic and operational control, with particular attention to one-dimensional and multi-dimensional models
• Bibliographic survey of national and international scientific production relating to the topic of the relevance of economic information in support of strategic and operational control activities
• Bibliographic survey of national and international scientific production relating to the topic of economic-financial forecasting on the main company and context variables, with particular attention to scenario-planning methodologies
• Development of digital tools for the computerized management of information relevant to corporate decisions, capable of catching in advance the weak signals of changes in context variables and corporate performance

Period abroad (mandatory):
A 6-month period abroad at a host institution is foreseen, which will be defined later

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TABLE 1 – PhD Programme in ACCOUNTING AND MANAGEMENT

Data foreign host subject:
A 6-month period abroad at a host institution is foreseen, which will be defined later

Period in enterprise (mandatory):
A period in the company of 18 months (from 6 to 18 months) is foreseen, even non-continuous, in relation to the experimental needs

Enterprise Data:
Safin SPA, Via dei Fagnà, 58 – 33017 Collalto di Tarcento (UD)

Research activities to be carried out in the enterprise:
Activities strictly connected to the pursuit of the general and specific objectives of the research, including the mapping of the control system in use (as-is) and the highlighting of the expected improvements (to be)

Consistency of the doctoral programme with the principles and specific obligations of the NRP:
- *cross-cutting priorities:* the PNRR for young people indicates as mission 4 the "strengthening of university education, with new scholarships, and the creation of new opportunities for young researchers, with the extension of research doctorates". In this regard, the program illustrated here will place the candidate at the center of a collaborative university-business network, providing the opportunity to learn research in a "situated manner". The training will take place through the supervision of the research project by both parties involved (University of Udine and the Safin group) and will allow the young researcher to develop theoretical and practical knowledge and skills.
- *twin transitions (green and digital):* the project, through the development of reorganization activities of corporate administrative processes through the use of advanced digital solutions, is in line with the twin green and digital transitions. In fact, digital systems will make it possible to improve and make data sharing more efficient, thus saving resource consumption and reducing the environmental impacts.
- *do no significant harm - DNSH:* the research activities will be carried out with a view to not creating significant environmental damage, in compliance with the provisions of article 17 of regulation (EU) 2020/852.
- *open science and FAIR Data:* all research results will be shared from the point of view of open science and will be published guaranteeing open Access and, at the same time, the confidentiality of corporate data.

Reference Professor/Researcher
Prof. Filippo Zanin

TABLE 2 – PhD Programme in LAW AND INNOVATION IN THE EUROPEAN LEGAL SPACE

THE PHD PROGRAMME	
Administrative location	University of Udine, Department of Legal Science (DISG), via Treppo 18, 33100 Udine, ITALY (tel. +39 0432 249520)
Associated location	University of Trieste (Department of Legal, Language, Interpreting and Translation studies) - piazzale Europa 1, 34127 Trieste, ITALY
Location for training, teaching and research activity	Teaching and other training activities will take place primarily at the administrative programme location or in other locations of the University of Udine. The research programme will be developed according to the section "Research tTopic Description".
Coordinator	Prof. Paolo Giangaspero (giangasp@units.it)
Programme duration	3 years
Curricula	1. Private and Economic Area: (IUS/01 Private Law, IUS/02 Comparative Private Law, IUS/03 Agrarian Law, IUS/04 Commercial Law, IUS/06 Maritime Law, IUS/07 Labour Law, IUS/18 Roman Law) 2. Public Area: (IUS/08 Constitutional Law, IUS/10 Administrative Law, IUS/21 Comparative Public Law, IUS/13 International Law, IUS/14 European Law, IUS/12 Tax Law, IUS/15 Civil Procedure; IUS/17 Criminal Law, IUS/16 Criminal Procedure)
Programme website	https://www.uniud.it/en/research/do-research/doctorate-res/our-ph-d-programmes/area-social-science-and-humanities/law-and-innovation-in-the-european-legal-space/ph-d-programme/law-and-innovation-in-the-european-legal-space?set_language=en

ADMISSION REQUIREMENTS	
Required degree	Italian Laurea (before DM 509/99) or Italian Laurea Specialistica/Magistrale (ex DM 509/1999 and DM 270/04). Foreign degrees and titles: refer to art. 3 and 4 of the Call.
Knowledge of the following foreign language	English

DOCUMENTS AND QUALIFICATIONS TO BE ATTACHED TO THE APPLICATION FOR ADMISSION	
Compulsory documents (art. 5 of the Call)	1. Certification or self-certification (refer to art. 5 paragraph 5 of the Call) of the academic title needed for admission to the PhD programme and mark degree. Applicants with qualification not yet obtained must submit certification or self-certification (as art. 5 paragraph 5 of the Call) of the academic degree needed for admission to the PhD programme and list of exams (list of exams: single score, average score and maximum score); 2. Copy of a valid identity document (citizens of countries not belonging to the European Union a copy of a valid passport, comprehensive of the pages containing the holder's photo, personal details, passport number, date and place of issue, date of expiry); 3. A research project, dated and signed, developed in accordance with the description of one of the 3 research topics listed in the Table and the related scientific domains (SSD) (IUS/12, IUS/07 and IUS/14), which highlights the contribution that the applicant can offer to the development of the same topic (approximate limit 10,000 characters, spaces included, in English language).
Optional documents (art. 5 of the Call)	-
All titles must be presented exclusively in PDF format, dated and signed by the candidate.	

SELECTION COMMITTEE	
Appointed members	Prof. Elisabetta Bergamini – full professor – University of Udine Prof. Marina Brollo – full professor – University of Udine Prof. Mario Nussi – full professor – University of Udine Prof. Angelo Venchiarutti – associate professor – University of Trieste
Substitute members	Prof. Paolo Giangaspero – full professor – University of Trieste Prof. Luca Ballerini – associate professor – University of Trieste Dott. Giulia Milo – researcher – University of Trieste Prof. Gian Paolo Dolso – full professor – University of Trieste

ADMISSION

GENERAL COMPETITION (art. 8 of the Call for Applications)

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TABLE 2 – PhD Programme in LAW AND INNOVATION IN THE EUROPEAN LEGAL SPACE

Available positions: 3				
Detailed description	***N.***	***Funding***	***Annual gross amount***	***Research topic***
Positions WITH SCHOLARSHIP: 3	1	D.M. 117 of March 2, 2023 (NRRP Mission 4 Component 2 Investment/Subinvestment 3.3) and Eutekne S.p.A. CUP G23C23001160005	€ 16,243.00	Topic 1.1 - Material selection criteria and legal method for the use of artificial intelligence in tax compliance, control and assessment activities. What new tools for taxpayer assistance and protection?
	1	D.M. 118 of March 2, 2023 (NRRP Mission 4 Component 1 Investment/Subinvestment 4.1) and University of Udine CUP G23C23001340003	€ 16,243.00	Topic 1.2 - We care: legal regulation, protection and perspectives for family caregiver workers.
	1	D.M. 118 of March 2, 2023 (NRRP Mission 4 Component 1 Investment/Subinvestment 3.4) and University of Udine CUP G23C23001220003	€ 16,243.00	Topic 1.3 - Smart contracts and blockchain technology in EU law: protecting rights and promoting competitiveness in the digital single market

Competition procedure and test schedule			
Evaluation of qualifications and oral examination. Evaluation of qualifications and oral examinations. For the evaluation of applicants' attitude for scientific research and their knowledge to develop the topic of interest, the Selection Committee can attribute up to 100 points to each applicant: at most 30 points to the qualifications and at most 70 points to the oral examination. The applicant is admitted to the interview if he/she scores at least 21 points for the qualifications. The oral examination is passed by scoring at least 49 points. The applicant is eligible for the PhD programme if he/she passes the oral examination. Only for eligible applicants, the points attained in in the oral examination will be added to the points of the qualifications. Enrolment in the PhD programme for winner applicants with not yet obtained degree will be possible only if the degree mark obtained is equal or greater than 95/110 (see art. 3 paragraph 2 of the Call). **DATE FOR THE PUBLICATION OF ADMITTED APPLICANTS TO THE ORAL EXAMINATION: within September 8, 2023.** **DATE FOR THE PUBLICATION OF THE FINAL RANKING LIST: within September 26, 2023.**			
Foreign language that can be used for examinations	Italian or English		
Evaluation Criteria of qualifications *During the preliminary meeting the Selection Committee may establish sub-criteria for the evaluation*	Graduation mark: *from* 95 to 99 *from* 100 to 101 *from 102 to 104* *105* *106* *107* *108* *109* *110 and 110 cum laude* For applicants with not yet obtained degree only the average of the exams regarding the academic title needed to access to the PhD programme will be evaluated: *from 25 to25,99* *from 26 to25 26,99* *from 27 to25 27,99* *from 28 to25 28,99* *from 29 to25 29,99* *110 and 110 cum laude*	 *1 point* *3 points* *4 points* *5 points* *6 points* *7 points* *8 points* *9 points* *10 points* *1 point* *4 points* *6 points* *8 points* *9 points* *10 points*
	Research project	*20 points*	
Oral examination	The oral examination could be carried out in Italian or in English. It will consist of a discussion about the to the Research project ad general topic referred to the scientific domain (SSD): selected. The interview will be evaluated according to the following criteria: level of knowledge of the themes of the proposed project; critical presentation skills; suitable use of legal language. The oral examiantion will also assess the knowledge of English language.		
Calendar of the oral examination	**Date**	**September 18 2023**	
	Time	**9.00 AM**	
	Place	University of Udine, Department of Legal Science (DISG), via Treppo 18, 33100 Udine, ITALY	

TABLE 2 – PhD Programme in LAW AND INNOVATION IN THE EUROPEAN LEGAL SPACE

	Based on the number of applicants, the oral examination may take place in more than one day. Applicants must exhibit a valid identification document for admission to the oral examination.

Descrizione tematiche di ricerca
Research Topic 1.1: Material selection criteria and legal method for the use of artificial intelligence in tax compliance, control and assessment activities. What new tools for taxpayer assistance and protection? *D.M. 117 of March 2, 2023 (NRRP "National Recovery and Resilience Plan" Mission 4 Component 2 Investment/Subinvestment 3.3)* Coherence of the proposed research with the PNRR fields of interest: PA (financial administration) digitization and innovation, measures to reduce the tax gap (use of new technologies to acquire information for use in both compliance and authoritative control/investigation tools) Objectives and expected results, proposed research activity, methodologies and content: The project is aimed at outlining the "tracks" of correct use of taxpayer-referable information obtained through increasingly advanced technological and even artificial intelligence tools. The foreseeable short-to-medium term scenario implies a potentially considerable change in the relations between financial administration and taxpayer: the need to regulate them also in terms of legal protection according to correct principles is of absolute importance. Particular attention will be paid to comparative profiles in the European context. On this basis, the renewed needs of taxpayer protection, to be implemented particularly in the field of professional assistance, will be specifically researched. Similar analysis will allow to configure new entrepreneurial scenarios for innovative companies dealing with qualified assistance of the professional world of certified public accountants and tax lawyers Period abroad (mandatory): 6 months Data foreign host subject: to be defined Period in enterprise (mandatory): 18 months Enterprise Data: Eutekne S.p.A. Research activities to be carried out in the enterprise: The Ph.D. student will be in contact with professionals and researchers experts in the in-depth study and dissemination of tax issues. He/she will have the opportunity to test the operation of some search and artificial intelligence algorithms to understand the practical implications of current technological developments. The firm will assist the doctoral student's research in identifying the most relevant topics, understanding technologies and processes, and more generally focusing lines of legal research with respect to all aspects and issues of a more strictly technical and technological nature. Consistency of the doctoral programme with the principles and specific obligations of the NRP: *- cross-cutting priorities:* *- twin transitions (green and digital):* *- do no significant harm - DNSH:* *- open science and FAIR Data:* Reference Professor/Researcher prof. Mario Nussi **Research Topic 1.2: We care: legal regulation, protection and perspectives for family caregiver workers.** *D.M. 118 of March 2, 2023 (NRRP "National Recovery and Resilience Plan" Mission 4 Component 1 Investment/Subinvestment 4.1) – Public Administration* Coherence of the proposed research with the PNRR areas of interest and, for the scientific-technological areas, highlight how the proposed research can promote interdisciplinarity, membership of international networks and intersectoriality: The project concerns 1) the legal framing of the figure of the worker who performs (also) the functions of family caregiver, recently regulated by R.L. no. 8/2023 of the Friuli Venezia Giulia Region; 2) the protections provided by laws and collective bargaining; 3) work-life balance and support through flexible, hybrid, agile forms of employment.The aims of the project are: 1. to reconstruct and interpret the legal framework of reference, national, regional and supranational, including collective bargaining; 2.to support the partner administration and the pp.a. concerned, which are potentially all, in dealing with the phenomenon considered, which represents a crucial junction in the management and development of human resources; 3.to strengthen the administrative capacity in identifying problems and solutions, to be adapted and customized on a case-by-case basis, to deal with the issue of care, carried out by its employees; 4. .to support institutional planning also through the experimentation of innovative tools, which adequately take into account the opportunities offered by new information and communication technologies (ICT) in the redistribution of work time and places; 5.to encourage the digital and ecological transition of public administrations, contributing to the

TABLE 2 – PhD Programme in LAW AND INNOVATION IN THE EUROPEAN LEGAL SPACE

redesign and simplification of organizational models, as well as to the processes of selection and adoption of enabling technologies and solutions, in order to ensure greater effectiveness, efficiency and economy of public action, through the adoption of flexible forms of work and corporate welfare tools

Expected objectives and results, proposed research activities, methodologies and contents:
The project aims to support the partner p.a. and, in perspective, all pp.a. facing the phenomenon of the dual role of human re-sources, engaged not only in the profession, but also in the care of family members. Also, the project wants to support the part-ner p.a. in the preparation of support tools for the private sector as well, in implementation of the aforementioned l.r. no. 8/2023.
It is expected:1.a comprehensive reconstruction, national and international, of the regulatory framework of the figure of the caregiver worker; 2.an analysis of collective agreements, with the identification of existing tools for a) the reduction of working time; b) the reorganization of work times and places, including as agile work; c) welfare tools; 3.a comparison with tools proper to the foreign system considered; 4.a support to the p.a. for the implementation of the regional law.

Period abroad (mandatory): 6 months
ISTITUTO DI DIRITTO PRIVATO – UNIVERSITE' TOULOUSE 1 CAPITOLE,
TOULOUSE, FRANCIA

Data of foreign host subject:
UNIVERSITE' TOULOUSE 1 CAPITOLE,
TOULOUSE, FRANCE

Possible Public Administration involved in the definition of the training pathway:
Regione Friuli Venezia Giulia
CF. 80014930327 P.IVA 00526040324
Piazza Unità d'Italia 1 Trieste
Direzione salute, politiche sociali e disabilità
Via Cassa di Risparmio 10 – Trieste

Research activities to be carried out at the Research Center:

Coherence of the doctoral programme with the principles and specific obligations of the PNRR:
- cross-cutting priorities:
- twin transitions (green and digital):
- do no significant harm - DNSH:
- open science and FAIR Data:

Reference Professor/Researcher:
Prof. Marina Brollo

Research Topic 1.3: Smart contracts and blockchain technology in EU law: protecting rights and promoting competitiveness in the digital single m.
D.M. 118 of March 2, 2023 (NRRP "National Recovery and Resilience Plan" Mission 4 Component 1 Investment/Subinvestment 3.4) – Digital and Environmental Transitions

Coherence of the proposed research with the PNRR areas of interest and, for the scientific-technological areas, highlight how the proposed research can promote interdisciplinarity, membership of international networks and intersectoriality:
Smart contracts can be used in many different sectors, from finance to logistics, from healthcare to public administration. In Europe, for example, blockchain projects are being developed for food traceability, renewable energy management and the digitization of public services. These are activities that have been placed at the center of the Next Generation EU strategy and, consequently, the Italian NRP. Moreover, blockchain is specifically mentioned among the tools aimed at the "Development of highly specialized support services and facilities for public administrations and businesses" mentioned by Regulation (EU) 2021/241 establishing the Recovery and Resilience Facility. Also not to be overlooked in this regard is the strategy of the European Digital Decade, outlined in European Commission Communication COM/2021/118 of March 9, 2021 and later implemented in Decision (EU) 2022/2481 of the European Parliament and of the Council of December 14, 2022, which sets ambitious digital targets such as reaching the 80 percent share of citizens with at least basic digital skills, 100 percent of citizens using digital identity, and 100 percent of essential public services online. All of these goals have been embraced by Italy, which has structured part of its PNRR investments precisely to help achieve the targets set by the Commission. The commitment of the PNRR and the European Union, combined with the natural diffusion of eCommerce, eGovernance and private online services, added to the principle of "digital by default" established by the Tallinn Declaration of October 6, 2017 make it likely that in the near future a vastly greater number of citizens and businesses will perceive the delivery of digital services and the conclusion of digital transactions as the "natural" way of their fruition.

Expected objectives and results, proposed research activities, methodologies and contents:
Objectives:
Despite the many advantages offered by this technology (thanks to the cryptography and decentralization of the blockchain, in fact, personal information and financial transactions are protected from unauthorized access and possible fraud; in addition, smart contracts allow clear and

TABLE 2 – PhD Programme in LAW AND INNOVATION IN THE EUROPEAN LEGAL SPACE

transparent rules to be established for data management, avoiding possible conflicts between parties), smart contracts also present some challenges and limitations, especially in terms of compatibility with national and European regulations.
The research therefore has the following specific objectives:
- Understand the concept of smart contracts and their potential impact on the digital single market.
- Examine the role of smart contracts in promoting innovation and competitiveness in the EU.
- Analyze the potential benefits and drawbacks of smart contracts on consumer rights in the EU.
- Identify the legal and regulatory challenges associated with the implementation of smart contracts in the EU and in EU law.
Period abroad:
Expected Results:
The results of this research program will be useful for EU policymakers, businesses, and consumers. Moreover, they will provide valuable insights for future research on the topic as they should allow to outline a European regulatory statute applicable to smart contracts, with particular reference to those embedded within blockchain technology, that will allow to address with the proper tools those critical compatibility profiles between the features of the new technology and the current set-up of the regulatory system. In this sense, the doctoral student, beyond merely hoping for an adaptation of the legal system to the technology, could go so far as to envisage, as far as possible (and thanks to the support of knowledge and expertise provided by the host institution) an adaptation of the technology (or rather, of the legally relevant consequences arising from its use) with respect to the European legal system, particularly where this is required by the pursuit of the two fundamental objectives of the protection of consumer rights and the promotion of the competitiveness of the economic system of the Union and its member states.

Period abroad (mandatory): 6 months
1 month in the first year of the Phd Course; 2 in the second; 3 in the third year of the PhD Course

Data of foreign host subject:
Universitatea de Vest din Timișoara – Faculty of Law
Bd. Eroilor de la Tisa, nr. 9A, Timișoara, 300575 Timis, Romania

Possible research center involved in the definition of the training pathway:
infoFactory s.r.l.
Via Linussio 51 - 33100 Udine (UD)

Research activities to be carried out at the Research Center:

Coherence of the doctoral programme with the principles and specific obligations of the PNRR:
- *cross-cutting priorities:*
- *twin transitions (green and digital):*
- *do no significant harm - DNSH*
- *open science and FAIR Data:*

Reference Professor/Researcher:
prof.ssa Elisabetta Bergamini

TABLE 3 – PhD Programme in COMPUTER SCIENCE AND ARTIFICIAL INTELLIGENCE

THE PhD PROGRAMME	
Administrative Location	University of Udine - Department of Mathematics, Computer Science and Physics (DMIF) – via delle Scienze 206, 33100 Udine, Italy (+39 0432 558400).
Associated Location	Fondazione Bruno Kessler – 77 via Santa Croce, 38122 Trento (TN), Italy
Location for Training, teaching and research activity	Teaching and other training activities will take place primarily at the administrative programme location or in other locations of the University of Udine. The research program will be mainly developed, with reference to the scholarship (see art. 11 of the Call) and/or to the supervisor assigned, at one of these locations: administrative location, associated location, financial supporter's location (if the financial supporter is an external institution).
Coordinator	Federico Fontana – University of Udine (coordinatore.iai@liste.uniud.it)
Programme duration	3 years
Curriculum	-
Research topics	- Acoustic scene analysis and Machine listening - Algorithms - Artificial intelligence in agrifood - Automatic planning and scheduling - Autonomous systems - Blockchain and Digital ledger technologies - Computational biology and Bioinformatics - Computational intelligence and Optimization - Computer vision - Crowdsourcing and Human-in-the-loop AI - Cyber-security - Data science and Big data analytics - Digital Humanities - 3D digitalization with Artificial intelligence - Distributed systems: models and applications - Formal methods and Automatic verification - Human-Computer interaction, Auditory-tactile interfaces - Knowledge representation and Automatic reasoning - Information retrieval - Internet of things: platforms and technologies - Logics in computer science - Machine learning and Deep learning - Medical informatics, Tele-medicine and e-Health - Methodologies, languages and techniques for problem solving in artificial intelligence - Natural language processing - Predictive monitoring, diagnostics and maintenance - Social systems and Recommendation systems - Software engineering - Virtual reality, Serious games.
Research programs	Decided by the Teaching Board within the PhD programme Research topics.
Programme website	https://www.uniud.it/it/ricerca/lavorare-nella-ricerca/dottorato-ricerca/inostricorsi/area-physical-science-and-engineering/informatica-e-intelligenza-artificiale/il-dottorato https://www.dmif.uniud.it/dottorato/iai/ https://phd.fbk.eu/https://phd.fbk.eu/

ADMISSION REQUIREMENTS	
Required degree	Italian Laurea (before DM 509/99) or Italian Laurea Specialistica/Magistrale (ex DM 509/1999 and Decree DM 270/04). Foreign degrees and titles: refer to art. 3 and 4 of the Call.
Knowledge of the following foreign language	English

DOCUMENTS AND TITLES TO BE ATTACHED TO THE APPLICATION FOR ADMISSION	
<u>Compulsory</u> documents (Art. 5 of the Call)	1. Certification issued by the University or, if the Candidate is a European Union citizen (refer to art. 5 paragraph 5 of the Call), self-certification of the academic title (already awarded, or to be issued by October 31, 2023) needed for admission to the PhD programme, with candidate's grade and highest possible grade; 2. Curriculum vitae et studiorum, dated and signed; 3. Copy of a valid identity document (citizens of countries not belonging to the European Union: copy of a valid passport, comprehensive of the pages containing the holder's photo, personal details, passport number, date and place of issue, date of expiry);

TABLE 3 – PhD Programme in COMPUTER SCIENCE AND ARTIFICIAL INTELLIGENCE

	4. A research project, dated and signed, developed in accordance with one of the research topics of the PhD course and with the Areas and S4 trajectories (approximate limit 10.000 characters, spaces included, in English language).
Optionally documents that will be evaluated if presented (Art. 5 of the Call)	1. Publications (max 3); 2. Recommendation letters (max 2) written by university professors, scientific researchers or other experts in the specific research topics (art. 6 of the Call); 3. Certification issued by the University or, if the Candidate is a European Union citizen (refer to art. 5 paragraph 5 of the Call), self-certification of the exams (a list with: grade for each exam, average grade, highest possible grade) passed during the Laurea Specialistica/Magistrale programmes or the Italian programmes ante D.M. 509/99 or during the foreign academic master programmes; 4. Certification issued by the University or, if the Candidate is a European Union citizen (refer to art. 5 paragraph 5 of the Call), self-certification of the academic title and the exams (a list with: grade for each exam, average grade, highest possible grade) passed during the Italian Laurea Triennale or equivalent foreign academic title (bachelor); 5. Abstract in Italian or English language (between 15.000 and 25.000 characters, spaces included) of the master thesis ("Tesi di Laurea") associated to the degree/title providing access to the PhD programme, signed by the thesis Supervisor or self-certified. The abstract must be submitted also by Applicants who are not graduated on the expiration date of this Call.
All titles must be presented exclusively in PDF format, dated and signed by the candidate.	

SELECTION COMMITTEE	
Appointed Members	Vincenzo Della Mea – associate professor – University of Udine Federico Fontana – associate professor – University of Udine Giuseppe Serra – associate professor – University of Udine
Alternate Members	Christian Micheloni – full professor – University of Udine Carlo Drioli – associate professor – University of Udine

ADMISSION

GENERAL COMPETITION (art. 8 of the Call for Applications)

Available positions: 1				
Seat description	***No.***	***Lender***	***Gross annual amount***	***research programs***
Places WITH SCHOLARSHIP: 6	1	Ministerial Decree 117 of 2 March 2023 (PNRR Mission 4 Component 2 Investment/Subinvestment 3.3) andBeanTech SRLCUP G23C23001180005	€16,243.00	Theme 1.1 - Integration of artificial intelligence systems based on large language models, code interpreters and generative AI in data analysis solutions
	1	Ministerial Decree 117 of 2 March 2023 (PNRR Mission 4 Component 2 Investment/Subinvestment 3.3) andBeanTech SRLCUP G23C23001180005	€16,243.00	Topics 1.2 - Industrial application of "copilot" for the purpose of parameterizing recipes of industrial systems (e.g. tuning algorithms on new productions)
	1	Ministerial Decree 117 of 2 March 2023 (PNRR Mission 4 Component 2 Investment/Subinvestment 3.3) andEYE-TECH SRLCUP G23C23001180005	€16,243.00	Theme 1.3 - Study and design of artificial intelligence algorithms for quality control of production processes
	1	Ministerial Decree 117 of 2 March 2023 (PNRR Mission 4 Component 2	€16,243.00	Theme 1.4 - Artificial intelligence for decision support in pathological anatomy

TABLE 3 – PhD Programme in COMPUTER SCIENCE AND ARTIFICIAL INTELLIGENCE

		Investment/Subinvestment 3.3) andThesis ELECTRONICS AND INFORMATION SYSTEMS SpACUP G23C23001180005		
	1	Ministerial Decree 118 of 2 March 2023 (PNRR Mission 4 Component 1 Investment/Subinvestment 4.1) and University of Udine CUP G23C23001240003	€16,243.00	Theme 1.5 - Artificial vision for wildlife tracking in uncontrolled environments
	1	Ministerial Decree 118 of 2 March 2023 (PNRR Mission 4 Component 1 Investment/Subinvestment 4.1) and University of Udine CUP G23C23001350003	€16,243.00	Theme 1.6 - Machine learning for decision support in the interpretation of pathological anatomy images

Competition procedure and schedule

Qualifications evaluation and oral examination.
For the evaluation of applicants' attitude for scientific research and their basic skills before the course program, the Selection Committee can attribute up to 100 points to each applicant: at most 30 points to the titles and at most 70 points to the oral examination. The applicant is admitted to the oral examination if he/she scores at least 18 points for the titles. The oral examination is passed by scoring at least 49 points. The applicant is eligible for the PhD programme if he/she passes the oral examination. Only for eligible applicants, the points attained in in the oral examination will be added to the points of the titles.
DATE FOR THE PUBLICATION OF ADMITTED APPLICANTS TO THE ORAL EXAMINATION: within September 12, 2023
DATE FOR THE PUBLICATION OF THE FINAL RANKING LIST: within September 26, 2023

Foreign language that can be used for examination	Italian or English		
Evaluation of the titles	Curriculum vitae et studiorum, academic title, exams and abstract of master thesis		Max 18 points
	Research project, scientific publications and Referees' recommendation letters		Max 12 points
Oral examination	Starting score bonus		At most 2/3 of the total score obtained from the evaluation of the titles
	Interview about titles, previous career and research project also aimed at understanding the Applicant's knowledge about fundamental topics in computer science and artificial intelligence, as well as his or her full eligibility to receive, if preferred, a scholarship funded by external institutions. Reading and understanding a short scientific text in English.		Max 50 points
Calendar of the oral examination	**Date**	September 21, 2023	
	Time	9:30 AM	
	Place	Department of Mathematics, Computer Science and Physics, (DMIF) "Sala Riunioni" – via delle Scienze 206, 33100 Udine https://www.dmif.uniud.it/il-dipartimento/sedi/	
	The oral examination may be organized across more than one day. Interviews online are allowed upon motivated request and within the Call provisions (art. 8 p.4 of the Call). Applicants must exhibit a valid personal identification document for admission to the oral examination.		

Description of research topics

Research Topic 1.1 - Integration of artificial intelligence systems based on large language model, code interpreter and generative AI to data analysis solutions
Ministerial Decree 117 of March 2, 2023 (NRP Mission 4 Component 2 Investment/Subinvestment 3.3)

Consistency of proposed research with PNRR areas of interest:
The program is consistent with the theme Digitization and Technological Innovation.

TABLE 3 – PhD Programme in COMPUTER SCIENCE AND ARTIFICIAL INTELLIGENCE

Objectives and expected results, proposed research activity, methodologies and content:
The research will focus on the study and analysis of Artificial Intelligence techniques and methods with particular reference to generative AI techniques and techniques that make use of large language models and code interpreters applied to data analysis solutions. In particular, generative AI techniques will be studied for the creation of new learning models capable of generating new content, such as text, images, music or video. Large language models (such as CHAT-GPT) that trained on large amounts of textual data can understand and generate human-like language will also be studied. The process of training large language models involves exposing the model to a large corpus of data. The model learns to predict the next word in a sentence based on the context provided by the previous words. This process enables the model to understand grammar, syntax and even semantic relationships between words.

Period abroad (mandatory): 6 months

Foreign host entity data: to be defined

Period in enterprise (mandatory): 18 months, including non-continuous period

Enterprise data:
beanTech s.r.l.
registered office Via Ivrea, 5 - 33100 Udine UD

Research activities to be carried out in the *enterprise*:
Tests and experiments on real data will be carried out during the period of stay in the enterprise. The phase of validation of prototypes on already found data in relation to evaluation parameters recognized in the International Scientific Community and final verification of the developed algortims will be carried out.

Consistency of the doctoral program with the specific principles and obligations of the NRP:

- Cross-cutting priorities: The doctoral program is fully consistent with the specific principles and obligations of the NRP, and in particular with its cross-cutting priorities.

- twin transitions (green and digital): As much as possible, the doctoral program will take into account the twin transitions (green and digital)

- Do No Significant Harm - DNSH: The implementation of project activities is expected not to cause significant harm to environmental objectives (so-called "Do No Significant Harm" (DNSH) principle), according to Article 17 of Regulation (EU) 2020/852.

- Open science and FAIR Data: the results obtained will be treated in accordance with the principles of Open science and FAIR Data.

Professor/researcher of reference:
Prof. Gianluca Foresti

Research Topic 1.2 - Industrial application of "copilot" for the purpose of recipe parameterization of industrial systems (e.g., tuning algorithms on new productions)
Ministerial Decree 117 of March 2, 2023 (NRP Mission 4 Component 2 Investment/Subinvestment 3.3)

Consistency of proposed research with PNRR areas of interest:
The program is consistent with the theme Digitization and Technological Innovation.

Objectives and expected results, proposed research activity, methodologies and content:
The research project aims to study and implement a co-pilot based on AI algorithms that can guide an operator in the design and development of industrial solutions for complex image analysis and processing. The goal is to develop a method to adapt a neural network, trained on the data of a particular industrial process, to a new process, automatically changing the network parameters according to the characteristics and performance of the new process. The developed system can be tested for the study and analysis of new approaches to existing problems, for the definition and choice of parameters in new application contexts, and for the possible extension of functionality in existing application systems. The project includes a phase of data collection and analysis on different industrial processes, a phase of state-of-the-art analysis on the main algorithms for transfer learning and automatic tuning of the intrinsic parameters of a neural network, the development of a neural network model capable of learning from different types of data and processes starting from a structure and a set of initial parameters fixed a priori, and the development of a training algorithm that performs the tuning of the developed neural network adapting to the process to be modeled.

Period abroad (mandatory): 6 months

Foreign host entity data: to be defined

Period in enterprise (mandatory): 18 months, including non-continuous period

Enterprise data:
beanTech s.r.l.

TABLE 3 – PhD Programme in COMPUTER SCIENCE AND ARTIFICIAL INTELLIGENCE

registered office Via Ivrea, 5 - 33100 Udine UD

Research activities to be carried out in the *enterprise*:
Testing and experiments on real data will be carried out during the tenure period of the enterprise. In particular, the validation phase of the prototypes will be carried out on the already found data in relation to evaluation parameters recognized in the International Scientific Community and final verification of the developed algorithms.

Consistency of the doctoral program with the specific principles and obligations of the NRP:
- Cross-cutting priorities: The doctoral program is fully consistent with the specific principles and obligations of the NRP, and in particular with its cross-cutting priorities.
- twin transitions (green and digital): As much as possible, the doctoral program will take into account the twin transitions (green and digital)
- Do No Significant Harm - DNSH: The implementation of project activities is expected not to cause significant harm to environmental objectives (so-called "Do No Significant Harm" (DNSH) principle), according to Article 17 of Regulation (EU) 2020/852.
- Open science and FAIR Data: the results obtained will be treated in accordance with the principles of Open science and FAIR Data.

Professor/researcher of reference:
Prof. Gian Luca Foresti

Research topic 1.3 - Study and design of artificial intelligence algorithms for quality control of production processes
Ministerial Decree 117 of March 2, 2023 (NRP Mission 4 Component 2 Investment/Subinvestment 3.3)

Consistency of proposed research with PNRR areas of interest:
The study and design of artificial intelligence algorithms for quality control of production processes represents consistency with the National Recovery and Resilience Plan (NRP) in several respects. First, the PNRR promotes digitization and technological innovation as fundamental pillars for the modernization of the Italian economy. The development of artificial intelligence algorithms for quality control of production processes represents a direct application of these technologies to the industrial sphere, enabling significant improvement in the efficiency and accuracy of quality control. In addition, the NRP stresses the importance of digital skills development and training to ensure the readiness of the Italian workforce to meet the challenges of the digital economy. The study and design of artificial intelligence algorithms require specialized skills in AI and data science, and their development and application foster the growth of digital skills and technological innovation in the manufacturing sector. In conclusion, the study and design of artificial intelligence algorithms for quality control of production processes aligns with the priorities and goals of the NRP, promoting digitization, technological innovation, business competitiveness and the development of digital competencies in the Italian industrial sphere.

Objectives and expected results, proposed research activity, methodologies and content (including the research activity to be carried out in the enterprise):
The objectives to be achieved through the research project, concern the study and design of an artificial intelligence system based on machine vision algorithms, which is able to recognize anomalies and defects on specific components made by industries operating in the furniture and automotive sectors where, at present, the detection of "defective" products, even in small percentages, leads to the rejection of the entire production batch with very high economic repercussions for the company that produced them. The research activities in this area will have to follow a path divided into several phases starting from the study and analysis of the state of the art for the search of the best artificial intelligence algorithms in the field of vision to be used or adapted for the intended purposes, to the prototype development of algorithms capable of processing the data acquired through heterogeneous sensors (traditional cameras, depth sensors, 3D scanners, etc.) supported also by robotic automation systems. The expected results should demonstrate the effectiveness and robustness of the realized algorithms for their subsequent introduction and use in industrial operating environments where quality control increasingly needs support from innovative artificial intelligence systems.
The research project focuses on the study and development of artificial intelligence algorithms and systems in the field of computer vision, with the goal of addressing the problem of anomaly and defect detection through visual sensor systems. In addition to what has been outlined above, the overall objectives of the project include the analysis of the state of the art of artificial intelligence and computer vision techniques applied to anomaly detection, as well as the development of new methods and approaches to improve the accuracy and efficiency of defect detection in industrial components.
The specific objectives of the project are as follows:
1. To analyze the state of the art of artificial intelligence and computer vision algorithms for detecting visual anomalies in order to identify the most promising techniques and research areas that require further development.
2. Develop prototypes of machine vision algorithms that can process images captured by different types of sensors, such as conventional cameras, depth sensors, and 3D scanners, to identify anomalies and defects in industrial components.
3. Integrate the developed algorithms with any robotic automation systems in order to improve the efficiency of the inspection process and reduce the time required for defect detection.
4. Test and evaluate the performance and robustness of the developed algorithms on different case studies and realistic scenarios in order to determine the effectiveness of the proposed solutions and identify possible areas for improvement.
5. To study the economic and environmental impact of implementing artificial intelligence systems for anomaly detection in the areas identified in agreement with the company involved in the training project, assessing the potential benefits in terms of reducing production waste and associated costs.
6. Disseminate research results through scientific publications, presentations at conferences and workshops, and collaborations with industrial and academic partners to promote the development and adoption of innovative solutions in the field of anomaly detection based on artificial intelligence and computer vision.
The main research activities to be carried out in the company will be as follows: 1) Study and analysis of the state of the art for research of artificial intelligence algorithms that can be used to achieve the set objectives. 2) Conceptual analysis of hardware and software system requirements and definition of the logical system architecture. 3) Design of algorithms and procedures for anomaly/defect detection and verification. 4) Integration of modules for system validation and verification of results.

TABLE 3 – PhD Programme in COMPUTER SCIENCE AND ARTIFICIAL INTELLIGENCE

In industrial sectors such as those concerning the production of accessories for the furniture and automotive industries requires, from a Lean Manufacturing perspective, precise and accurate quality control that is still carried out by the personnel in charge with low levels of accuracy, due to the difficulty of consistently detecting anomalies that define the product as scrap. Research in this area of artificial intelligence technology solutions for automated control to support production processes would enable the achievement of a high level of innovation while ensuring high quality standards. In addition, the achievement of the set goals would allow better waste management as well as an improvement of the entire production process where waste rates, especially in the production of these types of products, still reach very high values.
Added value derived to the company from the implementation of the project (e.g., prospects for company, employment, industry growth, etc.): Quality control of production processes is a sensitive issue in a number of industries, especially in those where the search for anomalies is still carried out "by hand" by the personnel in charge. Nowadays, the critical issues that companies in these production sectors are encountering, and which they see as an important issue on which to place the utmost attention in the coming years as well, mainly concern the difficulties in finding competent personnel who are willing to support the company in such tasks. Not only that, on the latest generation of production lines where the ability to manufacture each product has reached high levels of speed, it requires at the same time automated, reliable control systems capable of ensuring high levels of quality and, consequently, reducing waste. Research in this area would make it possible to identify innovative and concrete solutions regarding real problems that are occurring in different industries, allowing Eye-Tech to grow quickly both in terms of know-out and skills on how to best leverage artificial intelligence in Lean Manufacturing, and in the ability to be able to hire and train new technical employees with specific skills for activities such as research and development.
The expected outcomes of the research project in terms of publications and dissemination activities include the production of at least three major scientific contributions published in relevant journals and conferences. Below are some specific statements regarding these expected outcomes:
1. Publication of at least one article in a peer-reviewed international scientific journal is expected, in which the results obtained in the development of artificial intelligence and computer vision algorithms for the detection of anomalies and defects in industrial components will be presented.
2. At least two papers are expected to be presented at high-level international conferences in the field of artificial intelligence and computer vision, with the aim of sharing research results with the scientific community and receiving feedback for further improvement and future development.
3. Dissemination activities will also include participation in workshops and seminars, both nationally and internationally, to discuss the results obtained and promote collaboration with other researchers and research groups in the field of artificial intelligence and computer vision applied to anomaly detection.

Period abroad (mandatory): 6 months

Foreign host entity data: to be defined

Period in enterprise (mandatory): 18 months

Enterprise data:
Eye-Tech SRL
Prasecco Street 3/A
33170 Pordenone

Consistency of the doctoral program with the specific principles and obligations of the NRP:
- Cross-cutting priorities: A doctoral program in computer vision and artificial intelligence (AI) that focuses specifically on anomaly and defect detection using computer vision is encouraging STEM for some underrepresented groups, building diversity and improving sustainability. This program provides opportunities for advanced research and training in computer vision and AI, with a specific focus on anomaly and defect detection using computer vision techniques. Through the inclusion of underrepresented groups, such as women and minorities, the program aims to promote diversity in the STEM field. In addition, the application of machine vision techniques for anomaly and defect detection can help improve sustainability in various sectors, such as manufacturing and process automation, by reducing waste and improving overall efficiency.
- twin transitions (green and digital): A doctoral program such as the one described, focusing on computer vision and AI for anomaly and defect detection, would have a significant impact on digital innovation and the transition to a greener economy. Through the research and development of new techniques and algorithms for computer vision, the program would stimulate digital innovation in the field of anomaly and defect detection, enabling companies to identify and solve problems more efficiently and accurately. This could lead to increased productivity, reduced waste and improved product quality. In addition, the application of these technologies within key sectors of the economy, such as manufacturing and process automation, would support a transition to a greener economy, as it would enable more efficient resource management, reduced environmental impacts and greater overall sustainability.
- do no significant harm - DNSH: PhD students have access to tools to reduce significant harm to the environment by promoting responsible resource use and incorporating ethics into research. Many projects focus on solving real environmental challenges aligned with the United Nations Sustainable Development Goals, positioning graduates to promote sustainable solutions through AI innovation.
- Open science and FAIR Data: the program encourages students to adopt the principles of Open Science and FAIR Data, ensuring transparency, reproducibility and reuse of knowledge. Programs encourage the sharing of models, code, datasets and experimental results through platforms such as GitHub, Zenodo, Kaggle and others. Students publish open documents allowing future collaborators to build on existing insights and accelerate progress toward common goals. Emphasizing FAIR data principles helps combat data bias, prevent information silos, enable interdisciplinary analysis, and promote the collection of collective intelligence to improve AI outcomes.

Professor/researcher of reference:
Prof. Niki Martinel

Research Topic 1.4 - Artificial Intelligence for Decision Support in Pathology Anatomy.
Ministerial Decree 117 of March 2, 2023 (NRP Mission 4 Component 2 Investment/Subinvestment 3.3)

Consistency of proposed research with PNRR areas of interest:

TABLE 3 – PhD Programme in COMPUTER SCIENCE AND ARTIFICIAL INTELLIGENCE

The project is based on the PNRR pillars "Digital Transformation" and "Health and Resilience," with expected results relevant to the PNRR theme "M6C2: Innovation, Research and Digitization of the National Health Service."

Objectives and expected results, proposed research activity, methodologies and content:
The main objective concerns the study of methodologies and techniques for decision support in Anatomic Pathology, with particular but not exclusive reference to the use of machine learning techniques that help simplify the work of pathologists, for example, by prioritizing work lists, identifying suspicious areas in tissues, simplifying the quantification of immunohistochemical markers, but also supporting it traceability of specimens in the laboratory workflow.

More specific goals include:
- the analysis of histological images using deep learning systems also in a multimodal perspective that includes the use of data such as biographical or laboratory data. In this case, the decision support may be for diagnostic or prognostic purposes. The focus of the analyses may be on the main areas in which research is currently focusing, such as segmentation, classification, and quantification.
- Also as a result of the research period in the company, the study of workflow supported by laboratory information systems will allow the identification of models for the integration of Anatomic Pathology information systems and AI systems, with a view to the complete digitization of the workflow, and to identify situations in which the application of machine learning techniques may enable workflow optimization.

Activities
The following activities will be put in place to achieve the goal:
A) literature review and identification of the state of the art regarding microscope image analysis;
B) selection of one or more case studies for which meaningful baselines are available, on which to focus for testing some innovative techniques;
C) preparation of a methodology for the collection and selection of digital slides in a concrete application setting, to be used for a clinical validation of the results obtained, also in order to verify their generalizability. The most appropriate computer-aided annotation techniques to reduce the impact on the expert's workload will also be studied at this stage;
D) Systematic study of workflow supported by laboratory information systems in a concrete case study;
E) Once the more purely scientific issues have been addressed, a technological hypothesis for the exploitation of the developed models will also be designed, integrating them into the workflow typically supported by Anatomic Pathology information systems, with a view to their complete digitization.
Expected Results.
1. the development of one or more histological tissue classification and/or segmentation models in the identified case studies, obtained by experimenting with different deep learning techniques from CNN to Visual Transformers, with and without the integration of external data;
2. establishment of a dataset of relevant digital slides that can serve as a reference for further experimentation; if possible, the dataset will be made available according to FAIR principles;
3. evaluation of the effectiveness of the models in a real-world setting, consisting of slides acquired in multiple pathology laboratories, to understand their real clinical usability;
4. modeling of a methodology for integrating image analysis models within Anatomic Pathology information systems that will allow them and any models developed in the future to be used for clinical purposes;
5. identification of areas in the laboratory workflow where further machine learning techniques can be applied;
6. publication of at least 3 papers in international indexed journals and at least 4 papers in conference proceedings.

Period abroad (mandatory): 6 months

Foreign host entity data: to be identified

Period in enterprise (mandatory): 15 months

Enterprise data:
TeSi ELECTRONICS AND INFORMATION SYSTEMS S.p.A.
Registered office: Milan - ZIP code 20145 - Via Mascheroni, 14
Headquarters: Pianiga (VE) - Via Friuli Venezia Giulia, 77

Research activities to be carried out in the *enterprise*:
With reference to the activities previously described, those to be carried out in the enterprise are:
B) selection of one or more case studies for which significant baselines are available, on which to focus for testing some innovative techniques, with acquisition of the cases needed for the experiments.
D) Systematic study of workflow supported by laboratory information systems in a concrete case study with identification of nodes that can be improved by machine learning;
E) Once the more purely scientific issues have been addressed, a technological hypothesis for the exploitation of the developed models will also be designed, integrating them into the workflow typically supported by Anatomic Pathology information systems, with a view to their complete digitization.

Consistency of the doctoral program with the specific principles and obligations of the NRP:

The Ph.D. program in Computer Science & Artificial Intelligence as a whole is organized to meet the cross-cutting priorities of the NRP, particularly the participation of women and underrepresented groups in STEM fields, and to foster diversity and inclusion. In particular, a cross-curricular course on "Diversity and Inclusion in the Work Team" is offered to all doctoral students in the University. In general, the doctoral program contributes directly to the achievement of SDGs 4 and 5, and may contribute to several other SDGs depending on the technologies designed, tested, and evaluated in individual doctoral projects. Ph.D. students also have ways to publish their results according to FAIR

TABLE 3 – PhD Programme in COMPUTER SCIENCE AND ARTIFICIAL INTELLIGENCE

principles, and supplementary agreements with major scientific publishing publishers make it relatively easy to publish scientific articles in open access mode.

This project is also consistent with PNRR principles and obligations in the following ways:

- The implementation of the proposed machine learning technologies contributes to the achievement of SDG 3 "Health and Welfare," with possible spillover to SDG 9 "Enterprise Innovation and Infrastructure" as well.

- Twin transitions: the digital transition of healthcare is an integral part of the goals of this project.

- DNSH: The release of the developed models will allow their reuse both directly and as a basis for transfer learning, thus reducing the energy impact of training.

- Open science and FAIR principles: The data collected during the research will be subject to a Data Management Plan with the aim of making them available for reuse in an Open Data perspective. Accordingly, the models developed will be released publicly; if possible, the training dataset, anonymized appropriately, will also become a publicly available resource, all by leveraging resources such as Zenodo so that they are traceable and maintainable; the code developed, provided to accompany models and articles, will be published on Github; and finally, publications resulting from the project will be submitted to open access journals.

Professor/researcher of reference:
Prof. Vincenzo Della Mea

Research topic 1.5 - Artificial vision for tracking wildlife in uncontrolled environments
Ministerial Decree 118 of March 2, 2023 (PNRR Mission 4 Component 1 Investment/Subinvestment 4.1) - PNRR Research

Consistency of the proposed research with PNRR areas of interest and, for science-technology areas, indications of how the proposed research can promote interdisciplinarity, membership in international networks and intersectorality:
This proposal is highly consistent with the PNRR areas of interest for science-technology areas. Integrating artificial intelligence into environmental projects such as wildlife monitoring could offer new possibilities for conservation actions that are more accurate, faster, more efficient and cheaper than current ones. The collaboration that occurs between different knowledge domains also helps to create multidisciplinary teams that can work together, bringing added value and innovative perspectives. These cross-disciplinary partnerships facilitate the translational application of cutting-edge technologies into tangible benefits for the environment and biodiversity. This is a modern, holistic way of addressing some of the most important problems facing humanity today.
More specifically, the project promotes interdisciplinarity, membership in international networks, and intersectionality in several ways. First, it addresses a problem that requires collaboration between computer science and biology: the need for efficient and accurate methods for identifying wildlife in images and videos captured in natural habitats. Both disciplines bring unique expertise, and the proposed project recognizes the importance of working together to address the challenge. Second, the project involves linking with existing research networks and established biodiversity monitoring organizations to leverage existing resources and foster collaboration. Through collaboration with a foreign research organization with a particular focus on biodiversity, the project will benefit greatly from access to such expertise and the vast archives of scientific literature and data collected. The partnerships currently established by that center will then open the door to experts willing to contribute to the advancement of computational technologies to support ecological studies. Finally, the project promotes the creation of new connections between computer scientists and biologists, engaging research communities that would not otherwise interact frequently. The cross-pollination of ideas between people who specialize in different areas can lead to innovative solutions to common problems and help break down barriers between disciplines.
In summary, the proposed project brings attention to interdisciplinary research as an essential component in finding effective solutions to global problems. Through its international scope (already at the proposal level) and implementation, it seeks to build bridges between computer science and biology and is intended to encourage dialogue between academics and policymakers concerned with environmental conservation and technological development. Its goal is to not only produce cutting-edge AI, but to translate it into actionable insights for stakeholders interested in protecting animals, and by extension the ecosystems of planet Earth. By focusing on the intersection of technical advances and social responsibility, this project represents a concerted effort toward environmental protection, reflecting a crucial aspect of responsible leadership and informed decision-making that is more critical today than ever before.

Objectives and expected results, proposed research activity, methodologies and content:
Wildlife tracking has become increasingly important for conservation purposes, particularly in remote or difficult-to-access areas where traditional methods, such as manual counting or camera traps (camera-traps), are impractical. CV techniques have emerged as a powerful tool to automate this process by identifying and tracking animals through video footage. However, these approaches still face significant challenges due to the variability of lighting conditions, pose changes and backgrounds present in realistic scenarios. To overcome these limitations, we set ourselves the primary goal of developing new techniques to identify animals in images and videos captured in natural habitats considering minimal supervision. To achieve this goal, we propose a two-step approach, in which we proceed by initially introducing large-scale self-supervised learning solutions using "unlabeled" images to learn generic features applicable to different scenarios, followed by an eventual finalization phase applied using a limited number of labeled datasets adapted to particular species or environments. Our overall goal is to reduce reliance on costly manual labeling while enabling efficient deployment of state-of-the-art models for real-world use cases. We expect the proposed solutions to provide better performance than current approaches that rely solely on fully supervised training or unimodal feature extraction alone. In addition, we plan to evaluate robustness against common sources of uncertainty faced by field operators or autonomous systems collecting multimedia resources, such as variable illumination, occlusion, motion blur, etc. Finally, by sharing the knowledge gained in the course of this undertaking with a broader

TABLE 3 – PhD Programme in COMPUTER SCIENCE AND ARTIFICIAL INTELLIGENCE

audience spanning several disciplines (especially in the world of biology), we hope to stimulate thoughtful dialogue about the potential ethical implications of widespread adoption of intelligent monitoring equipment in unregulated environments.

Objectives and expected results:
- To develop a self-supervised learning model for re-identification of wild animals in unsupervised environments.
- Evaluate the effectiveness of the proposed model compared with previous methods that rely on human annotation.
- Connect to existing research networks in computer vision and wildlife conservation to promote interdisciplinary collaboration and knowledge exchange.
- Promote new connections with various stakeholders, including government agencies, nongovernmental organizations, and private companies working in the field of wildlife conservation to send project proposals to European/international open-calls.
- Publication of at least 3 papers in international journals and 4 papers at international conferences in the field of AI and computer vision. Publication of at least 2 papers in international journals and 2 papers at international conferences in the field of wildlife conservation.

Research activities:
- Literature Review: Review the existing literature on self-supervised learning in computer vision and its application to animal re-identification tasks. Identify gaps in the current state of the art and formulate hypotheses on how to improve performance.
- Data collection: Collect a set of images/videos depicting wild animals in different conditions (e.g., lighting, poses, backgrounds). Ensure diversity in terms of species, habitats, and environments to make the dataset representative of actual scenarios. These activities will be carried out in continuous coordination with the research center identified for collaboration as an expert in (conservation of) biodiversity.
- Model design: Design a set of self-supervised learning algorithms that leverage data augmentation techniques, contrastive learning methodologies, and data-masking solutions to obtain a robust representation of each specimen.
- Validation experiments: Conduct experiments to evaluate the performance of the proposed model against existing methods that require human annotation. Compare performance using standard metrics and understand gaps in solutions to identify alternative methods.
- Networking and outreach: Collaborate with experts and professionals in the fields of computer vision and wildlife conservation through conferences, workshops and online platforms. Share preliminary findings, seek feedback and explore potential opportunities for collaboration (beyond the current partnership with the research center).

Methodology and content:
In order to achieve the set goals, the following methodological steps will be adopted as a guide to project implementation:
- Quality data collection: An essential prerequisite for building effective artificial intelligence models is the collection of large amounts of relevant data, which requires significant effort and resources. Our team will work closely with the Biodiversity Research Center and related networks of nature reserves, national parks and zoos around the world
to obtain permission to capture images or videos showing various wildlife species living under different conditions. Since manual tagging of millions of individual frames is time-consuming and expensive (but necessary at least for the validation phase of the proposed algorithms), we intend to use semi-automated/assisted annotation workflows that consist of proposed videos/images of possible interest then refined by experts in the field or crowdsourced workers for greater accuracy.
- Designing Relevant Learning Objectives for Self-Supervised Modeling: Self-supervised learning has emerged as an exceptionally powerful tool for discovering meaningful features within large collections of images, using various learning tasks that exploit missing information prediction, perform input image reconstruction, or establish similarity between the same artificially manipulated sample and the rest of the dataset. These categories include, for example, jigsaw puzzle solving, contrastive learning based on cluster assignments, rotation prediction, coloring, or patch-based permutations. These can lead to generating valuable feature representations applicable to downstream classification problems, such as species recognition. Experimentation with various combinations of penalty features and customized network architectures specifically suited to computer vision in the natural environment is part of this phase.
- Evaluation of increased performance and generalization ability: Once satisfactory feature extraction abilities have been achieved through self-supervised methods, application of these learned representations for object detection and species recognition can be proceeded.

Period abroad (mandatory)*:* 6 months

Foreign host entity data:
Naturalis Biodiversity Center
Darwinweg 2
2333 CR Leiden
Nederland

Consistency of the doctoral program with the specific principles and obligations of the NRP:
- Cross-cutting priorities: AI has contributed significantly to the achievement of many of the UN SDGs, including Climate Action (SDG 13), Life Under Water (SDG 14) and Life on Earth (SDG 15). For example, AI/Computer Vision research and applications are being developed to monitor biodiversity and wildlife conservation, reduce deforestation rates, increase crop yields and water efficiency, optimize waste management, assess renewable energy potential, and more. These technologies could play a key role in addressing climate change and sustainability goals. Encouraging the participation of women and underrepresented groups in science, technology, engineering, and mathematics (STEM) fields is essential to avoid losing talented individuals who could make valuable contributions. Providing equal opportunities for mentoring, networking, publication, financial support, and professional growth can promote inclusion and broader perspectives. Promoting education, collaboration and community efforts could benefit society beyond academia. Help build the technical foundation needed to drive positive change while promoting diversity, inclusion and human rights within the STEM community. By providing role models, exposure to real-world applications, and awareness of modern challenges and limitations, the program prepares its students to pursue our collective quest for a better world.
- Twin Transitions (green and digital): the Ph.D. prepares graduates for a green and digital transition by promoting sustainable practices in technological innovation and fostering collaboration across industries. The interdisciplinary nature of these programs emphasizes understanding emerging trends and the social and economic impact of artificial intelligence and computer vision applications, training experts who contribute to inclusive and green solutions. The encouragement of open access, public engagement, and citizen science approaches further supports this transformative shift toward a more transparent and connected global community that harnesses advanced technologies for positive change.

TABLE 3 – PhD Programme in COMPUTER SCIENCE AND ARTIFICIAL INTELLIGENCE

- Do No Significant Harm - DNSH: Ph.D. students have access to tools to reduce significant harm to the environment by promoting responsible resource use and incorporating ethics into research. Many projects focus on solving real environmental challenges aligned with the United Nations Sustainable Development Goals, positioning graduates to promote sustainable solutions through AI innovation.
- Open science and FAIR Data: the program encourages students to adopt the principles of Open Science and FAIR Data, ensuring transparency, reproducibility and reuse of knowledge. Programs encourage the sharing of models, code, datasets and experimental results through platforms such as GitHub, Zenodo, Kaggle and others. Students publish open documents allowing future collaborators to build on existing insights and accelerate progress toward common goals. Emphasizing FAIR data principles helps combat data bias, prevent information silos, enable interdisciplinary analysis, and promote the collection of collective intelligence to improve AI outcomes.

Professor/researcher of reference:
Prof. Niki Martinel

Research Topic 1.6 - Machine Learning for decision support in image interpretation in anatomy
Ministerial Decree 118 of March 2, 2023 (NRP Mission 4 Component 1 Investment/Subinvestment 4.1) - Public Administration

Indication of multidisciplinarity, orientation to PA applied research and development of knowledge and skills referred to in Art. 9 c. 1 of M.D. 118/2023:
Because of the topic addressed, the project is extremely interdisciplinary, needing contributions from the medical area, which is also the field that can benefit from the outcomes of the project itself, but being unable to do without state-of-the-art knowledge in the field of artificial intelligence, both subsymbolic and symbolic.
The proposed project, in its more translational outcomes, may contribute to the PNRR pillars "Digital Transformation" and "Health and Resilience," with expected results relevant to the PNRR theme "M6C2: Innovation, Research and Digitization of the National Health Service."
In fact, the use of automatic microscope image analysis systems can offer new possibilities for streamlining the work of pathology laboratories, first by prioritizing activities based on the criticality of the case, highlighting suspicious areas, etc.
Health care is one of the areas of PA with the greatest impact on both the economy and quality of life for people, especially at a time of human resource shortages parallel to the aging of the general population. An approach that rationalizes and optimizes the work of the health care workforce using information technology certainly contributes to greater effectiveness, efficiency and economy of public action, including helping to redesign organizational models.

Objectives and expected results, proposed research activity, methodologies and content:
Microscope images can be acquired with special scanners, which produce images-known as digital slides or WSIs-at typical resolutions of 0.2-0.5 microns/pixel, on samples on the order of several mm2-cm2. The result is Gpixel images, rich in information that precisely because of the size of the images are to date not fully exploited. For the same reason, their systematic digitization is still rarely carried out, although some laboratories or entire regional networks of laboratories are beginning full digitization processes.
It is a field whose strong development began late compared with other medical specialties precisely because of the size of the images to be processed, which made their processing too complex for a long time, but it is now beginning to have results of scientific interest from both the informatics and clinical perspectives.
It is also an excellent application area for studying deep learning techniques geared toward both image and data integration and exploitation of multiresolution information, which is a topic of interest in microscopy.
One of the open problems is also the generalizability of the models: the whole pre-acquisition laboratory phase is not totally standardized, just as scanner outputs are not standardized, so the resulting colors may differ.

Objectives and expected results:
-Development of an ontology of tissues and cells.
-Defining a dataset of partially annotated images according to the developed ontology.
-A tissue segmentation model to be released publicly for two possible uses: directly, or as a pre-trained model to be specialized for diagnostic uses.
-One goal that follows from the development of a general histological tissue model, which can be specialized by transfer learning to more specific targets, is also to reduce the training time required compared to models trained from scratch or from generic training sets such as that of Imagenet. This may prospectively allow for lower power consumption and thus greater overall sustainability of model development.
-Validation of the model both for direct tissue segmentation and as a pre-trained model instead of the usual pre-trained models on Imagenet in some specific downstream tasks.
-Connecting with the international and national digital pathology community to promote interdisciplinary collaboration and verify the field use of project results.
-Publication of at least 3 papers in international journals and 4 papers at international conferences in the field of image analysis and medical informatics. Possible publication of clinically relevant results in anatomic pathology journals.
Research activities:
-Literature review: identification of possible tissue- and cell-specific ontologies, and/or upper-level ontologies to which to connect the ontology to be used for the project.
-Identification of a methodology that simplifies data annotation, reducing the need for lengthy sessions by experts.
-Model design: design and compare models both based on CNN and visual transformers, with or without pretraining, with and without data augmentation, with and without normalization. At this stage, crucial will be to identify and propose methods that can work at multiresolution.
-Validation experiments: two levels. The first relates to the effectiveness of the model in the specific training domain, i.e., with respect to the tissues identified in the ontology, also evaluating at possible levels of tissue or cell aggregation. The second level will relate to the use of the model as the basis for more specialized trainings.

Methodology and content:
The objectives will be achieved taking into account some methodological specificities:
-Tissue and cell ontology will be to the extent possible derived from pre-existing ontologies, such as for example CL (Cell Ontology) and BTO (BRENDA Tissue Ontology) with the necessary simplifications and specializations.

TABLE 3 – PhD Programme in COMPUTER SCIENCE AND ARTIFICIAL INTELLIGENCE

-Specific annotation costs a lot of specialized work by pathologists. Hybrid human-in-the-loop techniques may be tried, with the human expert refining cruder annotations made from preliminary models.

-Apart from an initial preliminary investigation phase, the developed models will have to be developed taking into account the problem of generalizability, which at present, in the field of digital pathology, is alternatively addressed by data augmentation or normalization.

-An additional constraint to consider concerns computational cost. At substantially equal performance, computationally lighter models will be preferred, again with a view to environmental sustainability.

Period abroad (mandatory): 6 months

Foreign host entity data:
Molecular Biology and Research Section
Hospital Virgen de la Cinta in Tortosa
Pere Virgili Institute for Health Research, Tarragona, Spain

Period in enterprise, research center or PA (mandatory): 6 months

Data enterprise, research center or PA:
Institute of Pathological Anatomy
Udine Hospital
Friuli Central University Health Company (ASUFC)

Research activities to be carried out in enterprise/research center/PA:
Several research activities, chosen with the involvement of the host institution, will be carried out at the Institute of Pathological Anatomy of the Azienda Ospedaliero-Universitaria di Udine (ASUFC):

1. First, the Ph.D. student will have the opportunity to increase his or her knowledge of histology and related disciplines from a design perspective (e.g., hints of molecular biology and genetics).
2. Support collection of images useful for model development.
3. Experimentation of the general model for pre-training of a specific model targeted at one or more problems of interest to the institution.
4. Discussion and insight regarding the possibilities of using structured data (such as molecular biology and genetic data), and possibly unstructured data (such as reports and clinical history), during the development of specific ti multimodal type models.

Consistency of the doctoral program with the specific principles and obligations of the NRP:
The Ph.D. program in Computer Science & Artificial Intelligence as a whole is organized to meet the cross-cutting priorities of the NRP, particularly the participation of women and underrepresented groups in STEM fields, and to foster diversity and inclusion. In particular, a cross-curricular course on "Diversity and Inclusion in the Work Team" is offered to all doctoral students in the University. In general, the doctoral program contributes directly to the achievement of **SDGs 4 and 5**, and may contribute to several other SDGs depending on the technologies designed, tested, and evaluated in individual doctoral projects. Ph.D. students also have ways to publish their results according to FAIR principles, and supplementary agreements with major scientific publishing publishers make it relatively easy to publish scientific articles in open access mode.
This project is also consistent with PNRR principles and obligations in the following ways:

- The implementation of the proposed machine learning technologies contributes to the achievement of SDG 3 "Health and Welfare," with possible spillover to SDG 9 "Enterprise Innovation and Infrastructure" as well.
- Twin transitions: the digital transition of healthcare is an integral part of the goals of this project, which is associated with a focus on the development of machine learning models with a lower than usual energy impact, which is notoriously high due to the large computing power to train the models, impacting the "green" transition;
- DNSH: The focus on reusable models that reduce the need for lengthy transfer learning trainings impacts air, water, or soil pollution prevention and reduction.
- Open science and FAIR principles: The data collected during the research will be the subject of a Data Management Plan with the aim of making them available for reuse in an Open Data perspective. Accordingly, the models developed will be released publicly; if possible, the training dataset, anonymized appropriately, will also become a publicly available resource, all by leveraging resources such as *Zenodo* so that they are traceable and maintainable; the code developed, provided to accompany models and articles, will be published on *Github*; and finally, publications resulting from the project will be submitted to open access journals.

Professor/researcher of reference:
Prof. Vincenzo Della Mea

TABLE 4 – PhD Programme INDUSTRIAL AND INFORMATION ENGINEERING

THE PhD PROGRAMME	
Administrative location	University of Udine, Polytechnic Department of Engineering and Architecture (DPIA) - via delle Scienze 206, 33100 Udine, ITALY (tel. +39 0432 558253)
Associated location	-
Location for training, teaching and research activity	Teaching and other training activities will take place primarily at the administrative programme location or in other locations of the University of Udine. The research programme will be developed according to the section "Research Topic Description".
Coordinator	Prof. David Esseni (david.esseni@uniud.it)
Programme duration	3 years
Curricula	1. New management paradigms and fabrication technologies for competitive enterprises with low environmental impact; 2. Information and communication technology for the inclusive society; 3. Design of innovative thermo-electro-mechanical systems and development of advanced methods for the assessment of structural damage and reliability for energy saving; 4. Mechanical technologies and electronic devices for domotics, medical diagnostic and safety.
Programme website	https://www.uniud.it/en/research/do-research/doctorate-res/our-ph-d-programmes/area-physical-science-and-engineering/industrial-and-information-engineering/ph-d-programme/industrial-and-information-engineering?set_language=en https://phd.diegm.uniud.it/iie-phd/

ADMISSION REQUIREMENTS	
Required degree	Italian Laurea (before DM 509/99) or Italian Laurea specialistica/magistrale (ex DM 509/1999 and DM 270/04). Foreign degrees and titles: refer to art. 3 and 4 of the Call.
Knowledge of the following foreign language	English

DOCUMENTS AND QUALIFICATIONS TO BE ATTACHED TO THE APPLICATION FOR ADMISSION	
Compulsory documents (art. 5 of the Call)	1. Certification or self-certification (refer to art. 5 paragraph 5 of the Call) of the academic title needed for admission to the PhD programme and list of the exams (with grades) passed during the Italian first level (bachelor) and the Laurea Specialistica/Magistrale programmess or during the Italian programmes before D.M. 509/99 or during the foreign academic programmes; 2. Curriculum vitae et studiorum, dated and signed; 3. Copy of a valid identity document (citizens of countries not belonging to the European Union a copy of a valid passport, comprehensive of the pages containing the holder's photo, personal details, passport number, date and place of issue, date of expiry); 4. A research project, dated and signed, developed, developed in accordance with the topic of interest, which highlights the contribution that the candidate can offer to the development of the topic itself (approximate limit 10.000 characters, spaces included).
Optional documents (art. 5 of the Call)	1. Master thesis ("Tesi di Laurea") associated to the degree/title providing access to the PhD programme. Applicants who are not graduated on the expiration date of this Call can submit an extended abstract in place of the complete thesis, in Italian or English language, signed by themselves and by their thesis Supervisor (approximate limit: 25.000 characters, including spaces); 2. Motivational letter by which the applicant explains the reasons for admission to the PhD programme, dated and signed (approximate limit: 2.500 characters, including spaces); 3. Publications (max 2); 4. Letters of reference (max 2), from university professors, scientific researchers or other experts in the field (art. 6 of the Call).
All titles must be presented exclusively in PDF format, dated and signed by the candidate.	

SELECTION COMMITTEE	
Appointed members	Ruben Specogna – associate professor – University of Udine Lauro Snidaro - associate professor – University of Udine Enrico Salvati – associate professor – University of Udine Pietro Romano – full professor – University of Udine
Substitute members	Roberto Rinaldo – full professor – University of Udine Marco Sartor – associate professor – University of Udine

ADMISSION
GENERAL COMPETITION (art. 8 of the Call for Applications)

TABLE 4 – PhD Programme INDUSTRIAL AND INFORMATION ENGINEERING

Positions available: 7				
Detailed description	***N.***	***Funding***	***Annual gross amount***	***Research topic***
Positions WITH SCHOLARSHIP: 7	1	D.M. 117 of March 2, 2023 (NRRP Mission 4 Component 2 Investment/Subinvestment 3.3) and EMC Gems Srl CUP G23C22001200003	€ 16,243.00	Topic 1.1 - Digital twin models for the virtualisation of product development and its condition monitoring based on physical models
	1	D.M. 117 of March 2, 2023 (NRRP Mission 4 Component 2 Investment/Subinvestment 3.3) and LimaCorporate S.p.A. CUP G23C22001200003	€ 16,243.00	Topic 1.2 - Application for parametric simulation of costs related to different distribution network scenarios
	1	D.M. 117 of March 2, 2023 (NRRP Mission 4 Component 2 Investment/Subinvestment 3.3) and Versalis S.p.A. CUP G23C22001200003	€ 16,243.00	Topic 1.3 - Artificial Intelligence for the economic and environmental sustainability of thermoplastic polymer production plants
	1	D.M. 117 of March 2, 2023 (NRRP Mission 4 Component 2 Investment/Subinvestment 3.3) and Thermokey S.p.A. CUP G23C22001200003	€ 16,243.00	Topic 1.4 - Study of pulsation dampers in microchannel heat exchangers
	1	D.M. 118 of March 2, 2023 (NRRP Mission 4 Component 1 Investment/Subinvestment 4.1) and University of Udine CUP G23C22001200003	€ 16,243.00	Topic 1.5 - Modeling of structural collapse phenomena in engineering materials and components using advanced numerical methods

Competition procedure and test schedule			
Evaluation of qualifications and oral examination. For the evaluation of applicants' attitude for scientific research and their basic skills to tackle the course program, the Selection Committee can attribute up to 100 points to each applicant: max 30 points to the titles and max 70 points to the oral examination. The applicant is admitted to the oral examination if his/her titles receive at least 16 points. The oral examination is passed with at least 49 points. The applicant is eligible to the PhD programme if he/she passes the oral examination. Only for eligible applicants, the points attained in in the oral examination will be added to the points of the titles. **DATE FOR THE PUBLICATION OF ADMITTED APPLICANTS TO THE ORAL EXAMINATION: within September 8, 2023.** **DATE FOR THE PUBLICATION OF THE FINAL RANKING LIST: within September 26, 2023.**			
Foreign language that can be used for examination	Italian or English		
Evaluation Criteria of qualifications	Curriculum vitae et studiorum		*10*
	Scientific publications		*5*
	Thesis/Abstract		*2*
	Letters of reference		*4*
	Motivational letter for admission to the PhD programme		*4*
	Research Project		*5*
Oral examination	The oral examination consists of an individual interview of about 15 minutes aiming to assess the applicant flair to undertake a research doctorate and to carry out the research tasks in the areas of interest for the doctorate. The interview will be assessed considering the following criteria: a) technical and scientific competence in the topics of the doctorate; b) knowledge of the state of the art for the doctorate curricula; c) mastery of English language.		
Calendar of the oral examination	**Date**	**September 11, 2023**	
	Time	**11:00 AM**	
	How to conduct the examination	The oral examination will be held online.	
	Based on the number of applicants, the oral examination may take place in more than one day. Applicants must exhibit a valid ID for admission to the oral examination.		

Description of research topics
Research topic 1.1 - Digital twin models for the virtualization of product development and its condition monitoring based on physical models *Ministerial Decree 117 of 2 March 2023 (PNRR Mission 4 Component 2 Investment/Subinvestment 3.3)*

TABLE 4 – PhD Programme INDUSTRIAL AND INFORMATION ENGINEERING

Consistency of the proposed research with the PNRR areas of interest:
The proposed research is perfectly consistent with the M1C2 mission: DIGITALIZATION, INNOVATION AND COMPETITIVENESS IN THE PRODUCTION SYSTEM, Investment 1: Transition 4.0. In particular, the project intends to explore various applications of artificial intelligence in the field of innovative product development and optimization (for example, more energy-efficient and therefore green electrical appliances), digital twins models for digital transformation and virtualization of production processes and for the development of industrial 4.0 equipment capable of advanced diagnostics and predictive maintenance.
Also compare the areas of intervention of the PNR 5.4.2 Digital, Industry, Aerospace - High performance computing and big data. Section 2: Basic and fundamental research in engineering, science and information technology for HPC and big data ("From the software point of view, the research includes: methodologies, processes, technologies and tools of Software Engineering for the development of HPC applications; mathematical methods, algorithms and mathematical software for HPC").
The proposed research fully enters the SNSI thematic area: Intelligent and sustainable industry, energy and the environment. In particular, the SNSI development trajectories are involved: SN_A1 Innovative production processes with high efficiency and for industrial sustainability, in particular "Integrated product-process-system modeling for the optimization of eco-efficiency (energy and resources)", "Solutions for the integrated management of maintenance, quality and logistics for "Zero-Defect" production", "Supervision and control systems of industrial processes", National thematic areas SNSI: 5.4.2 Intelligent and sustainable industry, energy and environment ("rethinking the Italian business model in a green key: to be more competitive with respect to emerging countries,

Objectives and expected results, proposed research activity, methodologies and contents:
Simulation tools are essential for the virtualization of the design, optimization and characterization phases of a product using "zero physical prototypes". On the one hand, the approach is green as the construction of innumerable physical prototypes is avoided, on the other, optimization allows for the creation of better products capable of consuming less energy. In any case there is a saving in the research and development phase and a reduction in time-to-market, which allow companies to increase their competitiveness. The main open problem is that commercial software is very slow, being based on the established Finite Elements technique (FEM). Up to 24 hours of simulation are required to characterize a single device. This involves a very large expenditure of energy (used by the servers where the simulation is performed) and makes the simulation unfeasible as regards the optimization of industrial products. In fact, the optimization would require months or years of time when even tens of thousands of simulations are required.
The goal of this PhD is to extend the simulation techniques called integrals, which differ substantially from FEM techniques, to other types of electromagnetic problems. In particular, the goal is to bring the recent innovations introduced in the integral formulations for eddy currents [1,2] in the solution of:
1) electromagnetic propagation problems with dielectric materials, useful for antenna modeling (5G, RFID, satellite, patch, etc.)
2) magnetostatics problems, useful for the modeling of undulators and magnetic position sensors
3) problems of induced currents with magnetic materials, useful for applications concerning power electronics and electromagnetic induction heating
4) general electromagnetic propagation problems with dielectric and magnetic materials
5) study of state-of-the-art preconditioners based on the multigrid or on the Calderon identity
6) implementation of new very innovative simulation techniques such as integral spectral ones, which do not yet exist
7) order reduction techniques and generation of surrogate models or reduced order models.
The expected results are new generation electromagnetic simulators, capable of solving the problem with greater accuracy than the state of the art while spending up to 3000 times less time than FEM techniques. The scientific research activity includes both a more theoretical activity of study, bibliographic research and the conception of new numerical methods, and an experimental part of the validation of ideas. The validation part will be carried out during the period in the company.
[1] M. Passarotto, S. Pitassi, R. Specogna, "Foundations of volume integral methods for eddy current problems", Computer Methods in Applied Mechanics and Engineering, Vol. 392, 114626, 2022
[2] Italian patent number 102021000015602 filed on 15 June 2021, extended PCT, owner University of Udine, exclusive use license granted to EMC Gems Srl.

Period abroad (mandatory): 6 months

Host foreign entity data:
Applied and Computational Electromagnetics (ACE) Group,
Montefiore Institute, University of Liège, Liège, Belgium
Prof Christophe Geuzaine,

Period in company (mandatory):18 months

Company data:
EMC Gems Srl
Via Sondrio, 2/M6, 33100 Udine UD

Research activities to be carried out in the company:
Thanks to the know-how on electromagnetic simulation of the EMC Gems Srl team—a startup of the University of Udine—the candidate will validate the theoretical ideas originating from scientific research by implementing them in the company's simulation software. The software is based on a proprietary cloud computing platform. The candidate will also validate the results by comparing them with measurements made in the laboratory on real devices.

TABLE 4 – PhD Programme INDUSTRIAL AND INFORMATION ENGINEERING

Consistency of the doctoral program with the specific principles and obligations of the PNRR:

- transversal priorities: All the activities carried out in the research program will respect the transversal priorities, relating to generational, gender and territorial equal opportunities.
- Twin transitions (green and digital): All activities carried out in the research program will respect the objectives set for the twin transitions (digital and green).
- not cause significant damage - DNSH: All the activities carried out in the research program will respect the principle of "not causing significant damage" to the environment (so-called DNSH) and all the other horizontal principles of the PNRR.
- Open science and FAIR Data: All the activities carried out in the research program will respect the principle of Open science and Open Data ensuring that data is accessible and reusable. In order for it to really be possible to reuse data, the production of FAIR data is promoted, i.e. data that is easy to find, accessible, interoperable and reusable.

Professor/researcher of reference:
Prof. Ruben Specogna

Research topic 1.2 - Study of optimization methods and implementation of an application for solving distribution network problems (location and choice of distribution model)
Ministerial Decree 117 of 2 March 2023 (PNRR Mission 4 Component 2 Investment/Subinvestment 3.3)

Consistency of the proposed research with the PNRR areas of interest:
The proposal is part of the M4C2 component "From Research to Business" of the PNRR which indicates among the objectives the need to intensify the demand for innovation by businesses and the integration of research results into the production system.

Objectives and expected results, proposed research activity, methodologies and contents:
The creation of an efficient algorithm for solving the distribution network problem (location and choice of distribution model) would make it possible to obtain a distribution of hubs and warehouses throughout the downstream of the supply chain such as to minimize the cost function taking into account the related environmental impact.

Activity
Study and selection of data (not yet structured) that describe and characterize the business model.
Definition of rules and systems for data organization and aggregation and definition of appropriate datasets for their management (eg turnover, transport costs, personnel, plant, fixed material).
Study of the current distribution model of Limacorporate based on the data analysis performed and attribution of the weight of the different parameters to define the model input set.
Study and identification of system constraints (level of service to the end customer, capex budget).
Study and analysis of existing distribution models in various sectors with the aim of identifying possible scenarios applicable to the medical reality (in compliance with the imposed constraints) to be subjected to a simulation model.
Development of a simulation model that manages all the fundamental parameters as input and returns a cost and environmental impact function as output.
Comparison of the different cost functions related to the models that have been simulated.
Industrialization of the simulation model through the integration of data sets.

Expected results
Study and development of a simulation model that manages all the fundamental parameters as input and returns a valued cost and environmental impact function as output.
Industrialization of the simulation model through the integration of data sets.

Period abroad (compulsory): 6 months

Host foreign entity data:to be defined

Period in company (mandatory):12 months, even non-continuous (in relation to research needs)

Company data:
LimaCorporate SpA
Via Nazionale no. 52 – 33038 Villanova di San Daniele del Friuli (UD)

Research activities to be carried out in the company*:*
The activities carried out in the company will be functional to the realization of the research.

Consistency of the doctoral program with the specific principles and obligations of the PNRR:

- transversal priorities: All the activities carried out in the research program will respect the transversal priorities, relating to generational, gender and territorial equal opportunities.
- Twin Transitions (green and digital): All activities carried out in the research program will respect the objectives set for the Twin Transitions (digital and green).

TABLE 4 – PhD Programme INDUSTRIAL AND INFORMATION ENGINEERING

- not cause significant damage - DNSH: All the activities carried out in the research program will respect the principle of "not causing significant damage" to the environment (so-called DNSH) and all the other horizontal principles of the PNRR.
- Open science and FAIR Data: All the activities carried out in the research program will respect the principle of Open science and Open Data ensuring that data is accessible and reusable. In order for it to really be possible to reuse data, the production of FAIR data is promoted, i.e. data that is easy to find, accessible, interoperable and reusable.

Professor/researcher of reference:
Prof. Pietro Romano

Research topic 1.3 - Artificial intelligence for the economic and environmental sustainability of thermoplastic polymer production plants
Ministerial Decree 117 of 2 March 2023 (PNRR Mission 4 Component 2 Investment/Subinvestment 3.3)

Consistency of the proposed research with the PNRR areas of interest:
M4C2: FROM RESEARCH TO BUSINESS
The proposal is part of the M4C2 component "From Research to Business" of the PNRR which indicates among the objectives the need to intensify the demand for innovation by businesses and the integration of research results into the production system. In particular, the proposed research aims to enhance high-profile skills especially in relation to Artificial Intelligence issues.
M1C2: DIGITALISATION, INNOVATION AND COMPETITIVENESS IN THE PRODUCTION SYSTEM
The themes of the proposal decline the themes of the M1C2 component "Digitalisation, Innovation and Competitiveness in the Production System", in particular the Transition to Industry 4.0 (Investment 1) with the concept of Smart Factory in its Smart production and Smart energy components.
MISSION 4C2: NEED FOR INNOVATION AND PROMOTION OF RECRUITMENT
The themes of the proposal are also configured in the target of the M4C2 "Introduction of innovative doctorates that respond to the innovation needs of companies and promote the recruitment of researchers from companies" (Investment 3.3.) with the concept of training highly specialized young people for inclusion in the industrial world and strengthening of the working fabric within the national entrepreneurship.

Objectives and expected results, proposed research activity, methodologies and contents:
Thermoplastic polymers – such as polyolefins and styrene polymers – are undoubtedly the most widespread polymeric materials, given their considerable and varied use in many final application sectors (packaging, automotive, construction, household appliances, etc.).
The production plants have characteristics common to most of the technological platforms:
- Large dimensions and large volumes of product to ensure cost-effectiveness of processes (hundreds of thousands tons per year)
- Continuous productions
- Different product grades, with transition from one grade to another always continuous
- Scheduled maintenance, which usually requires production shutdown
- High energy consumption, especially given the size
- Process conditions and potentially critical substances (high pressure, monomers from fossil sources, etc.)
- Process Data High Availability (DCS)

All these characteristics clearly indicate how the application of new digitization approaches is particularly useful, which can fully exploit the availability of digitized process data to optimize operational management. Advanced control systems, where implemented, generally use first principles approaches, through the use of polymerization kinetic models, and of what can be modeled in relation to aspects related to heat exchange and the performance of the main machines (such as, for example, gas compressors).
However, first principles models represent an approximate and generalized version of the operational reality. The digital twin approach, and in general of machine learning techniques, makes available alternative solutions, data-driven or in any case based on real process data, which allow a representation and therefore a management more responsive to the reality of the single and specific plant productive, with obvious and multiple advantages.
In detail, a first (non-exhaustive) list of advantages of the proposed project can already be outlined, such as:
- Production constancy in line with the expected product specifications
- Optimization of campaign changeover phases when transitioning between different product grades
- Predictive maintenance / Asset Integrity
- Early fault

which would allow:
- Reducing the production of non-standard or in any case second or third choice products, with obvious economic benefits
- Consequently increase the production potential, reducing or eliminating the operational phases due to non-optimal productions
- Reducing the consumption of raw materials and energy for unexpected productions, consequently reducing the carbon intensity and the consumption of fossil and environmental resources
- Reduce the onset of outages or in any case production irregularities, which potentially lead to the production of waste as a result of emergency conditions
- Reducing the frequency of scheduled stops, which have a particularly impact both from the point of view of production potential and the operating cost resulting from the maintenance operations themselves
- Reduce or eliminate potentially dangerous operational emergency situations due to the emergency management of both hazardous substances and particularly severe pressure and/or temperature operating conditions

Basically, through advanced digitization, it is possible to significantly improve operational management in terms of:
- Economic return
- Reduction of environmental impact
- Operational safety

TABLE 4 – PhD Programme INDUSTRIAL AND INFORMATION ENGINEERING

In particular, in the field of machine learning, the objectives are:
1. Describe the intrinsic correlations between the production parameters linked to the specific synthesis of the finished product (model correlation analysis);
2. Identify production inefficiencies in historical series and in real time inherent to production gears (Trouble shooting and fault detection/Early fault);
3. Monitor the plant capacity and quality of production intermediates (products and chemicals) and finished products (thermoplastic polymers) (predictive model);
4. Optimization of campaign changes between one production set-up and another (optimized protocol);
5. Estimation of the constants and parameters of a proprietary hard model of the reactor for the polymerization of the finished product through data analysis (Fine tuning hard model).
6. Deployment of the models obtained on MS Azure environment, available in the company

Period abroad (mandatory):6 months

Host foreign entity data (company name, registered and operational headquarters):to be defined

Period in company (mandatory): maximum 12 months even if not continuous.

Company data (company name, registered and operational headquarters):
Versalis spa
Piazza Boldrini, 1
San Donato Milanese

Research activities to be carried out in the company:
At the company, the candidate will have a workstation available with access to the data factory architecture, with real-time access to process data. He will also have a virtual machine on the MS Azure ML application. He will therefore have to take care of transferring the monitoring and optimization models developed off-line, on historical data, to the MS Azure environment, in order to place the above-mentioned models online with the plant data acquired in real time. He will also develop, always taking advantage of the company's IT resources, dashboards that make the results obtained with the developed and operationalized deep learning models available to the operating personnel in real time and continuously. For a more complete deployment activity,

Consistency of the doctoral program with the specific principles and obligations of the PNRR:
RESPONSIBLE AND SUSTAINABLE APPROACH
Sustainability is part of every aspect of the Versalis business. This bond is achieved with the integration of the missions of the 17 Sustainable Development Goals of the UN Agenda 2030. The proposal envisages the development of doctoral activities and the achievement of the objectives defined in harmony with the following SDGs:

GREEN TRANSITION:
The proposed research aims at optimizing the process and reducing production inefficiencies in petrochemical plants with consequent savings in terms of energy and production waste. These objectives are part of the Environment and Energy theme and are in line with the principles of the Green Transition.
DIGITAL TRANSITION:
The Artificial Intelligence techniques that will be analyzed in the context of the proposed research are aimed at optimizing and automating the production processes of petrochemical plants with a direct impact on Versalis' competitive advantage.
DNSH:
Object of the research are optimization algorithms of the petrochemical industrial production with the aim of bringing advantages in energy and environmental economic terms. The principle of not causing significant damage to the environment (Do No Significant Harm) will therefore be respected.
Open science and FAIR Data:
The results of the research conducted will be published in congress proceedings and scientific journals, in compliance with the indications of the National Research Program 2021-27 regarding Open science and FAIR data.

Professor/researcher of reference:
Prof. Lauro Snidaro

Research topic 1.4 - Study of pulsation dampers in microchannel heat exchangers
Ministerial Decree 117 of 2 March 2023 (PNRR Mission 4 Component 2 Investment/Subinvestment 3.3)

Consistency of the proposed research with the PNRR areas of interest:
The proposed research mainly concerns the PNRR themes: M4C2, M2C3 and M1C2

TABLE 4 – PhD Programme INDUSTRIAL AND INFORMATION ENGINEERING

The project aims to make heat exchangers more resistant to external stresses and will significantly reduce their breakage and replacement.

Objectives and expected results, proposed research activity, methodologies and contents:
- Study of the generated structural stresses and fatigue resistance with numerical calculation codes
- Optimization of the geometry of the dampers in terms of minimum pressure drops and less mechanical stress on the critical components of the exchanger
- Determination of the natural frequencies of the microchannel exchangers as a function of their geometric parameters
- Study of the vibrations as a function of the geometry of the exchanger, the pulsation frequency and possible other flow parameters

Period abroad (mandatory):6 months

Host foreign entity data (company name, registered and operational headquarters): to be defined

Period in company (mandatory): 9 months

Company data:
Thermokey SpA
Via dell'Industria, 1
33061 Theor Rivignano (UD)

Research activities to be carried out in the company:
- End of business report
- Calculation codes and design
- Validation of the calculation with experimental tests
- Logics for configuring the most suitable damper.

Consistency of the doctoral program with the specific principles and obligations of the PNRR:
- transversal priorities: All the activities carried out in the research program will respect the transversal priorities, relating to generational, gender and territorial equal opportunities.
- Twin transitions (green and digital): All activities carried out in the research program will respect the objectives set for the twin transitions (digital and green).
- not cause significant damage - DNSH: All the activities carried out in the research program will respect the principle of "not causing significant damage" to the environment (so-called DNSH) and all the other horizontal principles of the PNRR.
- Open science and FAIR Data: All the activities carried out in the research program will respect the principle of Open science and Open Data ensuring that the data is accessible and reusable. In order for it to really be possible to reuse data, the production of FAIR data is promoted, i.e. data that is easy to find, accessible, interoperable and reusable.

Professor/researcher of reference:
prof. Enrico Salvati

Research topic 1.5 - Modeling of structural collapse phenomena in engineering materials and components using advanced numerical methods
Ministerial Decree 118 of 2 March 2023 (PNRR Mission 4 Component 1 Investment/Subinvestment 4.1) – PNRR research

Consistency of the proposed research with the PNRR areas of interest and, for the scientific-technological areas, highlighting how the proposed research can promote interdisciplinarity, membership of international networks and intersectorality:
The proposed research topic mainly concerns mission 1 of the PNRR, in particular M1C2: digitalisation, innovation and competitiveness in the production system.
The project seeks to give a new impetus to the digital transition of companies and to the innovation rate of Italian industries. The digital transition dominates this proposal as it focuses on the concept of digital twin (better known as digital twin). In fact, the numerical simulation facilitates the design procedures and at the same time allows to identify efficient design configurations quickly and at the same time respecting the exploitation of natural resources.

Objectives and expected results, proposed research activity, methodologies and contents:
To achieve the objectives set by the PNRR, a considerable contribution can be made by making the methods of designing industrial engineering systems more efficient from a structural point of view and consequently reducing the exploitation of natural resources.
With the evolution of computers capable of performing increasingly complex calculations with ever shorter timescales, several numerical approaches have been developed in recent years for the prediction of crack nucleation and propagation in engineering materials under the effect of cyclic loads (fatigue).
The purpose of the presented project is in fact to develop new criteria for the evaluation of mechanical fatigue.

Period abroad (mandatory):6 months

Host foreign entity data:The student will spend a period of study and research of 6 months at a foreign university or research institute. The institution will be defined later on the basis of the development of research activities.

Consistency of the doctoral program with the specific principles and obligations of the PNRR:

TABLE 4 – PhD Programme INDUSTRIAL AND INFORMATION ENGINEERING

- transversal priorities: All the activities carried out in the research program will respect the transversal priorities, relating to generational, gender and territorial equal opportunities.
- Twin transitions (green and digital): All activities carried out in the research program will respect the objectives set for the twin transitions (digital and green).
- not cause significant damage - DNSH: All the activities carried out in the research program will respect the principle of "not causing significant damage" to the environment (so-called DNSH) and all the other horizontal principles of the PNRR.
- Open science and FAIR Data: All the activities carried out in the research program will respect the principle of Open science and Open Data ensuring that the data is accessible and reusable. In order for it to really be possible to reuse data, the production of FAIR data is promoted, i.e. data that is easy to find, accessible, interoperable and reusable.

Professor/researcher of reference:
prof. Enrico Salvati

TABLE 5 – PhD Programme in MOLECULAR MEDICINE

THE PhD PROGRAMME	
Administrative location	University of Udine, Department of Medical Area (DAME) –via Colugna 50, 33100 Udine, ITALY (tel. +39 0432 494301).
Associated location	C.R.O. - Centro di Riferimento Oncologico (National Cancer Institute Aviano) – via Franco Gallini 2, 33081 Aviano (PN) ITALY.
Location for training, teaching and research activity	Teaching and other training activities will take place primarily at the administrative programme location or in other locations of the University of Udine. The research programme will be developed according to the section "Research Topic Description".
Coordinator	Prof. Alessandra Corazza (alessandra.corazza@uniud.it)
Programme duration	3 years
Curriculum	-
Programme website	https://www.uniud.it/en/research/do-research/doctorate-res/our-ph-d-programmes/area-life-science/biomedical-sciences-and-biotechnology/ph-d-programme/biomedical-science-and-biotechnology?set_language=en

ADMISSION REQUIREMENTS	
Required degree	Italian Laurea (before DM 509/99) or Italian Laurea Specialistica/Magistrale (ex DM 509/1999 and DM 270/04). Foreign degrees and titles: refer to art. 3 and 4 of the Call.
Knowledge of the following foreign language	English

DOCUMENTS AND TITLES TO BE ATTACHED TO THE APPLICATION FOR ADMISSION	
<u>Compulsory</u> documents (art. 5 of the Call)	1. Certification or self-certification (refer to art. 5 paragraph 5 of the Call) of the academic title needed for admission to the PhD programme and list of the exams (with grades) passed during the Italian first level (bachelor) and the Laurea Specialistica/Magistrale programmes or during the Italian programmes before D.M. 509/99 or during the foreign academic programmes; 2. Curriculum vitae et studiorum, dated and signed, with emphasis on pre-doctoral experiences and on thesis activity (description of techniques acquired, personal contribution, etc.); 3. Copy of a valid identity document (citizens of countries not belonging to the European Union a copy of a valid passport, comprehensive of the pages containing the holder's photo, personal details, passport number, date and place of issue, date of expiry); 4. A research project, dated and signed, developed, developed in accordance with the topic of interest, which highlights the contribution that the candidate can offer to the development of the topic itself (approximate limit 10.000 characters, spaces included).
<u>Optional</u> documents (art. 5 of the Call)	1. Master thesis ("Tesi di Laurea") associated to the degree/title providing access to the PhD programme. Applicants who are not graduated on the expiration date of this Call can submit an extended abstract in place of the complete thesis, in Italian or English language, signed by themselves and by their thesis Supervisor (approximate limit: 25.000 characters, spaces included); 2. Motivation letter by which the applicant explains the reasons for admission to the PhD programme, dated and signed (approximate limit: 1.000 characters, spaces included); 3. Publications (max 2); 4. Letters of reference (max 2) written by university professors, scientific researchers or other experts in the field (art. 6 of the Call).

SELECTION COMMITTEE	
Appointed Members	Claudio Brancolini – full professor – University of Udine Alessandra Corazza – associate Professor – University of Udine Luca Quartuccio – associate professor – University of Udine
Substitute Members	Gianluca Tell – full Professor – University of Udine Giovanna Lippe – associate Professor – University of Udine Barbara Frossi - associate Professor – University of Udine

ADMISSION

GENERAL COMPETITION (art. 8 of the Call for Applications)

Positions available: 2				
Detailed description	***N.***	***Funding***	***Annual gross amount***	***Research topic***

TABLE 5 – PhD Programme in MOLECULAR MEDICINE

Positions **WITH SCHOLARSHIP: 1**	1	D.M. 118 of March 2, 2023 (NRRP Mission 4 Component 1 Investment/Subinvestment 4.1) and University of Udine CUP G23C22001200003	€ 16,243.00	Topic 1.1 - DIssecting the epigenetic complexes that supervise complex cell fate decisions in human health

Competition procedure and test schedule			
Evaluation of qualifications and oral examination. For the evaluation of applicants' attitude for scientific research and their basic skills to tackle the course program, the Selection Committee can attribute up to 100 points to each applicant: max 30 points to the titles and max 70 points to the oral examination. Applicant is admitted to the oral examination if his/her titles receive at least 15 points. The oral examination is passed with at least 49 points. The applicant is eligible to the PhD programme if he/she passes the oral examination. Only for eligible applicants, the points attained in in the oral examination will be added to the points of the titles. **DATE FOR THE PUBLICATION OF ADMITTED APPLICANTS TO THE ORAL EXAMINATION: within September 11, 2023.** **DATE FOR THE PUBLICATION OF THE FINAL RANKING LIST: within September 26, 2023.**			
Foreign language that can be used for examination	Italian or English		
Evaluation Criteria of qualifications *During the preliminary meeting the Selection Committee may establish sub-criteria for the evaluation*	Curriculum vitae		*2*
	Scientific publications		*2*
	Thesis/Abstract		*3*
	Letters of reference		*2*
	Motivation letter for admission to the PhD programme		*2*
	Grades reported in the exams taken in the undergraduate programmes		*7*
	Masters, additional training courses, experiences abroad, etc. etc		*2*
	Research project: - Central hypothesis - Objectives - Research Design		*8*
Oral examination	Part of the oral examination will be in English.		
Calendar of the oral examination	**Date**	**September 19th, 2023**	
	Time	**09:30 AM**	
	Place	Department of Medical Area (DAME), Seminar Room – Piazzale Kolbe 4, 33100 Udine ITALY	
	Based on the number of applicants, the oral examination may take more than one day. Applicants must exhibit a valid ID for admission to the oral examination.		

Research Topics Description

Topic 1.1: **Indagine sui complessi epigenetici che sovrintendo ad articolate decisioni sul destino delle cellule nella salute umana**

D.M. 118 of March 2, 2023 (NRRP "National Recovery and Resilience Plan" Mission 4 Component 1 Investment/Subinvestment 4.1) – NRRP Research

Coherence of the proposed research with the PNRR areas of interest and, for the scientific-technological areas, highlight how the proposed research can promote interdisciplinarity, membership of international networks and intersectoriality:
The research project aims to elucidate the complex regulatory networks that oversee the use of the human genome. Epigenetic regulations play a key role in cell fate decisions, and complex molecular mechanisms monitor these processes. Alterations in epigenetic regulators have been implicated in various human diseases and, in particular, cancer. The study of epigenetics and its impact on human health is an advanced aspect of international importance in the life sciences. Therefore, the proposed research project is part of a broad network of international research interests. Specifically, the project addresses the role of class IIa HDACs in the regulation of the epigenome. Studies will focus on defining the molecular partners that control and mediate the activities of class IIa HDACs in senescence and transformation. The project will take advantage of genome editing strategies to selectively target specific genomic regions or turn off and on specific class IIa HDACs. Gene functions will be studied using sophisticated in vivo microscopy approaches. Epigenomic influences of class IIa HDACs are defined by next generation sequencing using ChIP-seq, ATACT-seq, RNA-seq, and Hi-C techniques. These approaches require interdisciplinary skills that include the acquisition of basic bioinformatics knowledge of NGS data management and innovative experimental strategies in molecular biology, cell biology, and biotechnology. This project has a strong impact on human health and aging with the ambition to provide new knowledge on cancer development with a cross-sector strategy.

Expected objectives and results, proposed research activities, methodologies and contents:
The goal of the project is to understand how the spatial organization of the genome can regulate important aspects of gene expression and define its alterations in the context of neoplastic transformation. The project aims to reconstruct the network of regulatory elements (promoters, enhancers and super-enhancers) involved in the control of gene expression in the normal and cancer cell. To define the network of interactions between genes and regulatory elements by 3D reconstruction of the genome. Key molecular and cell biology methodologies will be used during the project and include:
- The management of in vitro cultures of various cell types.
- The engineering of cellular models by delivery of genes or shRNAs of interest using viral infection.
- The analysis of gene expression by RNA sequencing experiments. The goal of the project is to understand how the spatial organization of the genome can regulate important aspects of gene expression and define its alterations in the context of neoplastic transformation. The project aims to reconstruct the network of regulatory elements (promoters, enhancers and super-enhancers) involved in the control of gene expression in the

TABLE 5 – PhD Programme in MOLECULAR MEDICINE

normal and cancer cell. To define the network of interactions between genes and regulatory elements by 3D reconstruction of the genome. Key molecular and cell biology methodologies will be used during the project and include:
- The management of in vitro cultures of various cell types.
- Engineering of cellular models by delivery of genes or shRNAs of interest using viral infection.
- Analysis of gene expression by RNA sequencing experiments.
- Mapping of promoters, enhancers and super-enhancers using chromatin immunoprecipitation with appropriate markers (H3K4me1, H2BK120ac, H3K27ac)
- Spatial reconstruction of DNA folds through the use of Hi-C techniques
- Validation of targets through genomic editing using CRISPR/Cas9 as the delivery system.

Upon completion of the project, the molecular partners that control and mediate the activities of class IIa HDACs in senescence and transformation will be defined. The project will take advantage of genome editing strategies to selectively target specific genomic regions or to inactivate and activate specific class IIa HDACs. Gene functions will be studied using sophisticated in vivo microscopy approaches. Epigenomic influences of class IIa HDACs are defined by next-generation sequencing using ChIP-seq, ATACT-seq, RNA-seq, and Hi-C techniques.

Period abroad:
6 months

Data of foreign host subject:
Cutaneous Biology Research Center del Massachusetts General Brigham Hospital, at Harvard Medical School Boston, 02114, MA, USA.

Possible research center involved in the definition of the training pathway:
Eurac research– Bolzano - Italy

Research activities to be carried out at the Research Center:
Bioinformatics training and data analysis.

Coherence of the doctoral programme with the principles and specific obligations of the PNRR:

- Cross priorities: In the announcement it will be clearly stated that the candidate will be selected regardless origin, religion, disability, age or sexual orientation.
- Twin transitions (green e digital): Digital skills will have to be developed by the candidate during the project for the treatment of large amounts of data, such NGS data related to ChIP-seq, Hi-C and RNA-seq experiments. The ability to manage and analyze big data may be spent by the candidate also in future work areas.
- Do not significant harm - DNSH: The study will not affect significantly the environment. Particular attention will be paid to the conscious use of, vehicles for transportation, materials and reagents. Online platforms will be used for scientific meetings to limit the increase of CO2 in the environment.
- Open science and FAIR Data: Data will be published in open access journals and the NGS data in the public databases such as GEO.

Reference Professor/Researcher:
prof. Claudio Brancolini

TABLE 6 – PhD Programme in FOOD SCIENCE

THE PhD PROGRAMME	
Administrative location	University of Udine - Department of Agricultural, Food, Environmental and Animal Sciences (DI4A) – via delle Scienze n. 206, 33100 Udine, ITALY (tel. +39 0432 558600)
Associated location	-
Location for training, teaching and research activity	Teaching and other training activities will take place primarily at the administrative programme location or in other locations of the University of Udine. The research program will be developed as stated in the "Research Topic Description" section.
Coordinator	Prof. Walter Baratta (walter.baratta@uniud.it)
Programme duration	3 years
Curriculum	-
Programme website	https://www.uniud.it/en/research/do-research/doctorate-res/our-ph-d-programmes/area-life-science/scienze-degli-alimenti/ph-d-programme/scienze-degli-alimenti?set_language=en

ADMISSION REQUIREMENTS	
Required degree	Italian Laurea (before DM 509/99) or Italian Laurea Specialistica/Magistrale (ex DM 509/1999 and DM 270/04). Foreign degrees and titles: refer to art. 3 and 4 of the Call.
Knowledge of the following foreign language	English

DOCUMENTS AND QUALIFICATIONS TO BE ATTACHED TO THE APPLICATION FOR ADMISSION	
Compulsory documents (art. 5 of the Call)	1. Certification or self-certification (refer to art. 5 paragraph 5 of the Call) of the academic title needed for admission to the PhD programme and list of the exams (with grades) passed during the Italian first level (bachelor) and the Laurea Specialistica/Magistrale programmes, or during the Italian programmes before D.M. 509/99 or during the foreign academic programmes; 2. Curriculum vitae et studiorum, dated and signed; 3. Copy of a valid identity document (citizens of countries not belonging to the European Union a copy of a valid passport, comprehensive of the pages containing the holder's photo, personal details, passport number, date and place of issue, date of expiry); 4. A research project, dated and signed, developed, developed in accordance with the topic of interest, which highlights the contribution that the candidate can offer to the development of the topic itself (approximate limit 10.000 characters, spaces included, in English language).
Optional documents (art. 5 of the Call)	1. Master thesis ("Tesi di laurea") associated to the degree/title providing access to the PhD programme. Applicants who are not graduated on the expiration date of this Call can submit an extended abstract in place of the complete thesis, in Italian or English language signed by themselves and by their thesis Supervisor (approximate limit: 25.000 characters, spaces included); 2. Publications (max 2); 3. Letters of reference (max 2), from university professors, scientific researchers or other experts in the field (art. 6 of the Call).
All qualifications must be presented exclusively in PDF format, dated and signed by the candidate.	

SELECTION COMMITTEE	
Appointed members	Prof. Walter Baratta – full professor – Università di Udine Prof. Giuseppe Comi – full professor – Università di Udine Prof. Piergiorgio Comuzzo – associate professor – Università di Udine Prof.ssa Sabrina Moret – associate professor – Università di Udine Dott.ssa Pierangela Rivellini - delegate of Innovhub
Substitute members	Prof.ssa Lucilla Iacumin – full professor – Università di Udine Prof. Andrea Venerando – associate professor – Università di Udine

ADMISSION

GENERAL COMPETITION (art. 8 of the Call for Applications)

Positions available: 5				
Detailed description	***N.***	***Funding***	***Annual gross amount***	***Research topic***
Positions WITH SCHOLARSHIP: 5	1	D.M. 117 of March 2, 2023 (NRRP Mission 4 Component 2 Investment/Subinvestment 3.3) and G. & P. Garbellotto S.p.A CUP G23C23001190005	€ 16,243.00	Topic 1.1 - Selection of wood for the production of quality wines

TABLE 6 – PhD Programme in FOOD SCIENCE

	1	D.M. 117 of March 2, 2023 (NRRP Mission 4 Component 2 Investment/Subinvestment 3.3) and Innovhub - Stazioni Sperimentali per l'Industria S.r.l. CUP G23C23001190005	€ 16,243.00	Topic 1.2 - Development and application of innovative analytical protocols for characterization and quantification of exogenous and biogenic hydrocarbon fraction in olive oils
	1	D.M. 117 of March 2, 2023 (NRRP Mission 4 Component 2 Investment/Subinvestment 3.3) and Johnson Matthey PLC - Public Limited Company CUP G23C23001190005	€ 16,243.00	Topic 1.3 - Sustainable conversion of fatty esters and natural oils to high value fatty alcohols under homogeneous catalytic conditions
	1	D.M. 117 of March 2, 2023 (NRRP Mission 4 Component 2 Investment/Subinvestment 3.3) and AMORIM CORK ITALIA SPA CUP G23C23001190005	€ 16,243.00	Topic 1.4 - : Effects of cork on the evolution of bottled wines
	1	D.M. 118 of March 2, 2023 (NRRP Mission 4 Component 1 Investment/Subinvestment 4.1) and University of Udine CUP G23C23001260003	€ 16,243.00	Topic 1.5 - Development of functional fermented pistachio-beverage for an active aging: basic and applied aspects

Competition procedure and test schedule

Evaluation of titles and oral examination.
For the evaluation of applicants' attitude for scientific research and their basic skills to tackle the course program, the Selection Committee can attribute up to 100 points to each applicant: max 30 points to the titles and max 70 points to the oral examination. Applicant is admitted to the oral ex examination am if his/her titles receive at least 21 points. The oral examination is passed with at least 49 points. The applicant is eligible to the PhD programme if he/she passes the oral examination. Only for eligible applicants, the points attained in in the oral examination will be added to the points of the titles.
DATE FOR THE PUBLICATION OF ADMITTED APPLICANTS TO THE ORAL EXAMINATION: within September 12, 2023.
DATE FOR THE PUBLICATION OF THE FINAL RANKING LIST: within September 26, 2023.

Foreign language that can be used for examination	Italian or English		
Evaluation Criteria of qualifications *During the preliminary meeting the Selection Committee may establish sub-criteria for the evaluation*	Curriculum vitae et studiorum		*10*
	Research project		*14*
	Scientific publications		*2*
	Thesis/Abstract		*2*
	Letters of reference		*2*
Oral examination	Part of the oral examination will be in English.		
Calendar of the oral examination	Date	**September 21, 2023**	
	Time	**9:00 AM**	
	Place	Department of Agricultural, Food, Environmental and Animal Sciences (DI4A) – via Sondrio 2/A, 33100 Udine	
	Based on the number of applicants, the oral examination may take place in more than one day. Applicants must exhibit a valid ID for admission to the oral examination.		

Descrizione tematiche di ricerca

Research Topic 1.1: Selection of wood for the production of quality wines
D.M. 117 of March 2, 2023 (NRRP "National Recovery and Resilience Plan" Mission 4 Component 2 Investment/Subinvestment 3.3)

Coherence of the proposed research with the PNRR fields of interest:
M2C1.2 Improve the sustainability of the agri-food chain

Objectives and expected results, proposed research activity, methodologies and content:
Objectives:
The selection of wood for the construction of barrels and the selection of barrels for aging wines is still based to empirical factors, both from the point of view of the cooperage industry and on the part of the wineries. The research project will focus on the identification of objective parameters for the online assessment of wood quality; this quality will refer both to the barrel producers (identification of the characteristics of the wood in relation to its chemical and physical properties), and to the winemakers, interested in the relationship between wood and wine and in the evolution of the wine itself. The investigation techniques used, in addition to further evolutions of the NIR, already consolidated in the company, will focus on the implementation of new techniques to evaluate the chemical and physical quality of individual staves. This will be accompanied, in an indissoluble way, by the direct test in winery to predict the evolution of the wine with the different classes of wood.

Expected results:
Rationalization of the techniques for assessing and managing the quality of wood compatible with the production chain, Interaction with the wineries to identify ways to manage the aging in wood of white and red wines. Creation of management skills and transfer of production skills to workers

TABLE 6 – PhD Programme in FOOD SCIENCE

Activity:
Bibliographic survey. Updating of NIR techniques, study of the interaction of red and white wine with wood. Testing of innovative uses of photometric techniques for the assessment and management of wood quality

Period abroad (mandatory):
6 months with program and subject to be defined

Data foreign host subject:
To be defined

Period in enterprise (mandatory):
6 months

Enterprise Data: G. & P. Garbellotto S.p.A

Research activities to be carried out in the enterprise:
Evaluation and analysis of the production chain, selection and preparation of samples, interactions with test companies, access to statistics and company databases

Consistency of the doctoral programme with the principles and specific obligations of the NRP:
- *cross-cutting priorities:*
The experimental activities and the selection of candidates will be managed in compliance with the three transversal activities of the NRP

- *twin transitions (green and digital):*

- *do no significant harm - DNSH:*
The implementation of the project activities envisages not to cause significant damage to the environmental objectives (so-called "Do No Significant Harm" (DNSH) principle), pursuant to article 17 of Regulation (EU) 2020/852.

- *open science and FAIR Data:*
Scientific results suitable for publication in open access

Reference Professor/Researcher
prof. Franco Battistutta and prof. Piergiorgio Comuzzo

Research Topic 1.2: Development and application of innovative analytical protocols for characterization and quantification of exogenous and biogenic hydrocarbon fraction in olive oils
D.M. 117 of March 2, 2023 (NRRP "National Recovery and Resilience Plan" Mission 4 Component 2 Investment/Subinvestment 3.3)

Coherence of the proposed research with the PNRR fields of interest:
Under Mission 4, component 2 ("From Research to Enterprise"), aimed at supporting investments in R&D and innovation, the project aims to develop and apply analytical protocols based on the use of innovative multidimensional chromatographic techniques to promote quality control of olive oils (focusing on exogenous and endogenous hydrocarbon fraction characterization), offering new training and growth opportunities to young researchers/researchers (investment line 3. 3), who will be able to strengthen their skills in the field, with a view to future entry into the world of work, which will be facilitated by the knowledge and experience gained.

Objectives and expected results, proposed research activity, methodologies and content:
The aims of the project are to strengthen Italian scientific excellence in food safety through the development of platforms and services for food quality control, with a focus on the research/characterization of hydrocarbons of exogenous and biogenic origin in olive oils. The focus on hydrocarbons of exogenous origin, will be particularly directed at assessing the presence in olive oils (virgin, refined, and pomace) of MOAH of petrogenic origin (mineral oil aromatic hydrocarbons) with 3 and more aromatic rings and low alkylation degree, which are considered carcinogenic and genotoxic as the corresponding non-alkylated polycyclic aromatic hydrocarbons (PAHs). Their presence will be correlated with both total MOAH and non-alkylated PAHs originating from organic matter pyrolysis processes, in oils with total MOAH levels greater than or equal to 2 mg/kg. The plan of activities is to preliminarily evaluate different approaches aimed at isolating the MOAH of interest from the oil matrix, eliminating the interference of mono- and di-aromatic components, which are present in far greater quantities than the 3- and multi-ring components. Subsequently, in order to provide data useful to carry out a risk assessment based on the presence of potentially genotoxic and carcinogenic components, data will be collected on the presence or absence of genotoxic and carcinogenic PAHs and MOAH in different categories of olive oil. High-performance liquid chromatography coupled on-line with gas chromatography (HPLC-GC on-line), and two-dimensional gas chromatography (GC×GC) coupled with flame ionization detection (FID) for quantitative analysis, and mass spectrometry (MS) to elucidate hydrocarbon structure and/or the presence of possible interferents, will be employed for analysis of the hydrocarbon fraction of interest. The study of the biogenic hydrocarbon fraction will also be aimed at evaluating the qualitative-quantitative profile of natural n-alkanes in extra virgin olive oil, in order to identify suitable indices (in addition to those already present) to highlight fraudulent addition of small amounts of seed oils in extra virgin olive oils. The expected results consist of the development of new analytical protocols, addressed to the simplification of the analytical approach towards the issue of contamination and safeguarding the authenticity of extra-virgin olive oil. In particular, the methods developed to isolate the most toxic aromatic fraction, and their application in the different classes of olive oils, will be able to provide the competent authorities with a useful tool to define congruous maximum limits to the toxic potential of these substances, in order to safeguard consumer health. The results obtained from the study of the endogenous hydrocarbon fraction will be useful in defining new tools dedicated to the detection of fraud in the extra virgin olive oil sector. The optimized analytical protocols and results obtained will be shared with the entire scientific community, and can also be made available to control bodies.

TABLE 6 – PhD Programme in FOOD SCIENCE

Period abroad (mandatory): 6 months

Data foreign host subject: The foreign host institution will be identified at a later date by agreement between the University and Innovhub - Experimental Stations for Industry S.r.l.

Period in enterprise (mandatory): 18 months

Enterprise Data: Innovhub - Stazioni Sperimentali per l'Industria S.r.l.

Research activities to be carried out in the enterprise:
The research activity carried out in the company by the Ph.D. student will take up and implement what was acquired and developed at the University of Udine. In the enterprise, the researcher will have the opportunity to compare the robustness of methods developed using similar coupled chromatographic techniques present at the University of Udine. He/she will also have the opportunity to work with high-resolution GCxGC-FID TOF instrumentation. The Ph.D. student will be part of the Chemistry, Technology and Food Safety Team, with the opportunity to interact and collaborate also with experts from the Laboratory Service Team. The acquired specialization will be of interest to many national and international companies and institutions.

Consistency of the doctoral programme with the principles and specific obligations of the PNRR:
- cross-cutting priorities: the PNRR for youth indicates as mission 4 the "strengthening of university education, with new scholarships, and the creation of new opportunities for young researchers, with the extension of PhD." The proposed program offers the candidate the opportunity to work in very stimulating contexts in which, in addition to learning the knowledge necessary to achieve the objective, the young researcher/researcher will be able to establish relationships and collaborations at the national and international level, including job prospects.
- *twin transitions (green and digital)*: the project is in line with the twin transitions green and digital in that it aims to (a) promote the sharing of knowledge generated by the project from the perspective of FAIR Data principles; (b) increase the competitive potential of the industrial product, through the search for innovative and sustainable solutions with particular reference to the global supply chain of ingredients and raw materials.
- *do no significant harm* - DNSH: research activities will be carried out with a view to not creating significant environmental harm, in compliance with Article 17 of Regulation (EU) 2020/852.
- Open science and FAIR Data: research results will be shared with a view to open science, and will be made available to the scientific community in order to ensure the principles of FAIR data.

Reference Professor/Researcher
Prof. Sabrina Moret

Research Topic 1.3: Sustainable conversion of fatty esters and natural oils to high value fatty alcohols under homogeneous catalytic conditions
D.M. 117 of March 2, 2023 (NRRP "National Recovery and Resilience Plan" Mission 4 Component 2 Investment/Subinvestment 3.3)

Coherence of the proposed research with the PNRR fields of interest:
The project is in line with the PNRR "Food, bioeconomy, natural resources, agriculture, environment" and in particular with "Green technologies", "Biochemicals, bioproducts and sustainable chemical processes in synergy with biofuels, bioenergy and agro-energies", "Reduction of waste and the demand for critical raw materials through recovery and restructuring approaches of waste products".

Objectives and expected results, proposed research activity, methodologies and content:
Rapeseed, soybean, olive oil, used cooking oils, biodiesel are renewable sources of unsaturated fatty alcohols, which are industrially produced on a large scale (> 3 Mt / year) and have applications in a variety of products such as biodegradable detergents, personal care, cosmetics, food, lubricants and pheromones for crop protection. Fatty alcohols are currently being produced by transformation of the triglycerides from the natural oils into the corresponding methyl esters and subsequent hydrogenation at high pressure and temperature, using heterogeneous catalysts such as copper chromates. This project is focused on the development, preparation and characterization of the new homogenous and highly productive ruthenium catalysts which can be employed for the conversion of fatty esters and natural oils to high value fatty alcohols under mild reaction conditions. Thus this work will contribute to the progress towards the development of a technology for the conversion of sustainable natural products, using hydrogen at low pressure or hydrogen transfer donors, capable of reducing the consumption of fossil products with a reduced impact on the environment and reduced energy demand.

Period abroad (mandatory): 6 months

Data foreign host subject:

Period in enterprise (mandatory): 6 months

Enterprise Data: Johnson Matthey PLC - Public Limited Company

Research activities to be carried out in the enterprise:
In order to apply the catalysts on real substrates and to optimize the performances of the designed catalysts a secondment of 6 months at the JM laboratories in Cambridge is planned to exploit a rapid parallel screening available at the industrial site and the scale up syntheses.

Consistency of the doctoral programme with the principles and specific obligations of the NRP:
- *cross-cutting priorities:*

TABLE 6 – PhD Programme in FOOD SCIENCE

This program aims to foster a sustainable and circular industrial economy focused on the use of raw materials of natural origin and the recovery of raw materials from products at the end of their life cycle through highly selective chemical processes.

- twin transitions (green and digital):

- do no significant harm - DNSH:
The catalytic and selective transformations which occur under mild conditions does not cause any significant harm for the environment, according to the DNSH principle.

- open science and FAIR Data:
The results will be presented at the congresses and published according to the principles of Open science e FAIR Data

Reference Professor/Researcher
prof. Walter Baratta

Research Topic 1.4: Effects of cork on the evolution of bottled wines
D.M. 117 of March 2, 2023 (NRRP "National Recovery and Resilience Plan" Mission 4 Component 2 Investment/Subinvestment 3.3)

Coherence of the proposed research with the PNRR fields of interest:
M2C1.2 Develop a sustainable agri-food chain

Objectives and expected results, proposed research activity, methodologies and content:
Objectives:
The quality of cork underwent a marked improvement in the last twenty years, with respect to the presence of defects, such as trichloroanisoles and the management of oxygen permeability. Despite this, some wine lots undergo an apparently random oxidation or an unexpected evolution. The present study aims to identify how the characteristics of cork may affect the evolution of wines, both in positive and negative terms, regardless of the parameters previously mentioned. For this purpose, defective production lots will be monitored, in order to identify the non-positive characteristics of the cork and the analytical techniques useful for identifying "a priori" these problems. The goal is to understand the chemical mechanisms underlying these evolutions and to identify the analytical techniques useful for the evaluation of cork, as well as, if useful and possible, to implement the acquired knowledge in the supply chain

Expected results:
Understanding of the chemical mechanisms underlying the oxidative evolution of some wines sealed with cork closures; development of analytical methods for the evaluation of cork in relation to the evolution of the wine redox state. Training and transfer of high professionalism

Activity:
Bibliographic search. Technical evaluation of wines that have undergone unexpected evolutions; development of cork evaluation methods

Period abroad (mandatory):
6 months with program and subject to be defined

Data foreign host subject:
To be defined

Period in enterprise (mandatory):
6-12 months

Enterprise Data:
AMORIM CORK ITALIA SPA

Research activities to be carried out in the enterprise:
Evaluation and analysis of the production chain, selection and preparation of samples, interactions with testing companies, access to company statistics and history, physicochemical evaluations of the quality of the closures

Consistency of the doctoral programme with the principles and specific obligations of the NRP:
- cross-cutting priorities:
The experimental activities and the selection of candidates will be managed in compliance with the three cross-cutting activities of the NRP

- twin transitions (green and digital):

- do no significant harm - DNSH:
The implementation of the project activities envisages not to cause significant damage to the environmental objectives (so-called "Do No Significant Harm" (DNSH) principle), pursuant to article 17 of Regulation (EU) 2020/852.

- open science and FAIR Data:
Scientific results suitable for publication in open access

Reference Professor/Researcher
prof. Piergiorgio Comuzzo

TABLE 6 – PhD Programme in FOOD SCIENCE

Research Topic 1.5: Development of functional fermented pistachio-beverage for an active aging: basic and applied aspects
D.M. 118 of March 2, 2023 (NRRP "National Recovery and Resilience Plan" Mission 4 Component 1 Investment/Subinvestment 4.1) – NRRP Research

Coherence of the proposed research with the PNRR areas of interest and, for the scientific-technological areas, highlight how the proposed research can promote interdisciplinarity, membership of international networks and intersectoriality:
The project is in line with the PNRR "Food, bioeconomy, natural resources, agricultural, environmental" and in particular with "Green Technologies", "Reduction of waste and the demand for critical raw materials through recovery and restructuring approaches of waste products", "Health" with the aim of "Active aging".
The project is consistent with the themes of the SNSI in the field of:
a) Systems and technologies for packaging, conservation and traceability and safety of food productions;
b) Nutraceuticals, Nutrigenomics and Functional Foods.
Consistency of the proposed research with the themes of the PNR:
The project is consistent with the themes of the areas:
6.2 Food Science and Technology
Section 1. Hygienic-sanitary safety of food
Section 2. Authenticity and integrity of the food system
Section 3. Enhancement of the microbiome in agri-food production systems
Article 4. Healthy and sustainable nutrition
Section 5. Protein sources and their use in food technologies.
The project, as can be highlighted by the national and international partners involved, aims to aggregate different skills to be transferred to the PHD student, in this context the PhD student will be favored in the knowledge of national and international colleagues who will allow him to build his own research network. The skills involved to develop the project are interdisciplinary and intersectoral, in fact groups dealing with microbiology (UniUD, CNR), medicine (UniUD), engineering (NTNU) and food technologies (CNR) are involved.

Expected objectives and results, proposed research activities, methodologies and contents:
1) the development of a functional beverage to improve human wellbeing, in particular to help active aging with the reduction of the socio-economic impact of problems related to chronic and degenerative diseases, typical of this phase of life.
2) the sustainability of the functional beverage: pistachio-based beverages will be produced using a protocol free-of-waste using an innovative technology, and a vegetable as raw material, with a very high nutritional value.
3) the increase of knowledge on gerobiotics, their properties, and their metabolites and secretion systems, of which very little is known but their relevance in the relationship host-microbota has already attracted a huge part of the researchers in several and different fields, because their impact in human-plant-animal wellbeing is very promising.
The result will be an optimized drink and its production protocol, that will be directly transferable to the productive world. The production protocol will be sustainable and guarantee a safe product containing vital probiotics even at the end of the shelf life, suitable for responding to the needs of active ageing, for its nutritional components.

Period abroad:
6 months

Data of foreign host subject:
Prof. Angela Daniela La Rosa, Dept. Of Manufacturing and Civil Engineering at NTNU, Gjøvik, Norway.
Prof. Paul O'Toole, University College Cork, Ireland.

Possible research center involved in the definition of the training pathway:
ISA-CNR di Avellino dot.ssa Anna Reale

Research activities to be carried out at the Research Center:
The project will be implemented thanks to the synergistic collaboration of the two research units (ISA-CNR and UNIUD), which will make available the solid experience and specific skills of the researchers involved in the project for the achievement of the foreseen objectives. At the Avellino research center, the PhD student will deal with the transformation of the pistachio into a drink through innovative technologies that allow processing without the production of waste. Furthermore, thanks to the collaboration of technical staff and researchers working in the institute's omic science laboratories, the PhD student will have the possibility to perform proteomic and metabolomic analyzes of the finished product.

Coherence of the doctoral programme with the principles and specific obligations of the PNRR:
- *cross-cutting priorities: yes*
- *twin transitions (green and digital): yes*
- *do no significant harm - DNSH: yes*
- *open science and FAIR Data: yes*

Coherence of the doctoral programme with the principles and specific obligations of the PNRR:
- cross-cutting priorities: The experimental activities and the selection of candidates will be managed in compliance with the three transversal activities of the PNRR.
- twin transitions (green and digital): Research activities will respect the principles of the Green Era; Production of functional foods with health properties suitable for preventing pathologies.
- do no significant harm - DNSH: The implementation of the project activities envisages not to cause significant damage to the environmental objectives (so-called "Do No Significant Harm" (DNSH) principle), pursuant to article 17 of Regulation (EU) 2020/852.
- open science and FAIR Data: Scientific results suitable for publication in open access and in any case in international refereed journals.

TABLE 6 – PhD Programme in FOOD SCIENCE

Reference Professor: prof. Giuseppe Comi

TABLE 7 – PhD Programme in ENVIRONMENTAL AND ENERGY ENGINEERING SCIENCE

THE PhD PROGRAMME	
Administrative location	University of Udine - Polytechnic Department of Engineering and Architecture (DPIA) - via delle Scienze 206, 33100 Udine, ITALY (tel. +39 0432 558253).
Associated location	-
Location for training, teaching and research activity	Teaching and other training activities will take place primarily at the administrative programme location or in other locations of the University of Udine. The research program will be developed as stated in the "Research Topic Description" section.
Coordinator	Prof. Cristian Marchioli (cristian.marchioli@uniud.it)
Programme duration	3 years
Curriculum	-
Course website	https://www.uniud.it/en/research/do-research/doctorate-res/our-ph-d-programmes/area-physical-science-and-engineering/environmental-and-energy-engineering-science/ph-d-programme/environmental-and-energy-engineering-science?set_language=en https://phd.diegm.uniud.it/eees-phd/

ADMISSION REQUIREMENTS	
Required degree	Italian Laurea (before DM 509/99) or Italian Laurea specialistica/magistrale (ex DM 509/1999 and DM 270/04). Foreign degrees and titles: refer to art. 3 and 4 of the Call.
Knowledge of the following foreign language	English

DOCUMENTS AND QUALIFICATIONS TO BE ATTACHED TO THE APPLICATION FOR ADMISSION	
<u>Compulsory</u> documents (art. 5 of the Call)	1. Certification or self-certification (refer to art. 5 paragraph 5 of the Call) of the academic title needed for admission to the PhD programme and list of the exams (with grades) passed during the Italian first level (bachelor) and the Laurea Specialistica/Magistrale programmes or during the Italian programmes before D.M. 509/99 or during the foreign academic programmes; 2. Curriculum vitae et studiorum, dated and signed; 3. Copy of a valid identity document (citizens of countries not belonging to the European Union a copy of a valid passport, comprehensive of the pages containing the holder's photo, personal details, passport number, date and place of issue, date of expiry); 4. A research project, dated and signed, developed in accordance with the topic of interest, which highlights the contribution that the candidate can provide to the development of the topic itself (approximate limit 10.000 characters, spaces included, in English language).
<u>Optional</u> documents (art. 5 of the Call)	1. Master thesis ("Tesi di Laurea") associated to the degree/title providing access to the PhD programme. Applicants who are not graduated on the expiration date of this Call can submit an extended abstract in place of the complete thesis, in Italian or English language, signed by themselves and by their thesis Supervisor (approximate limit 10.000 characters, spaces included); 2. Motivational letter, dated and signed, by which the applicant explains the reasons for admission to the PhD programme (approximate limit 2.500 characters, spaces included); 3. Publications (max 2); 4. Letters of reference (max 2), from university professors, scientific researchers or other experts in the field (art. 6 of the Call).
All titles must be presented exclusively in PDF format, dated and signed by the candidate.	

SELECTION COMMITTEE	
Appointed members	Luca Casarsa – Associate Professor – Università di Udine Paola D'Agaro – Associate Professor – Università di Udine Lorenzo Fedrizzi – Full Professor – Università di Udine Stefano Savino – Associate Professor – Università di Udine
Substitute members	Giulio Croce – Full Professor – Università di Udine Damiana Chinese – Associate Professor – Università di Udine

ADMISSION

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TABLE 7 – PhD Programme in ENVIRONMENTAL AND ENERGY ENGINEERING SCIENCE

GENERAL COMPETITION (art. 8 of the Call for Applications)

Available Positions: 7				
Detailed description	***N.***	***Funding***	***Annual gross amount***	***Research Topic***
Positions WITH SCHOLARSHIP: 7	1	D.M. 117 of March 2, 2023 (NRRP Mission 4 Component 2 Investment/Subinvestment 3.3) and Thermokey Spa CUP G23C22001200003	€ 16,243.00	Topic 1.1 - Design of a new distributor by 3D printing to increase evaporator performance
	1	D.M. 117 of March 2, 2023 (NRRP Mission 4 Component 2 Investment/Subinvestment 3.3) and Thermokey Spa CUP G23C22001200003	€ 16,243.00	Topic 1.2 - Optimization of the geometry and control systems of a Multi System Dual Flow Microchannel Air Exchanger (MSDF)
	1	D.M. 117 of March 2, 2023 (NRRP Mission 4 Component 2 Investment/Subinvestment 3.3) and Thermokey Spa CUP G23C22001200003	€ 16,243.00	Topic 1.2 - Optimization of an industrial brazing process on aluminium alloys used in green applications and development of new solutions
	1	D.M. 117 of March 2, 2023 (NRRP Mission 4 Component 2 Investment/Subinvestment 3.3) and VETRI SPECIALI S.p.A. CUP G23C22001200003	€ 18.563,00	Topic 1.4 - Carbon-free energy paths for the glass industry Special
	1	D.M. 118 of March 2, 2023 (NRRP Mission 4 Component 1 Investment/Subinvestment 4.1) and University of Udine CUP G23C22001200003	€ 16,243.00	Topic 1.5 - Dynamics of microplastics in turbulent flow
	1	D.M. 118 of March 2, 2023 (NRRP Mission 4 Component 1 Investment/Subinvestment 4.1) and University of Udine CUP G23C22001200003	€ 16,243.00	Topic 1.6 - Development and characterization of new surface modifications to titanium alloys for biomedical applications

Competition procedure and test schedule

Evaluation of qualifications and oral examination.
For the evaluation of applicants' attitude for scientific research and their basic skills to tackle the course program, the Selection Committee can attribute up to 100 points to each applicant: max 30 points to the titles and max 70 points to the oral examination. The applicant is admitted to the oral examination if his/her titles receive at least 21 points. The oral examination is passed with at least 49 points. The applicant is eligible to the PhD programme if he/she passes the oral examination. Only for eligible applicants, the points attained in in the oral examination will be added to the points of the titles.
DATE FOR THE PUBLICATION OF ADMITTED APPLICANTS TO THE ORAL EXAMINATION: within September 11, 2023.
DATE FOR THE PUBLICATION OF THE FINAL RANKING LIST: within September 26, 2023.

Foreign language that can be used for examination	Italian or English		
Evaluation Criteria of qualifications *During the preliminary meeting the Selection Committee may establish sub-criteria for the evaluation*	Curriculum studiorum		*10*
	Curriculum vitae		*2*
	Research Project		*6*
	Scientific publications		*2*
	Thesis/Abstract		*4*
	Letters of reference		*2*
	Motivational letter for admission to the PhD programme		*4*
Oral examination	Interview based on technical, motivational and scientific discussion.		
Calendar of the oral examination	**Date**	**September 20, 2023**	
	Time	**02:30 PM**	
	Place	Polytechnic Department of Engineering and Architecture (DPIA), Sala Riunioni Verde (Meeting room "Sala Verde") DPIA – via delle scienze 206, 33100 Udine	
	Based on the number of applicants, the oral examination may take place in more than one day. Applicants must exhibit a valid ID for admission to the oral examination.		

Research topic description

Research Topic 1.1 - Design of a new distributor by 3D printing to increase evaporator performance
D.M. 117 del 2 marzo 2023 (PNRR Missione 4 Componente 2 Investimento/Subinvestimento 3.3)

Coherence of the proposed research with the PNRR fields of interest:

TABLE 7 – PhD Programme in ENVIRONMENTAL AND ENERGY ENGINEERING SCIENCE

The research project is consistent with Component 3 (M2C3) - Energy efficiency and buildings renovation of the NRRP. Energy efficiency in buildings is one of the most relevant and efficient levers for reducing emissions in our country. The innovative component proposed by Thermokey can lead to significant overall efficiency gains in a sector, such as HVAC&R, that accounts for a significant share of global energy needs.

Objectives and expected results, proposed research activity, methodologies and content:
The phase transition process in an evaporator is a complex physical phenomenon, which still poses open questions in terms of modelling and simulation. One critical aspect is still the need for uniform distribution of the fluid in the different passages of the evaporator coil. The main objective is firstly to understand the details of the transformations taking place inside the distributor, then to identify a numerical calculation model suitable for the design of a new distributor model, by means of 3D printing, to improve performance in terms of heat transfer rate of the evaporator. There are several distributor solutions on the market, and Thermokey itself has proposed and patented its own innovative solution. The optimisation of such a distributor requires a clear understanding of the details of the processes within the distributor itself, where there is typically a flow of liquid and vapour, with phase transition under variable pressure, in ducts of complex geometry and whose diameter can be of the order of magnitude of some of the bubbles being formed. Thermal, dynamic and compressibility aspects play an important role. For these reasons, the design of the channels inside the distributor will require two- and three-dimensional thermofluid-dynamic numerical analyses, investigating different approaches in modelling the liquid-vapour interfaces and phase transition mechanisms, in order to achieve increased performance at the evaporator. The theoretical study will focus on the shape and distribution of the gaseous part with respect to the liquid part, for a given refrigerant having a fixed vapour quality at the evaporator inlet. CFD simulations require to be validated by means of experimental analyses; since tests on the distributor only are very complex, data can also be inferred from the performance of the whole evaporator. The theoretical study of the distributor will allow the determination of the shape and number of additional internal channels, which will then be designed by 3D printing. The approach adopted will allow the analysis of a wide range of evaporator sizes, a wide range of refrigerants and a wide range of inlet vapour qualities, thus allowing the design logic of the component to be identified.

Period abroad (mandatory): 6 months

Data foreign host subject: The host institution will be defined later by mutual agreement between the scientific supervisors.

Period in enterprise (mandatory): 9 months, not necessarily continuous.

Enterprise Data: Thermokey Spa

Research activities to be carried out in the enterprise:
Collaboration with the enterprise has as its objectives:
- the determination of the operating points of the distributor for different applications of the evaporator;
- the determination of the input parameters for the choice of geometrical parameters required for the design;
- the optimisation of the geometry of the distributor.

Collaboration with the enterprise includes:
- numerical calculation activities concerning the distributor using codes available within the enterprise itself;
- identification of the input parameters for the choice of geometrical parameters required for the design of the distributor;
- production of prototypes and field testing;
- support for the development of models to estimate the performance of the whole device depending on the geometry of the chosen distributor.

The main expected outcome is a 'mapping' between the input data of the distributor and its geometry and performance in terms of output flow uniformity, as a preliminary analysis for a subsequent market launch of the innovative 3D printed distributor.

Consistency of the doctoral programme with the principles and specific obligations of the NRP:
- *cross-cutting priorities:* The proposed project is in line with the transversal priorities of the NRP, particularly with regard to young people (missions 1 and 4). The research programme aims to promote the green transition and digital transformation, to improve the employability skills of young people and to foster territorial convergence. The project will also ensure compliance with regulations concerning the principle of non-discrimination (equal treatment of persons, irrespective of nationality, gender, race or ethnic origin, religion, disability, age or sexual orientation) contributing to the transversal objectives of gender equality and reduction of the citizenship gap.
- *twin transitions (green and digital):* The project will be in line with the principles of green transition and circular economy. The scientific-technological objectives of the PhD, in particular, contribute to the achievement of climate neutrality with a potential impact on the reduction of environmental pollution associated with the HVAC&R industrial sector.
- *do no significant harm - DNSH:* The implementation of the project activities will not cause damage of any kind to environmental objectives (DNSH principle), according to Article 17 of Regulation (EU) 2020/852), aiming in effect at the reduction of pollution and environmental damage.
- *open science and FAIR Data:* The data from the project will be published in Open Access articles and made publicly available, whenever possible.

Reference Professor/Researcher
Prof. Giulio Croce

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TABLE 7 – PhD Programme in ENVIRONMENTAL AND ENERGY ENGINEERING SCIENCE

Research Topic 1.2- Optimization of the geometry and control systems of a Multi System Dual Flow Microchannel Air Exchanger (MSDF) *D.M. 117 del 2 marzo 2023 (PNRR Missione 4 Componente 2 Investimento/Subinvestimento 3.3)*

Coherence of the proposed research with the PNRR fields of interest:
The research project is consistent with Component 3 (M2C3) - Energy efficiency and buildings renovation of the NRRP. Energy efficiency in buildings is one of the most relevant and efficient levers for reducing emissions in our country. The innovative component proposed by Thermokey can lead to significant overall efficiency gains in a sector, such as HVAC&R, that accounts for a significant share of global energy needs.

Objectives and expected results, proposed research activity, methodologies and content:
The Multi System Dual Flow MSDF micro-channel air exchanger proposed by Thermokey is an innovative solution in the field of heating, ventilation, air conditioning and refrigeration. The use of a third fluid, in addition to the two used in conventional condensers or coolers, brings a degree of freedom that increases flexibility in both the design and management of the system, and offers a compact and efficient interface for heat recovery systems. The main project objectives are: first, the development of a procedure for designing the device geometries for various applications in terms of thermodynamic performance, thermomechanical stresses, ease of manufacture and assembly; then the development of the logic of the controllers that, depending on the specific industrial application, adjust the thermodynamic parameters of the device to define the optimum operating point of the overall system. One of the main advantages of the MSDF concept is the design freedom offered by the third fluid. To fully exploit this capability requires, on the one hand, a perfect understanding of the physical heat exchange mechanisms between the three fluids under all operating conditions, and on the other hand, the development of equally flexible design models and techniques capable of identifying the optimal solutions suitable for a wide range of applications. The physical heat transfer mechanisms will be investigated using Numerical Thermo-Fluid Dynamics techniques. Some optimal tubes and manifold configurations will be generated by coupling selected CFD simulations and machine learning algorithms for geometry selection. Selected configurations will be chosen for prototype production and on-field testing. Concerning the analysis of the overall system, thermodynamic models with concentrated parameters will be developed for some representative applications in order to identify the most suitable control logics by means of algorithms using artificial intelligence for performance optimisation. In the short term, the study will allow the development of the final MSDF product, which will be the optimal solution for condensation heat recovery and a flexible version for pure cooling. The possibility of heat recovery, on the other hand, opens the way to multiple applications, from defrost processes to air preheating mechanisms. The point-of-operation control system will allow the PLCs of the various machines to be programmed. In the medium term, the improvement of the system will enable a higher degree of plant integration, turning the heat exchanger into a flexible thermal interface element between different subsystems and thus leading to synergies and appreciable increases in overall efficiency.

Period abroad (mandatory): 6 months

Data foreign host subject: The host institution will be defined later by mutual agreement between the scientific supervisors.

Period in enterprise (mandatory): 9 months, not necessarily continuous.

Enterprise Data: Thermokey Spa

Research activities to be carried out in the enterprise: Collaboration with the enterprise has as its objectives:
- the development of procedures based on numerical simulations for heat exchange analysis in the characteristic geometries of MSDF exchangers;
- the development of thermodynamic models for estimating plant performance as a function of the operating point of the MSDF exchanger;
- the development of control systems depending on the specific application.

Collaboration with the enterprise includes:
- numerical calculation activities concerning the geometries of the MSDF using codes available within the enterprise itself;
- production of prototypes and field testing;
- identification of plant configurations for representative applications;
- support in the development of thermodynamic models for the analysis and optimisation of plants using the MSDF as a component.

The main expected outcome is the development of a Multi System Dual Flow (MSDF) microchannel air exchanger, to be offered on the market, which has been optimised and tested for several specific applications. Furthermore, depending on the specific applications, it will be possible to define the most suitable control logic for the optimisation of the performance of the whole system.

Consistency of the doctoral programme with the principles and specific obligations of the NRP:
- *cross-cutting priorities:* The proposed project is in line with the transversal priorities of the NRP, particularly with regard to young people (missions 1 and 4). The research programme aims to promote the green transition and digital transformation, to improve the employability skills of young people and to foster territorial convergence. The project will also ensure compliance with regulations concerning the principle of non-discrimination (equal treatment of persons, irrespective of nationality, gender, race or ethnic origin, religion, disability, age or sexual orientation).
- *twin transitions (green and digital):* The project will be in line with the principles of green transition and circular economy. The scientific-technological objectives of the PhD, in particular, contribute to the achievement of climate neutrality with a potential impact on the reduction of environmental pollution associated with of heating, ventilation, air conditioning and refrigeration processes.
- *do no significant harm - DNSH:* The implementation of the project activities will not cause damage of any kind to environmental objectives (DNSH principle), according to Article 17 of Regulation (EU) 2020/852), aiming in effect at the reduction of pollution and environmental damage.
- *open science and FAIR Data:* The data from the project will be published in Open Access articles and made publicly available, whenever possible.

Reference Professor/Researcher
Prof. Stefano Savino

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TABLE 7 – PhD Programme in ENVIRONMENTAL AND ENERGY ENGINEERING SCIENCE

Research Topic 1.3 - Ottimizzazione di un processo di brasatura industriale su leghe di alluminio utilizzate in applicazioni green e sviluppo di nuove soluzioni
D.M. 117 del 2 marzo 2023 (PNRR Missione 4 Componente 2 Investimento/Subinvestimento 3.3)

Coherence of the proposed research with the PNRR fields of interest:
The proposed research is in line with PNRR Mission 1 M1C2 Investment 5.

Objectives and expected results, proposed research activity, methodologies and content:
The objectives are divided into two sub-objectives:
- Optimisation of the brazing process for heat exchangers;
- Performance evaluation in terms of component durability:
For the first sub-objective, the following activities are planned:

- Preliminary evaluation of brazing and brazing materials;
- Evaluation of the brazing process parameters as a function of the materials used;
- Optimisation of the brazing process and selection of the most suitable materials for heat exchanger production;

For the second sub-objective to predict:

- Evaluation of the mechanical properties of brazed materials;
- Evaluation of component durability;

The research activities will be carried out in collaboration between the University of Udine and the Thermokey company. In particular, for the University of Udine, the activities will be carried out at the advanced materials laboratory under the supervision of Prof. A. Lanzutti. In this laboratory, experiments will be carried out with reference to the optimisation of the brazing process through small-scale static heat treatments, followed by mechanical and microstructural characterisation. Optimisation of the brazing process on a large scale using the production plant will be carried out, with the aim of reproducing the results obtained in the laboratory. Afterwards, durability tests will then be carried out both with the equipment available in the advanced materials laboratory and at the company.
The expected results have the final aim to obtain an optimised brazing process also from a green perspective, i.e. using materials with a low environmental impact. The results obtained will then be used to increase the durability of the components. The optimised process can then be used on a large scale in the company's industrial production.

Period abroad (mandatory): A period abroad of 6 months at a host institution is foreseen. The exact start and end dates of this period will be defined later.

Data foreign host subject: The foreign host will be identified later.

Period in enterprise (mandatory): An in-company period of 9 months, also non-continuous, is envisaged, depending on the experimental requirements.

Enterprise Data: Thermokey Spa

Research activities to be carried out in the enterprise:
During the in-company period, activities will be carried out to optimise the brazing process on a large scale using the production plant, with the aim of reproducing the results obtained in the laboratory. Lastly, durability tests will be carried out with the means available to the advanced materials laboratory and the company.

Consistency of the doctoral programme with the principles and specific obligations of the NRP:
- *cross-cutting priorities:* The proposed project is in line with the transversal priorities of the NRP, particularly with regard to young people (missions 1 and 4). The research programme aims to promote the green transition and digital transformation, to improve the employability skills of young people and to foster territorial convergence. The project will also ensure compliance with regulations concerning the principle of non-discrimination (equal treatment of persons, irrespective of nationality, gender, race or ethnic origin, religion, disability, age or sexual orientation) contributing to the transversal objectives of gender equality and reduction of the citizenship gap.
- *twin transitions (green and digital):* The project will be in line with the principles of green transition and circular economy. The scientific-technological objectives of the PhD, in particular, contribute to the achievement of climate neutrality with a potential impact on the reduction of environmental pollution associated with industrial brazing processes, by using materials with a low environmental impact.
- *do no significant harm - DNSH:* The implementation of the project activities foresees not to cause significant harm to environmental objectives (so-called "Do No Significant Harm" principle), in accordance with Article 17 of Regulation (EU) 2020/852.
- *open science and FAIR Data:* The data obtained from the project will be published in Open Access articles and made publicly available, whenever possible.

Reference Professor/Researcher
prof. Alex Lanzutti

Finanziato dall'Unione europea
NextGenerationEU

TABLE 7 – PhD Programme in ENVIRONMENTAL AND ENERGY ENGINEERING SCIENCE

Research Topic 1.4 Carbon-free energy routes for the glass industry Special
D.M. 117 del 2 marzo 2023 (PNRR Missione 4 Componente 2 Investimento/Subinvestimento 3.3)

Coherence of the proposed research with the PNRR fields of interest:
According to the National Plan for Ecological Transition, the greatest challenge facing the international community is the decarbonisation of energy processes, the electrification of many heat uses and the replacement of fossil fuels with renewable and clean fuels. The proposed research project aims to foster the integration of renewable energies and new fuels in hard-to-abate industrial processes, thereby contributing to the reduction of energy dependence on foreign countries and, therefore, to increased competitiveness, particularly for energy-intensive industrial sectors. The research project also integrates circular economy objectives, proposing to assess, in the design and planning phase of the operation of renewable energy plants, even the middle-of-life and end-of-life impact of the operation of new plants as well as the disposal of replaced components.

Objectives and expected results, proposed research activity, methodologies and content:
The decarbonisation of the glass production process also calls for a substantial modification of the process itself, so that the range of energy carriers that can be used for melting raw materials can be expanded.
The objective of the proposed research activity is the development of models and decision support systems for the integration of renewable energy sources in hollow glass production processes.
In particular, the PhD student will develop, validate and apply models for the quantification and optimisation of economic and environmental performance in the various phases of the plant life cycle:
- In the design phase, for the dimensioning and integration of components and subsystems, with the aim of minimising the use of resources and the environmental impact of the components.
- In the operational phase, for assessing the impact of different management strategies on the efficiency of plants and the expected life of their components, identifying possible trade-offs and taking into account the risks associated with the operational and maintenance management of innovative technologies;
- When replacing components and decommissioning the plant as a whole, analysing reuse, recycling and life extension processes of the systems.
By constructing and integrating appropriate inventories and databases, primary energy consumption, carbon footprint and economic feasibility indicators will be identified and quantified, as well as the most relevant environmental impact and resource use indicators (e.g. water, soil) for the ecosystems in which the reference plants are located.
Outputs of the research will be the methodologies and energy systems models developed, validated through application to case studies, as well as proposals for the optimal configuration of plants and systems. A critical evaluation of the applicability of innovative technologies on an industrial scale, particularly for energy storage systems, is also an expected outcome of the research.

Period abroad (mandatory): 6 months

Data foreign host subject: European university or research lab, to be defined.

Period in enterprise (mandatory): 18 months

Enterprise Data: VETRI SPECIALI S.p.A.

Research activities to be carried out in the enterprise:
The activity in the company will initially focus on the collection and processing of data relating to the production process, aimed at its global description in terms of energy and material flows, production and consumption time profiles, age, maintenance status and expected useful life of the main machinery. At the same time, the doctoral candidate will also acquire knowledge of the regulatory framework to which the sector is subject, in terms of constraints, opportunities and future developments. The algorithms and calculation tools, which will be developed mainly in the academic work, will be validated in the activity in the company, comparing the results with measurements or with the systematic and structured collection of expert judgement.

Consistency of the doctoral programme with the principles and specific obligations of the NRP:
- *cross-cutting priorities:* Investments and reforms on the green transition contribute to the creation of youth employment in all sectors addressed by the European Green Deal, including renewable energy, transmission and distribution networks, and the hydrogen supply chain. Female applicants are particularly encouraged.
- *twin transitions (green and digital):* The integration of renewables and the redefinition of processes under research are based on calculation, simulation and in particular data analytics and machine learning tools for predicting energy demand profiles as production conditions change.
- *do no significant harm - DNSH:* The implementation of the project activities will not cause damage of any kind to environmental objectives (DNSH principle), according to Article 17 of Regulation (EU) 2020/852), aiming in effect at the reduction of pollution and environmental damage.
- *open science and FAIR Data:* The data obtained from the project will be published in Open Access articles and made publicly available, whenever possible.

Reference Professor/Researcher
prof.ssa Damiana Chinese

Finanziato dall'Unione europea
NextGenerationEU

TABLE 7 – PhD Programme in ENVIRONMENTAL AND ENERGY ENGINEERING SCIENCE

Research Topic 1.5 - Dynamics of microplastics in turbulent flow
D.M. 118 of March 2, 2023 (NRRP "National Recovery and Resilience Plan" Mission 4 Component 1 Investment/Subinvestment 4.1) – NRRP Research

Coherence of the proposed research with the PNRR areas of interest and, for the scientific-technological areas, highlight how the proposed research can promote interdisciplinarity, membership of international networks and intersectoriality:
The proposed research is consistent with the objectives of the PON IV.6 action on green transition, ecosystem conservation and reduction of climate change impacts, and falls within the thematic area "Sustainability of production processes, energy (green economy) and resilience". Moreover, the research contribution is consistent with the SNSI thematic area 'Intelligent and sustainable industry, energy and environment' and, in particular, with the development trajectory 'Innovative high-efficiency production processes for industrial sustainability' as it aims at introducing innovative predictive techniques within production processes currently based on empirical design and optimisation criteria. The proposed research is consistent with the following NRP topics: Green technologies (Articulation no. 1. Biochemicals, bioproducts and sustainable chemical processes in synergy with biofuels, bioenergy and agroenergy), High performance computing and big data (Articulation no. 2. Basic and fundamental research in engineering, science and computing technologies for HPC and big data). The proposed research is also consistent with the following PNRR themes: ecological transition, land protection, energy efficiency, which fall under Mission 2: Green Revolution and Ecological Transition, Component 1 - Circular Economy and Sustainable Agriculture (M2C1). Suffice it to say that the dispersion of microplastics from synthetic textiles and footwear during all phases of their life cycle further increases the environmental impact of the textiles and clothing sector, which is economically important in the European Union and can play a decisive role in the circular economy.
The research proposal responds to Sustainable Development Goal 14 'Conserve and sustainably use the oceans, seas and marine resources for sustainable development'. Finally, the proposal consolidates fundamental research and enhances the circulation of knowledge and skills between the research world and the production system, aiming to accompany the development of a new generation of researchers, technologists and technology transfer professionals.

Expected objectives and results, proposed research activities, methodologies and contents:
The project aims to carry out a numerical and experimental study of the rotational dynamics and preferential orientation of microplastics, modelled as non-axisymmetric anisotropic particles of elongated shape, in a turbulent flow. Studying this specific physical problem is relevant for the many implications it may have in terms of industrial and environmental applications, where microplastics interact with a carrier flow that is typically non-homogeneous and anisotropic, strongly three-dimensional and time-dependent. The research activities will consist of a series of experimental and numerical investigations aimed at characterising the relative importance of the different modes of rotation of microplastics (tumbling, spinning) on their tendency to preferentially orient and concentrate within the different flow regions, possibly giving rise to fragmentation or aggregation phenomena. In particular, the wall zone and the zone near the free surface of the flow will be examined, where different flow conditions are expected to result in different dynamics of both translation and rotation. A further aim of the project is to synergistically combine experiments and simulations in order to improve the methodological approach to the study of turbulent fibre dispersions and, consequently, to develop more accurate predictive models than those currently available. The first result (improved methodological approach) will be obtained by (I) developing experimental tracking techniques capable of measuring fibre rotation near walls and free surfaces (and not only at a sufficient distance from these, as is currently the case) and (II) developing tracking models capable of better reproducing the physics of dispersion in the presence of anisotropic flows and particles, thanks to direct comparison with specially collected experimental data. This first result will make it possible, in cascade, to carry out simulation campaigns capable of covering a wide range of operating conditions (e.g. Reynolds number of the flow, Stokes number of the fibres) and to use the experimental and numerical data collected to develop models capable of reproducing the statistical properties of the rotation, orientation and preferential distribution of microplastics.
To carry out the experimental measurements, the Turbulent Water Channel available at the Institute of Fluid Mechanics and Heat Transfer at TU Wien will be used. This is an inclined channel equipped with Particle Tracking Velocimetry for 3D measurements of turbulent flows with dispersed anisotropic particles and in the presence of a free surface. To carry out the simulations, a proprietary code available at the DPIA Multiphase Fluid Dynamics Laboratory will be used. The code, based on a very accurate pseudo-spectral method, allows direct numerical simulation of turbulent flows in both closed and open channels, and Lagrangian tracking of both rigid and flexible fibres. This makes it possible to simulate exactly the flow conditions produced in the Turbulent Water Channel, a necessary condition for a correct validation of the numerical results.
The proposed study requires a range of skills relating to the use of the numerical and experimental tools needed to investigate the mechanisms described. It is therefore essential to be able to find a young researcher/researcher with specific physical-mathematical, experimental and computational knowledge that will enable her/him to carry out the planned research activities. The study will make it possible to consolidate or establish collaborations with several European institutions dealing with microplastics (among others: OGS, TU Wien, University of Aix-Marseille, University of Portsmouth). Finally, it should be noted that industry's interest in the containment and reduction of microplastic pollution has literally exploded in recent years. In particular, in the textile, fashion and automotive sectors, as the main source of microplastics is synthetic fabrics and abrasion from car tyres. Among the companies investing is also Eni, which recently involved Fincantieri in a memorandum of understanding for the development of projects aimed at "identifying and implementing technological solutions to synergistically tackle the marine litter phenomenon, which compromises the marine and coastal ecosystem mainly due to floating plastic waste and microplastics". One of the aims of the project will be to make the university's Multiphase Fluid Dynamics Laboratory a point of reference for the industrial sector thanks to the physical-modelling and experimental characterisation skills of the processes of atmospheric and marine dispersion of microplastics that can also be developed thanks to the PhD student recruited.

Period abroad: 6 months

Data of foreign host subject: Technische Universität Wien (TU Wien), Karlsplatz 13, 1040 Vienna.

Possible research center involved in the definition of the training pathway: Institute of Fluid Mechanics and Heat Transfer at TU Wien.

Research activities to be carried out at the Research Center:

TABLE 7 – PhD Programme in ENVIRONMENTAL AND ENERGY ENGINEERING SCIENCE

The proposed research project requires a range of skills that are not currently available at our university, particularly with regard to the use of the experimental tools needed to investigate the dynamics of microplastics in free-surface turbulent flows. Such expertise, on the other hand, is the prerogative of the experimental laboratory of the Institute of Fluid Mechanics and Heat Transfer at TU Wien, where a number of studies on the behaviour of microplastics in open channels have been carried out. For the purposes of the project, in particular, it will be possible to have access to the TU Wien Turbulent Water Channel, equipped with PTV measurement systems for three-dimensional measurements of turbulent multiphase flows. The use of such systems requires specific skills, which the PhD student will develop under the supervision of institute staff. Also for this reason, the experimental activities envisaged in the project will be agreed and then carried out at the laboratories of the Institute of Fluid Mechanics and Heat Transfer, during the PhD student's visit. These activities will be aimed at examining the importance of parameters related to the type of turbulent flow transporting the fibres (considering in particular wall and thermal stratification effects), the shape of the fibres (such as length versus turbulence scales and shape factor) and the material they are made of (which determines their ability to deform and/or fragment due to turbulent stresses) on the fluid-dynamic mechanisms of dispersion. The results obtained will provide both important benchmarks for the validation of the numerical tools developed during the PhD and complementary data bases to those developed by the simulations to characterise the dispersion process from a phenomenological point of view. During the visiting period, the PhD student will also have the opportunity to participate in seminars and courses organised by the host institute on general topics concerning thermo-fluid dynamics, further enriching the PhD programme.

Coherence of the doctoral programme with the principles and specific obligations of the PNRR:
- *cross-cutting priorities:* The proposed project is in line with the transversal priorities of the NRP, particularly with regard to young people (missions 1 and 4). The research programme aims to promote the green transition and digital transformation, to improve the employability skills of young people and to foster territorial convergence. The project will also ensure compliance with regulations concerning the principle of non-discrimination (equal treatment of persons, irrespective of nationality, gender, race or ethnic origin, religion, disability, age or sexual orientation) contributing to the transversal objectives of gender equality and reduction of the citizenship gap.
- *twin transitions (green and digital):* The project will be in line with the principles of green transition and circular economy. The scientific-technological objectives of the PhD, in particular, contribute to the achievement of climate neutrality with a potential impact on the reduction of environmental pollution by microplastics.
- *do no significant harm - DNSH:* The implementation of the project activities will not cause damage of any kind to environmental objectives (DNSH principle), according to Article 17 of Regulation (EU) 2020/852), aiming in effect at the reduction of pollution and environmental damage.
- *open science and FAIR Data:* The implementation of the project activities will comply with the principles of Open Science and FAIR data promoted by the EU. In particular, in line with the National Research Programme (NRP) 2021-2027, research results will be published in international journals and presented at national and international conferences in order to pursue a high quality of research by the PhD student. There are no constraints related to industrial confidentiality.

Reference Professor/Researcher:
prof. Cristian Marchioli

Research Topic 1.6 - Development and characterization of new surface modifications to titanium alloys for biomedical applications
D.M. 118 of March 2, 2023 (NRRP "National Recovery and Resilience Plan" Mission 4 Component 1 Investment/Subinvestment 4.1) – NRRP Research

Coherence of the proposed research with the PNRR areas of interest and, for the scientific-technological areas, highlight how the proposed research can promote interdisciplinarity, membership of international networks and intersectoriality:
The proposed research falls within the PNRR areas of interest, particularly with the M6 mission related to the development of new materials intended for the use in the biomedical field and of potential interest to the National Health Service. The research falls within an interdisciplinary theme within materials science and technology with a focus on chemical-physical and biological aspects; it will also fit within a network of international collaborations.

Expected objectives and results, proposed research activities, methodologies and contents:
The project aims to develop new surface modifications to titanium alloys that will enable additional and advanced functionalities compared to alloys currently used in the biomedical field, especially as implantable biomaterials in orthopedics as bone substitutes. Specifically, the goal is to (i) obtain materials that are capable of promoting the growth of cells on the surface, so as to facilitate the integration of the implanted material with the host patient's tissues, and (ii) simultaneously to limit the adhesion and growth of bacteria, so as to prevent bacterial infections, one of

TABLE 7 – PhD Programme in ENVIRONMENTAL AND ENERGY ENGINEERING SCIENCE

the complications often associated with the clinical use of biomaterials. Micro- and nano-particles capable of providing both of these functionalities will then be synthesized based on ceramic, metallic, polymeric materials and/or resulting from the combination of materials of different types. The synthesis of such particles will be optimized, and the obtained particles will be characterized to evaluate their chemical-physical and morphological properties. The obtained particles will then be deposited on the titanium surface following processes such as dip coating and electrodeposition. The modified materials will be tested biologically by evaluating their interaction with cells and bacteria. The main result will be the development of new implantable biomaterials that allow for simultaneous good integration with native tissues and avoid bacterial infection.

Period abroad: 6 months

Data of foreign host subject: University of Nantes, France

Possible research center involved in the definition of the training pathway: NA

Research activities to be carried out at the Research Center:
Biological tests of interaction between the obtained biomaterials and cellular models.

Coherence of the doctoral programme with the principles and specific obligations of the PNRR:
- *cross-cutting priorities:* The proposed research falls within the PNRR areas of interest, particularly regarding the development of new materials for use in the biomedical field and of potential interest to the National Health Service.
- *twin transitions (green and digital):* The doctoral program addresses the use of green materials with reduced environmental impact and aims to reduce the production of toxic waste.
- *do no significant harm - DNSH:* The doctoral program will not do significant harm, but rather is aimed at producing health benefits for people; it will also use part of waste materials with added value in waste reduction and pollution reduction.
- *open science and FAIR Data:* The data obtained from the project will be published in Open Access articles and made publicly available.

Reference Professor/Researcher:
prof. Lorenzo Fedrizzi

TABLE 8 – PhD programme AGRICULTURAL SCIENCES AND BIOTECHNOLOGY

THE PhD PROGRAMME	
Administrative location	University of Udine - Department of Agricultural, Food, Environmental and Animal Sciences (DI4A) – via delle Scienze n. 206, 33100 Udine, ITALY (tel. +39 0432 558600)
Associated location	-
Location for training, teaching and research activity	Teaching and other training activities will take place primarily at the administrative programme location or in other locations of the University of Udine. The research program will be developed as stated in the "Research Topic Description" section.
Coordinator	Prof. Francesco Nazzi (francesco.nazzi@uniud.it)
Programme duration	3 years
Curricula	A. Biology and plant production; B. Biology and livestock science; C. Biology of pathogens and plant protection.
Programme website	https://www.uniud.it/en/research/do-research/doctorate-res/our-ph-d-programmes/area-life-science/agricultural-sciences-and-biotechnology/ph-d-programme/agricultural-sciences-and-biotechnology?set_language=en

ADMISSION REQUIREMENTS	
Required degree	Italian Laurea (before DM 509/99) or Italian Laurea specialistica/magistrale (ex DM 509/1999 and DM 270/04). Foreign degrees and titles: refer to art. 3 and 4 of the call.
Knowledge of the following foreign language	English

DOCUMENTS AND QUALIFICATIONS TO BE ATTACHED TO THE APPLICATION FOR ADMISSION	
Compulsory documents (art. 5 of the Call)	1. Certification or self-certification (refer to art. 5 paragraph 5 of the Call) of the academic title needed for admission to the PhD programme and list of the exams (with grades) passed during the Italian Laurea Specialistica/Magistrale programme or during the Italian programmes before D.M. 509/99 or during the foreign academic programmes; 2. Curriculum vitae et studiorum, dated and signed; 3. Copy of a valid identity document (citizens of countries not belonging to the European Union must attach a copy of a valid passport, comprehensive of the pages containing the holder's photo, personal details, passport number, date and place of issue, date of expiry); 4. A research project, dated and signed, developed in accordance with the topic of interest, which highlights the contribution that the candidate can offer to the development of the topic itself (approximate length of the research project, in English, spaces included: 10.000 characters).
Optional documents (art. 5 of the Call)	1. Master thesis ("Tesi di Laurea") associated to the degree/title providing access to the PhD programme. Applicants who are not graduated by the expiration date of this call can submit an extended abstract in place of the complete thesis, in Italian or English language, signed by themselves and by their thesis Supervisor (approximate limit: 25.000 characters, spaces included); 2. Publications (max 2); 3. Letters of reference (max 2), from university professors, scientific researchers or other experts in the field (art. 6 of the Call).
All qualifications must be presented exclusively in PDF format, dated and signed by the candidate.	

SELECTION COMMITTEE	
Appointed members	Elisa Angelini – research manager - CREA Conegliano Enrico Braidot - associate professor – University of Udine Emanuele De Paoli - full professor – University of Udine Sandy Sgorlon - ajunted professor – University of Udine Bruno Stefanon - associate professor – University of Udine Sabina Susmel - ajunted professor – University of Udine
Substitute members	Francesco Boscutti - associate professor – University of Udine Elisa Marraccini - ajunted professor – University of Udine Giuseppe Stradaioli - full professor – University of Udine Francesca Tulli - ajunted professor – University of Udine Riccardo Velasco – research manager – CREA Conegliano

ADMISSION

GENERAL COMPETITION (art. 8 of the Call for Applications)

Posti disponibili: 5				
Detailed description	***N.***	***Funding***	***Annual gross amount***	***Research Topic***

TABLE 8 – PhD programme AGRICULTURAL SCIENCES AND BIOTECHNOLOGY

	1	D.M. 118 of March 2, 2023 (NRRP Mission 4 Component 1 Investment/Subinvestment 4.1) and Università degli Studi di Udine CUP G23C22001200003	€ 16,243.00	Tematica 1.1 - Use of (bio)sensors specifically optimized for the analysis of priority and emerging contaminants in surface water
	1	D.M. 118 of March 2, 2023 (NRRP Mission 4 Component 1 Investment/Subinvestment 4.1) and University of Udine CUP G23C22001200003	€ 16,243.00	Tematica 1.2 - Breeding drought tolerant buckwheat for sustainable plant protein production in Italy

Competition procedure and test schedule

Evaluation of qualifications and oral examination.
For the evaluation of applicants' attitude for scientific research and their basic skills to tackle the course program, the Selection Committee can attribute up to 100 points to each applicant: max 30 points to the titles and max 70 points to the oral examination. The applicant is admitted to the oral examination if his/her titles receive at least 21 points. The oral examination is passed with at least 49 points. The applicant is eligible to the PhD programme if he/she passes the oral examination. Only for eligible applicants, the points attained in the oral examination will be added to the points of the titles.
DATE FOR THE PUBLICATION OF ADMITTED APPLICANTS TO THE ORAL EXAMINATION: within September 12, 2023.
DATE FOR THE PUBLICATION OF THE FINAL RANKING LIST: within September 26, 2023.

Foreign language that can be used for examination	Italian or English		
Evaluation Criteria of qualifications *During the preliminary meeting the Selection Committee may establish sub-criteria for the evaluation*	Curriculum vitae et studiorum		10
	Research project		10
	Scientific publications		2
	Thesis/Abstract		6
	Letters of reference		2
Oral examination	The oral examination is based on a discussion on the scientific titles submitted and includes an evaluation of English language knowledge.		
Calendar of the oral examination	**Date**	**15 September 2023**	
	Time	**8:30 AM**	
	Place	On line MS Teams	
	Based on the number of applicants, the oral examination may take place in more than one day. Applicants must exhibit a valid ID for admission to the oral examination		

Research Topics Description

Research Topic 1.1 - Use of (bio)sensors specifically optimized for the analysis of priority and emerging contaminants in surface water
D.M. 118 of March 2, 2023 (NRRP "National Recovery and Resilience Plan" Mission 4 Component 1 Investment/Subinvestment 4.1) – NRRP Research

Coherence of the proposed research with the PNRR areas of interest and, for the scientific-technological areas, highlight how the proposed research can promote interdisciplinarity, membership of international networks and intersectoriality:
The proposed project intercepts the "linea investimento" 3.5: Restoration and protection of seabed and marine habitats described in PNRR mission 2 and in particular M2C4: SAVING THE QUALITY OF THE AIR AND THE BIODIVERSITY OF THE TERRITORY THROUGH THE PROTECTION OF GREENLANDS, SOIL AND SEA AREAS, maintaining continuity in the research activity carried out by the proposing group, which consists in the determination of analytes of interest for the safeguard of the quality of marine habitats through the development of (bio) sensors. Specifically, the investment line envisages "large-scale interventions for the restoration and protection of the seabed and marine habitats in Italian waters, aimed at reversing the trend of degradation of the Mediterranean ecosystems enhancing their resilience to climate change and thus allowing the maintenance and sustainability of activities fundamental not only for coastal areas but also for the essential inland production chains (fishing, tourism, food, blue growth)." Hence the need to extend and execute over time measurement and monitoring activities on chemical parameters affecting the health of marine aquatic environments to increase knowledge and thus to be able to activate targeted and effective actions to preserve it. Thus, the availability of rapid measurement tools to complement the monitoring procedures now implemented supports this knowledge and mapping effort. The optimization work of (bio)sensors applied to the measurement of chemical species of interest for seawater quality requires the involvement of cross-cutting knowledge. The 'optimization of (bio)sensors requires that, to achieve selectivity in measurement, a modifier of chemical or biological nature, is immobilized on the surface of a transducer, embedded in an electrical and electronic circuit, for the collection of the data and its conversion to measurable magnitude following the recognition process at the sensor/solution interface. Such a definition of bio/sensor highlights the need for cross-disciplinary knowledge and skills involving the materials used or prepared to obtain the transducer then subjected to modification, the chemistry and biochemistry useful in the anchoring phase of the modifier, and finally arriving at the collection and analysis of the data. With the goal of applying such measurement systems to the marine environment and its habitats expands interdisciplinarity by involving knowledge of marine biology or chemistry of aquatic environments. With respect to the assessment of the current state of marine habitats, the driving variables of their alteration processes have to be determined in order to identify analytical targets to be monitored that better and more effectively describe deviations from the actual state. The marine environment is evaluated on the basis of good environmental status indicators as stated by the marine strategy and these are in progress with the progress of the knowledge about the marine environment and its habitats. Therefore, interdisciplinarity has already been proven to be a need to carry out a critical analysis of the analytical data and the information conveyed by them regarding the system under observation, meaning that multi/interdisciplinarity has already proven to be necessary and useful for a correct and critical contextualization of the information collected through measurements. This methodological approach has made it possible to open a network of Italian and foreign contacts which is effective due to the heterogeneous

TABLE 8 – PhD programme AGRICULTURAL SCIENCES AND BIOTECHNOLOGY

pressures acting on the marine environment and its stability. This shared working method and operational continuity on the topic is also expected to further expand the network of international relations, strengthening the opportunity for participation in competitive calls in the field of blue economy and of the protection of biodiversity and seawater quality based on the analysis and on the optimisation of new tools for measurement.

Expected objectives and results, proposed research activities, methodologies and contents:
The project aims to develop rapid measurement systems i.e., bio/sensors for the determination of chemical components present in the marine environment resulting from anthropogenic pressure on that ecosystem. In particular, molecules of a chemical nature that are conferred into the sea, even after purification and within the limits imposed by regulations, although not affecting the quality of the sea for aspects of human use (ie bathing quality), may have consequences on the life of aquatic organisms and on the balances of trophic networks. Furthermore, among the molecules that reach the marine environment there are many that are not subjected to restriction and control nor do they have operational protocols (i.e., sampling and analysis protocols) such as Pharmaceutically Active Compounds (PhACs), Personal Care Products (PCPs), sugars and Artificial Sweeteners (ASWs), Priority Contaminants, etc. However, it is believed that they can interfere with marine ecosystems and modify their integrity. The project aims to optimize a measurement system based on the development of a bio/sensor for the determination in the relevant environment of at least 2 of the above-mentioned analytes, and to contribute to the definition of an operational protocol for the determination. The expected result is thus a better understanding of the quality of the marine environment through the rapid measurement of target analytes influencing trophic networks and the health status of aquatic species (animal and vegetation).

The first part of the project, will focus on the analysis of all directives that have as their focus the quality of water and of marine environments and the literature concerning the following classes of compounds: Emerging Contaminants (ECs) such as Pharmaceutically Active Compounds (PhACs), Personal Care Products (PCPs), Artificial Sugars and Sweeteners (ASWs), and Priority Contaminants (Hg, Pb, Zn, Cd etc), with particular attention to the conventional and sensor-based analytical methodologies used for their measurement, the operational protocols available, the strengths and weaknesses of their determination as well as the information about the stability of these compounds in aquatic environments and the effects of their presence or the presence of their degradation products. The baseline so defined support the selection of at least two analytes, chosen from the categories of compounds aforementioned to be investigated and subjected to analysis either using conventional measurement techniques or through the use of a purposely optimized bio/sensor. Specifically, the most appropriate surface modifier, either chemical or biological, to be immobilized to the transducer surface and capable of achieving a selective determination is evaluated (Scheme 1, A). Aptamers or molecularly imprinted polymers or chemical modifiers that selectively react with the analyte of interest are considered and tested. The correct immobilization strategy will be identified and, in addition, the characterisation of the substrate prepared by/at the working group (ie, electrode or transducer in Scheme 1) on which the modifier is immobilized is performed to, overall, improve the performance of the developed device. This phase also involves the choice of electrochemical (and or optical) measurement parameters that will ensure the highest sensitivity and robustness to the analytical data. The sensor is tested in a controlled environment in consideration of the presence of potential interferents and finally on real samples. Validation of the data is achieved by conducting the determination of the selected analytes through the use of conventional analytical methodologies, and in addition, aspects related to in situ determination are considered, again for the purpose of obtaining sensitivity appropriate to the scope of application of the analytical device.

Period abroad: 6 months

Data of foreign host subject: Rudjer Boskovic Institute, Bijenička cesta 54, 10000 Zagreb, +385 1 4561 111, info@irb.hr

Possible research centre involved in the definition of the training pathway: n. d.

Research activities to be carried out at the Research Centre:
The Research Institute is organized into 11 Divisions and is supported by 4 scientific research centers. The research carried out at the Institute is multidisciplinary in nature and covers the fields of theoretical and experimental physics, different areas of chemistry, chemistry and physics of materials, biochemistry of molecular biology and medicine, research in environmental and marine sciences as well as in the areas of computer science and electronics. In addition Rudjer Boskovic Insitute is involved in teaching and is part of European and international collaborative networks. The collaboration will contribute to a comparison of the measurement methodology adopted, namely the electrochemical approach with conventional one, to the optimization of the sensor for the characterisation of the electrodic material and to the analysis of the data for their relevance vs the marine environment.

Coherence of the doctoral programme with the principles and specific obligations of the PNRR:
- *cross-cutting priorities:* the PhD program is committed to encouraging the participation of young people, women (and territories) by ensuring equal opportunities for all, without discrimination.

- *twin transitions (green and digital):* the proposed theme participates in the green transition (green new deal), in particular as the extension of marine protected areas and environmental buffer zones is envisaged, the availability of quick and inexpensive user-friendly measurement tools supports the control and monitoring work needed to define the state of the sea surrounding areas that could be earmarked for application.

- *do no significant harm - DNSH:* the doctoral project commits not to harm:

- to climate change mitigation, as no operations leading to significant greenhouse gas (GHG) emissions are planned;

TABLE 8 – PhD programme AGRICULTURAL SCIENCES AND BIOTECHNOLOGY

- to adaptation to climate change, as the project is designed to protect the environment, thus not leading to a greater negative impact of the current and future climate, on the activity itself or on people, nature or goods;
- the sustainable use or protection of water and marine resources, as the proposed research activity is aimed at preserving the status of water bodies;
- the prevention and reduction of pollution, as no increase in emissions of pollutants to air, water or soil is expected. The objective of the doctoral project is to reduce and monitor environmental pollutants;
- the protection and restoration of biodiversity and ecosystems, as a cross-cutting objective of the doctoral project is to maintain the good condition and resilience of ecosystems or the conservation status of habitats and species, including those of EU interest.

- *open science and FAIR Data:* the doctoral programme provides for the sharing of original scientific research data, ensures open public access to research results in the shortest possible time and with the least possible restrictions. (ensuring open public access to research results and related data (e.g.publications of original scientific research results, raw data and metadata, sources, digital graphic and graphical and imaging digital representations and scientific multimedia materials) in the shortest possible time and with the fewest possible limitations, in accordance with the principles of 'Open Science' and 'FAIR Data').

Reference Professor/Researcher:
prof.ssa Sabina Susmel e prof.ssa Francesca Tulli

Research Topic 1.2 - Breeding drought tolerant buckwheat for sustainable plant protein production in Italy
D.M. 118 of March 2, 2023 (NRRP "National Recovery and Resilience Plan" Mission 4 Component 1 Investment/Subinvestment 4.1) – NRRP Research

Coherence of the proposed research with the PNRR areas of interest and, for the scientific-technological areas, highlight how the proposed research can promote interdisciplinarity, membership of international networks and intersectoriality:
This PhD project plans to utilize modern genetic tools to enhance the nutritional content and water use efficiency of common buckwheat, a promising functional and resilient crop. The objective is to breed a crop that is better adapted to fragile environments and can contribute to enhancing habitat diversity, as well as developing resilience in Italian cropping systems.
The proposal is coherent with Mission 2 of "Green revolution and ecological transition" of PNRR, particularly with Component 1 "Sustainable agriculture and circular economy. The proposal also responds to the National Strategy of Circular Economy for the efficient use of hydric resources. At the international level, this PhD project proposal is in line with the EU Green Deal through its EU Farm to Fork strategy for the sustainability of the agri-food sector and the EU 2030 Biodiversity Strategy to increase organic farming and biodiversity-rich landscape features on agricultural land (EU Biodiversity Strategy factsheet, 2020). These goals also align with SDG 2 (2.4; 2.5) and SDG12 (12.1; 12.2) trajectories for food security, sustainable and diversified agriculture and production.
The exploitation and improvement of a resilient plant species such as buckwheat involves core disciplines of crop sciences and plant breeding but also requires input from other important disciplines such as crop physiology or new indispensable types of expertise like bioinformatics. Modern breeding, per se, is a multidisciplinary activity requiring different skills and knowledge from the areas of genetics, molecular biology, biotechnology, plant phenotyping, computer science and digitalization. Developing drought-tolerant genotypes that are well-suited to the Italian environment and efficient in water use requires an interdisciplinary approach that links various scientific and technical fields relevant to this PhD proposal. The research proposed will have a cross-sectorial collaboration between academy (agriculture, biological and food sciences), farmers and when needed, relevant stakeholders that can help to improve results (e.g. farming associations, breeders, breeding companies, food industry).

Expected objectives and results, proposed research activities, methodologies and contents:
The main goal of this PhD proposal is to identify and breed drought tolerant and high-digestibility genotypes of buckwheat to provide sources of resilience and agrodiversity to North Italian production systems. To accomplish this goal, we have put forth the following research objectives along with the corresponding methods proposed to address them:
1. Identification of novel buckwheat genotypes suitable for cultivation in Northern Italy by a) the screening of commercial cultivars and, depending on their availability, exotic ecotypes from dry Asian areas, for two years and b) Genotype x Environment trials under different soil conditions (marginal soils vs a representative soil type of Northern Italy);
2. High-throughput genotyping of a panel of ~40 buckwheat varieties to evaluate the genetic pool potentially available for selection;
3.Development of a genomic selection training population aimed at defining a prediction model for genomic selection capable of facilitating further selection;
4. Phenotypic characterization of collected varieties and training genotypes at the nutritional (low anti-nutrients, e.g. tannins, for higher digestibility) and physiological level (with emphasis on water use efficiency) for definition of the genomic selection model;
5. Nutritional analysis of seeds (protein, flavonoids, phenolic compounds or antioxidant activity). A detailed nutritional analysis of seeds harvested from drought tolerant genotypes identified will be performed to describe proteins and bioactive compounds and their properties using HPLC. Correlation analyses will follow to explore the potential relationships between specific nutritional qualities and drought tolerance traits.

Period abroad: 6 months

Data of foreign host subject: will be identified after the beginning of the project.

Possible research centre involved in the definition of the training pathway: n. d.

Research activities to be carried out at the Research Centre: Nutritional analysis in terms of bioactive compounds of buckwheat and their properties as well as the analysis of proteins by HPLC.

TABLE 8 – PhD programme AGRICULTURAL SCIENCES AND BIOTECHNOLOGY

Coherence of the doctoral programme with the principles and specific obligations of the PNRR:
- *cross-cutting priorities:* The PhD scholarship strengthens education and provides new opportunities for researchers in the areas of plant breeding and crop sciences being coherent with the principle of PNRR for young people. The program is inclusive to all applicants and encourages equal gender opportunities and balance to access to higher education. Finally, considering that this proposal intends to develop alternatives for adaptation and sustainable development of marginal areas of Italy, the objective is coherent and aligned with the principle of reducing territorial disparities.
- *twin transitions (green and digital):* This proposal supports the double transition – green and digital. Breeding alternatives for plant protein production supports the green transition towards reduced greenhouse gas emissions for food production favouring climate neutrality. The use of novel and accessible breeding techniques that include bioinformatics favours digital transformation for the innovation and acceleration of crop improvement.
- *do no significant harm - DNSH:* the research activities taking place during the PhD will substantially contribute to mitigation and adaptation to climate change
- *open science and FAIR Data:* the project will meet the principles of open science and will manage data in a Findable, Accessible, Interoperable and Re-usable way

Reference Professor/Researcher:
prof. Emanuele De Paoli, prof.ssa Elisa Marraccini

TABLE 9 – PhD Programme MATHEMATICAL AND PHYSICAL SCIENCES

THE PhD PROGRAMME	
Administrative location	University of Udine - Department of Mathematics, Computer Science and Physics (DMIF) – via delle Scienze 206, 33100 Udine, Italy (+39 0432 558400).
Associated location	-
Location for training, teaching and research activity	Teaching and other training activities will take place primarily at the administrative programme location or in other locations of the University of Udine. The research program will be developed as stated in the "Research Topic Description" section.
Coordinator	Prof.ssa Roberta Musina (roberta.musina@uniud.it)
Programme duration	3 years
Curriculum	-
Research topics	- MATHEMATICS: Algebra and Topology; Numerical analysis; Mathematical and functional analysis; Algebraic geometry; Mathematical logic; Dynamical systems; Statistics; Operation research; Mathematics for applied economics and finance. - PHYSICS: Astrophysics; Physics education; Particle physics; Advanced detection systems; Bio- and Nanosystems simulation. More details at https://www.dmif.uniud.it/dottorato/smf/collegio-docenti/
Research programs	Decided by the Teaching Board within the PhD programme Research topics.
Programme website	https://www.uniud.it/en/research/do-research/doctorate-res/our-ph-d-programmes/area-physical-science-and-engineering/mathematical-and-physical-sciences/ph-d-programme/mathematical-and-physical-sciences?set_language=en https://www.dmif.uniud.it/dottorato/smf/

ADMISSION REQUIREMENTS	
Required degree	Italian Laurea (before DM 509/99) or Italian Laurea Specialistica/Magistrale (ex DM 509/1999 and Decree DM 270/04). Foreign degrees and titles: refer to art. 3 and 4 of the Call.
Knowledge of the following foreign language	English

DOCUMENTS AND TITLES TO BE ATTACHED TO THE APPLICATION FOR ADMISSION	
<u>Compulsory</u> documents (Art. 5 of the Call)	1. Certification or self-certification (refer to art. 5 paragraph 5 of the Call) of the academic title needed for admission to the PhD programme (with candidate's grade and highest possible grade) and certified list of the exams (with candidate's grades, average grade, highest possible grade) passed during the Italian first level (bachelor) and the Laurea Specialistica/Magistrale programmes or during the Italian programmes ante D.M. 509/99 or during the foreign academic programmes; 2. Curriculum vitae et studiorum, dated and signed; 3. Copy of a valid identity document (citizens of countries not belonging to the European Union a copy of a valid passport, comprehensive of the pages containing the holder's photo, personal details, passport number, date and place of issue, date of expiry); 4. A research project, dated and signed, developed, developed in accordance with the topic of interest, which highlights the contribution that the candidate can offer to the development of the topic itself (approximate limit 5.000-10.000 characters, spaces included, in English language).
<u>Optional</u> documents (Art. 5 of the Call)	1. Master thesis ("Tesi di Laurea") associated to the degree/title providing access to the PhD programme. Applicants who are not graduated on the expiration date of this Call must submit an extended abstract in place of the complete thesis, in Italian or English language, signed by the thesis Supervisor (between 15.000 and 25.000 characters, spaces included). 2. Motivation letter from the applicant explaining the reasons for admission to the PhD programme, dated and signed (between 1.500 and 2.500 characters, spaces included); 3. Publications (max 3); 4. Letters of reference (max 2) written by university professors, scientific researchers or other experts in the field (art. 6 of the Call).
All documents must be presented exclusively in PDF format, dated and signed by the candidate.	

SELECTION COMMITTEE	
Appointed Members	Marina Cobal – Full Professor – University of Udine Paolo Giannozzi – Associate Professor – University of Udine Paolo Gidoni – Researcher – University of Udine
Alternate Members	Federico Fogolari – Professore Associato – Università di Udine Guglielmo Feltrin – Professore Associato – Università di Udine

TABLE 9 – PhD Programme MATHEMATICAL AND PHYSICAL SCIENCES

	Simone Monzani – Ricercatore – Università di Udine

ADMISSION

GENERAL COMPETITION (art. 9 of the Call for Applications)

Posti disponibili: 1

Detailed description	*N.*	*Funding*	*Annual gross amount*	*Research Topic*
Positions WITH SCHOLARSHIP: 2	1	D.M. 118 of March 2, 2023 (NRRP Mission 4 Component 1 Investment/Subinvestment 3.4) and University of Udine CUP G23C22001200003	€ 16,243.00	Topic 1.1 - Biomass and solar energy, ancient innovative technologies
	1	D.M. 118 of March 2, 2023 (NRRP Mission 4 Component 1 Investment/Subinvestment 4.1) and University of Udine CUP G23C22001200003	€ 16,243.00	Topic 1.2 – Mathematical methods for the modelling of soft robots

Competition procedure and test schedule

Evaluation of qualifications and oral examination.
For the evaluation of applicants' attitude for scientific research and their basic skills before the course program, the Selection Committee can attribute up to 100 points to each applicant: max 30 points to the titles and max 70 points to the oral examination. The applicant is admitted to the oral examination if his/her titles receive at least 15 points. The oral examination is passed with at least 49 points. The applicant is eligible for the PhD programme if he/she passes the oral examination. Only for eligible applicants, the points attained in in the oral examination will be added to the points of the titles.

DATE FOR THE PUBLICATION OF ADMITTED APPLICANTS TO THE ORAL EXAMINATION: within September 15, 2023.
DATE FOR THE PUBLICATION OF THE FINAL RANKING LIST: within September 26, 2023.

Foreign language that can be used for examination	Italian or English	
Evaluation Criteria of qualifications *During the preliminary meeting the Selection Committee may establish sub-criteria for the evaluation*	Curriculum vitae et studiorum and Scientific publications	*10*
	Title and average grade of exams and Thesis/Abstract	*10*
	Research project and Applicant's letters (Motivation letter + Letters of reference)	*10*
Oral examination	Interview about titles, previous career and research project also aimed at understanding the applicant's knowledge about fundamental topics in mathematics and/or physics, as well as his or her full eligibility to receive a scholarship funded by external institutions. Reading and understanding a short scientific text in English.	
Calendar of the oral examination	**Date**	**September 19, 2023**
	Time	**9:00 AM**
	How to conduct the examination	The oral examination will be held online.
	Based on the number of applicants, the oral examination may take more than one day. Applicants must exhibit a valid ID for admission to the oral examination.	

Research Topics Description

Research Topic 1.1 - Biomass and solar energy, ancient innovative technologies

D.M. 118 of March 2, 2023 (NRRP "National Recovery and Resilience Plan" Mission 4 Component 1 Investment/Subinvestment 3.4) – NRRP Research

Coherence of the proposed research with the NRRP areas of interest and, for the scientific-technological areas, highlight how the proposed research can promote interdisciplinarity, membership of international networks and intersectoriality:

The proposed research is coherent with two out of the six investment missions of NRRP, notably the first two:

- *Mission 1: Digitalisation, innovation, competitivity, culture and tourism.*
- *Mission 2: Green revolution and transition to sustainability.*

It is moreover highly interdisciplinary, involving physics as well as computer science, engineering, chemistry. The search for new ways to exploit renewable energy sources is a very hot subject and easily allows to join international networks in such a field. In addition, it has a potential interest for the industry and guarantees as well a high level of inter-sector interactions.

Expected objectives and results, proposed research activities, methodologies and contents:

In the framework of the Strategic Plan of the University, an integrated biomass conversion system is being designed in Udine with the aim of generating clean and efficient energy. The system consists of a small gasifier of poor biomass and a newly developed solar concentrator, and represents a technological innovation in the field of renewable energy sources. To allow the collection and management of the data generated by

TABLE 9 – PhD Programme MATHEMATICAL AND PHYSICAL SCIENCES

the system, we propose - in addition to collaboration in the optimization of the apparatus - the creation of an IoT system, based on sensors and data acquisition devices, to monitor in real time the operating parameters of the system components. The IoT system will also allow data visualization both locally and remotely, through a web server hosted on UniUD hosting. The student engaged in this thesis will acquire specific skills in the design and programming of programmable logic controllers (PLCs) such as LOGO! and Simatic S7 1200 from Siemens, as well as in the use of instrumentation and technologies for renewable energy. In particular, the student will have to develop control algorithms for the operation of the integrated system, using advanced programming techniques and simulation tools. The expertise acquired in PLC programming and interaction with instrumentation for renewable energy will be applied in the automation of industrial and commercial systems such as the automation of photovoltaic panels and control units for energy saving, as well as in scientific research for the management and control of detectors of various types.

Period abroad:
6 months

Data of foreign host subject:
CNRS (Centre National pour la Recherche Scientifique, France)

Possible research center involved in the definition of the training pathway:
Université Grenoble Alpes

Research activities to be carried out at the Research Center:
The period abroad will preferably be organized within the second year of the doctorate. The PhD student will be able to follow doctoral courses related to the thesis topic and to present the results obtained. The degree of involvement in the definition of the training path of the Research Center is to be defined.

Coherence of the doctoral programme with the principles and specific obligations of the NRRP:
- cross-cutting priorities:
- twin transitions (green and digital):
- do no significant harm - DNSH:
- open science and FAIR Data:
The doctoral programme shall be consistent with the principles and obligations of the NRRP as regards cross-cutting priorities. The actions of the Plan are aimed at recovering the potential of the new generations and building an institutional and business environment capable of encouraging their development and their leading role within society. In particular, research in support of the ecological transition can contribute to the creation of youth employment in all sectors affected by the European Green Deal, including renewable energy, and transmission and distribution networks. The research respects the DNSH principle. The data collected will be accessible, interoperable and reusable, and therefore definable as FAIR data.

Reference Professor/Researcher:
prof.ssa Marina Cobal e prof. Paolo Giannozzi

Tematica 1.2 - Mathematical methods for the modelling of soft robots
D.M. 118 of March 2, 2023 (NRRP "National Recovery and Resilience Plan" Mission 4 Component 1 Investment/Subinvestment 4.1) – NRRP Research

Coherence of the proposed research with the PNRR areas of interest and, for the scientific-technological areas, highlight how the proposed research can promote interdisciplinarity, membership of international networks and intersectoriality: The project is consistent with the PNRR areas of interest, in particular with mission 2 'Green Revolution and Ecological Transition' in its first component 'Sustainable Agriculture and Circular Economy'. The paradigm of soft robotics encourages the use of materials such as natural fibres, biopolymers and other smart materials that, compared to traditional robotics, bring advantages in terms of sustainability of the production process, biocompatibility and biodegradability, thus supporting the increase in the eco-sustainability of the device for the entire duration of its life cycle. The versatility and adaptability properties of soft materials have proven particularly effective in agriculture, with applications such as harvesting and handling fruit and vegetables without damaging the product; or for monitoring delicate ecosystems minimising the environmental impact, e.g. through robot-roots that grow by deposition of biopolymers or robots inspired by animal locomotion. The project aims to support the development of these technologies by building a theoretical framework that improves the modelling of such devices, in order to facilitate efficient and effective design and control. The research activity is part of an international network of research collaborations that includes the University of Lisbon (Portugal), the Czech Academy of Sciences and the University of Chemistry and Technology in Prague (Czech Republic), the University of Graz (Austria) and Queen's University in Kingston (Canada). The project crosses several research areas and the ability to interface with researchers from different disciplines is a key aspect of the project. Specifically, in the more applied aspects of the project, elements of modelling of mechanical systems and smart materials will be combined; while in the more theoretical component of the research advanced methods of the theory of differential equations, calculus of variations and qualitative theory of dynamic systems will be used. Concepts of differential geometry and numerical analysis will also be utilised to a lesser extent. Emphasis will be placed on developing the doctoral student's ability to interface and collaborate with researchers from different fields.

Expected objectives and results, proposed research activities, methodologies and contents:
The aim of the project is to develop analytical methods and derive theoretical results that support the modelling and development of soft robots, the analysis of their qualitative properties and their controllability, with a focus on their locomotion.

TABLE 9 – PhD Programme MATHEMATICAL AND PHYSICAL SCIENCES

The use of 'soft', i.e. easily deformable, robotic components provides the device with new abilities in terms of adaptability and dexterity. Such properties find effective applications in contexts where the device has to gently interact with the surrounding environment (e.g. in the case of medical equipment or fruit/vegetable harvesting machinery) or has to move over adverse and uneven terrain, overcoming obstacles of various kinds (e.g. in search and rescue operations in the event of natural disasters).
At the same time, the presence of deformable components entails the loss of a direct control over the state of the device, which will therefore depend on the combination of the prescribed actuation, material properties, interaction with the external environment and the history of the system itself (hysteresis). From a mathematical point of view, this significantly increases the mathematical complexity of the model and introduces the need to study new qualitative properties of the system.
In the framework of the project, we propose to study the following three themes.

A. Development of reduced models for robots made with smart materials.
B. Mathematical characterisation of compliance and stability properties.
C. Characterisation of gaits as an asymptotic property.

A. Development of reduced models for robots made with smart materials. An important factor for soft-robotic technologies is the recent development and proliferation of smart materials, i.e. active materials that respond to external stimuli such as electricity, heat, magnetism and light with an alteration of their resting configuration, resulting in elongation, bending or torsion of the material. Examples of smart materials successfully used in robotics include hydrogels, nematic elastomers and shape memory materials.
In this section of the project, the aim is to introduce analytically studiable models, exemplifying the main qualitative properties of the behaviour of a device made from such materials, possibly deriving them in a mathematically rigorous manner as reduced models for the system from a detailed but difficult-to-study description of the system. To do this, methods from continuum mechanics combined with calculus of variations will be used.

B. Mathematical characterisation of compliance and stability properties. The main advantage of the soft robotics paradigm is the ability of the device to spontaneously adapt to the environment with which it interacts, exploiting the features of the material, leading for example to a reduction in the number of control parameters and/or sensors required to perform a given task. For manipulation models, an example of such properties is the ability of a soft-gripper to grasp objects of different shapes using the same actuation strategy, with the robot's structure spontaneously adjusting, thanks to so-called morphological computation, to the shape of the grasped object, without the need for either precise a priori knowledge of the latter or a feedback mechanism. For locomotion models, such properties are manifested, for example, in the ability to deform in order to overcome an obstacle without resorting to alterations in the prescribed actuation, and then spontaneously recover the original locomotion strategy, or to stabilise on a different gait, but with similar qualitative properties. An example of this phenomenon is, for example, the ability of a soft-crawler to advance, deforming elastically, along a tunnel with a section narrower than its body at rest. In this part of the project, the aim is to study the adaptability properties for certain models of soft-robotic manipulation and/or locomotion, providing a precise characterisation and analysis in mathematical terms. In the study of this sub-theme, techniques from control theory and dynamical systems theory will mainly be used.

C. Characterisation of gaits as an asymptotic property. Any locomotion strategy can usually be idealised mathematically as a relatively periodic evolution of the system. This concept is based on a decomposition of the state of the system into two components: the first describes the shape of the locomotor body, the second its position and orientation in space. A relatively periodic evolution of the system consists of a periodic evolution in shape associated with a specific transformation in space of the position variable (e.g. a translation or rotation), describing the displacement performed by the system in an actuation cycle. In concrete systems, however, once a periodic actuation is set, the locomotor generally does not exhibit a relatively periodic evolution, which instead usually emerges as asymptotic behaviour of the system. This phenomenon is due to the influence of the system's initial conditions and to effects related to inertia and possible elastic components of the device, which makes this situation particularly relevant in the soft-robotic field.
In this part of the project we aim to characterise the concept of gait in certain locomotion models as a relatively periodic behaviour of the system reached asymptotically, analysing its qualitative and convergence properties. At the same time, its stability properties will be studied, which fall under sub-theme B. In the study of this sub-theme, techniques from the theory of dynamical systems, withelements of differential geometry and nonsmooth analysis, will be mainly used.

Period abroad: As part of the project, a 6-month period abroad is planned at the Faculty of Science of the University of Lisbon (Portugal), to carry out research activities at the research group of Prof. Alessandro Margheri, in the framework of an established collaboration on the modelling of mechanical and biological systems and their qualitative study with techniques from the theory of dynamical systems. The research activity in this period will focus mainly, but not exclusively, on sub-theme C.

Data of foreign host subject:
Faculdade de Ciências, Universidade de Lisboa

Campo Grande, 1749-016 Lisboa, Portugal

Possible research center involved in the definition of the training pathway:

Research activities to be carried out at the Research Center:

Coherence of the doctoral programme with the principles and specific obligations of the PNRR:
- cross-cutting priorities: the doctoral fellowship responds to the transversal priority of recovering the potential of the younger generation, as it is placed within 4th mission, in the point concerning the strengthening of university education and the creation of new opportunities for young researchers.

TABLE 9 – PhD Programme MATHEMATICAL AND PHYSICAL SCIENCES

- twin transitions (green and digital): the research project is consistent with the green transition as it is placed, as described above, within the areas of interest of mission 2 'Green and ecological transition' of the PNRR.
- do no significant harm - DNSH: The doctoral grant, falling within component MA.C1, inv.4.1 of the PNRR, is classifiable, within the scenarios contemplated by the DNSH assessment, among the measures with no or negligible expected impact in each of the environmental objectives, evaluating both direct and indirect primary effects within the implementation cycle. The theoretical nature of the project does not result in any foreseeable additional adverse impacts in each of the environmental objectives. Therefore, the measure can be considered in accordance with the DNSH principles.
- open science and FAIR Data: The results obtained within the research project will be made available to the public as quickly as possible through publication in open scientific archives. Furthermore, subject to available resources and appropriate valorisation and dissemination of the results, preference will be given to publication in international open access journals. Any datasets and databases produced as part of the research project will be treated in accordance with the FAIR principles of traceability, accessibility, interoperability and reusability. Any other products of the research activity will be made available according to the principles of Open Science.

Reference Professor/Researcher:
dott. Paolo Gidoni

TABLE 10 – PhD PROGRAMME in CLINICAL AND TRANSLATIONAL MEDICAL SCIENCES

THE PhD PROGRAMME	
Administrative location	University of Udine, Department of Medical Area (DAME) –via Colugna 50, 33100 Udine, ITALY (tel. +39 0432 494301).
Associated location	
Location for training, teaching and research activity	Teaching and other training activities will take place primarily at the administrative programme location or in other locations of the University of Udine. The research program will be developed as stated in the "Research Topic Description" section.
Coordinator	Prof. Giuseppe Damante (giuseppe.damante@uniud.it)
Programme duration	3 years
Curriculum	-
Programme website	https://www.uniud.it/en/research/do-research/doctorate-res/our-ph-d-programmes/area-life-science/scienze-mediche-cliniche-e-traslazionali/ph-d-programme/eng-scienze-mediche-cliniche-e-traslazionali?set_language=en

ADMISSION REQUIREMENTS	
Required degree	Italian Laurea (before DM 509/99) or Italian Laurea Specialistica/Magistrale (ex DM 509/1999 and DM 270/04). Foreign degrees and titles: refer to art. 3 and 4 of the Call.
Knowledge of the following foreign language	English

DOCUMENTS AND TITLES TO BE ATTACHED TO THE APPLICATION FOR ADMISSION	
Compulsory documents (art. 5 of the Call)	1. Certification of the foreign University (for non UE applicants) or self-certification (for UE applicants only) (refer to art. 5 paragraph 5 of the Call) of the academic title needed for admission to the PhD programme with the list of the exams (with grades) and the final grade (for degrees obtained abroad refer to art. 3 and 4 of the Call); 2. Curriculum vitae et studiorum, dated and signed; 3. Copy of a valid identity document (citizens of countries not belonging to the European Union a copy of a valid passport, comprehensive of the pages containing the holder's photo, personal details, passport number, date and place of issue, date of expiry). 4. A research project, dated and signed, developed, developed in accordance with the topic of interest, which highlights the contribution that the candidate can offer to the development of the topic itself (approximate limit 10.000 characters, spaces included).
Optional documents (art. 5 of the Call)	1. Publications on impact factor journals (max 2); 2. Letters of reference (max 2) written by university professors, scientific researchers or other experts in the field (art. 6 of the Call).
All titles must be presented exclusively in PDF format, dated and signed by the candidate.	

SELECTION COMMITTEE	
Appointed Members	Giuseppe Damante – full professor – Università degli Studi di Udine Bruno Grassi – full professor – Università degli Studi di Udine Alvisa Palese – full professor – Università degli Studi di Udine
Substitute Members	Stefano Lazzer –associate professor – Università degli Studi di Udine Piercamillo Parodi – full professor – Università degli Studi di Udine Maria Parpinel – associate professor – Università degli Studi di Udine

ADMISSION

GENERAL COMPETITION (art. 8 of the Call for Applications)

Available positions: 2				
Detailed description	***N.***	***Funding***	***Annual gross amount***	***Research Topic***
Positions WITH SCHOLARSHIP: 2	1	D.M. 117 of March 2, 2023 (NRRP Mission 4 Component 2 Investment/Subinvestment 3.3) and Dr. Schaer AG/SPA CUP G23C22001200003	€ 16,243.00	Topic 1.1 - Ketogenic nutritional intervention in subjects with neuroinflammatory and neurodegenerative diseases. Evaluation of functional outcomes and changes in the gut microbiota.
	1	D.M. 117 of March 2, 2023 (NRRP Mission 4 Component 2 Investment/Subinvestment 3.3)	€ 16,243.00	Topic 1.2 DEPICT - Disorders of neurodevelopment and Evaluation of Psychopathology for Intervention

TABLE 10 – PhD PROGRAMME in CLINICAL AND TRANSLATIONAL MEDICAL SCIENCES

		Azienda Sanitaria del Friuli Occidentale CUP G23C23001210005		and Care in Transition
	1	D.M. 118 of March 2, 2023 (NRRP Mission 4 Component 1 Investment/Subinvestment 4.1) and University of Udine CUP G23C22001200003	€ 16,243.00	Topic 1.3 - Prevention and management of infections related to care practices

Competition procedure and test schedule			
Evaluation of qualifications and oral examination. For the evaluation of applicants' attitude for scientific research and their basic skills to tackle the course program, the Selection Committee can attribute up to 100 points to each applicant: max 30 points to the titles and max 70 points to the oral examination. Applicant is admitted to the oral examination if his/her titles receive at least 15 points. The oral examination is passed with at least 49 points. The applicant is eligible to the PhD programme if he/she passes the oral examination. Only for eligible applicants, the points attained in the oral examination will be added to the points of the titles. **DATE FOR THE PUBLICATION OF ADMITTED APPLICANTS TO THE ORAL EXAMINATION: within September 8, 2023.** **DATE FOR THE PUBLICATION OF THE FINAL RANKING LIST: within September 26, 2023.**			
Foreign language that can be used for examination	Italian or English		
Evaluation Criteria of qualifications *During the preliminary meeting the Selection Committee may establish sub-criteria for the evaluation*	Curriculum vitae and studiorum		*10*
	Scientific publications		*4*
	Letters of reference		*2*
	Research project		*14*
Oral examination	Part of the oral examination will be in English.		
Calendar of the oral examination	**Date**	**September 18, 2023**	
	Time	**02:00 PM**	
	Place	Department of Medical Area (DAME), Room B – Piazzale Kolbe 4, 33100 Udine ITALY	
	Based on the number of applicants, the oral examination may take more than one day. Applicants must exhibit a valid ID for admission to the oral examination.		

Research topics description

Research Topic 1.1 - Ketogenic nutritional intervention in subjects with neuroinflammatory and neurodegenerative diseases. Evaluation of functional outcomes and changes in the gut microbiota.

Ministerial Decree 117 of March 2, 2023 (NRRP Mission 4 Component 2 Investment/Subinvestment 3.3)

Consistency of the proposed research with NRRP areas of interest:

Mission 4 C2 "from research to enterprise" and Mission 6 C2 Innovation, research and digitalization of the national health system

Objectives and expected results, proposed research activity, methodologies and contents:

The ketogenic diet (KD) aims at producing a state of ketosis in the body through the intake of a daily proportion of fats higher than sugars. The aim is to promote the production of ketone bodies, which are an alternative and more efficient energy source for brain tissue. Although known since the early decades of the last century as a therapy in drug-resistant epileptic disease, KD had been relegated to the "niche" of epilepsy therapy for decades, and in recent years, through a deeper understanding of its underlying biochemical mechanisms, it has emerged as an "alternative" or supportive therapeutic strategy in many neurological diseases, including primary headaches, multiple sclerosis, gliomas, and neuroinflammatory diseases.

Project Objectives. This project aims at investigating the possibilities to improve clinical outcomes in individuals with neuroinflammatory diseases through the development of a personalized and patient-friendly KD.

Activities.

-analysis of ketogenic product requirements in a group of subjects with neuroinflammatory and neurodegenerative diseases;
-development of customized KD protocols;
-clinical study on subjects with neuroinflammatory and neurodegenerative diseases to evaluate the clinical effects of personalized KD

Expected Results. It is expected that the project can achieve as a final result the development of a dietary intervention protocol that can be easily exported to other care facilities;

Period abroad (mandatory): 6 months

Foreign host entity data: Universitatzklinikum Munster - Germany

Period in enterprise (mandatory): 6 months

TABLE 10 – PhD PROGRAMME in CLINICAL AND TRANSLATIONAL MEDICAL SCIENCES

Enterprise data: Dr. Schaer Inc.

Research activities to be carried out in the enterprise:

An in-house period of about 6 months, even non-continuous, is planned, depending on experimental needs.

The Ph.D. student will be able to use all the laboratories of the Dr. Schaer R&D Centre in Trieste, namely: an analytical laboratory with all the instruments for the chemical-physical and rheological characterization of raw materials, semi-finished and finished products; a technological laboratory for the realization of food products and mixtures of ingredients in powder or liquid form for the development of products for special medical purposes; a laboratory for the processing of raw materials equipped with mills, decorticators and separators to evaluate all types of grains; an aromatic laboratory for the extraction and concentration of aromatic substances from food matrices; and a biotechnology laboratory for the study of probiotics.

By way of example, some of the instruments available are: HPLC, viscometers, TA (texture analyser), SAFE Distillation, incubators, western blot, PCR, kneaders, levitation cells, ovens, MAP packaging machines and blast chillers.

In carrying out his or her activities in the company, the Ph.D. student will collaborate with:

-Researchers belonging to the Basic Research and Product Development Medical Nutrition teams in the development of innovative ketogenic diet products and the development of personalized feeding protocols for individuals with neuroinflammatory and neurodegenerative diseases;

--The Dr. Schaer nutrition team for studying the nutritional needs of individuals with neuroinflammatory and neurodegenerative diseases.

Consistency of the doctoral program with the specific principles and obligations of the NRRP:

- cross-cutting priorities: youth and gender equality: the project will enable young researchers to develop skills necessary for entry into the work life with prominent roles in both public and private research facilities as well as in care facilities.

There will be no gender discrimination in the selection of candidates, and respect for gender equality even during the doctoral course will be ensured among other things by the University of Udine's "Comitato Unico di Garanzia per le pari opportunità e la valorizzazione del benessere di chi lavora contro le discriminazioni" (Single Guarantee Committee for Equal Opportunities and the Enhancement of the Wellbeing of Those Who Work Against Discrimination), which works to protect and promote equal opportunities.

- twin transitions (ecological and digital): In carrying out the project, communication through digital devices, the use of telemedicine for monitoring the clinical status of patients as well as the adherence itself to the dietary program will be emphasized whenever possible. Finally, biodegradable materials will be used for the packaging of products and foods

- do not cause significant harm - DNSH: The activities envisaged by the doctoral pathway, by their nature, do not cause any harm to the environment. As a matter of fact, the Schaer company has been adopting a path toward sustainability for years, guided by the UN Sustainable Development Goals by aiming to promote biodiversity and sustainable agriculture, decrease the impact of our packaging, reduce our CO_2 consumption, and foster inclusion.

- open science and FAIR Data: the results of the activities will be published in open access, and the data collected (excluding sensitive data) will be shared with scientific colleagues as well as disseminated to the public through public engagement initiatives.

Professor/researcher of reference:

Professor Mariarosaria Valente

Research Topic 1.2: DEPICT - Disorders of neurodevelopment and Evaluation of Psychopathology for Intervention and Care in Transition

D.M. (Ministerial Decree) 117 of March 2, 2023 (NRRP Mission 4 Component 2 Investment/Subinvestment 3.3)

Consistency of the proposed research with NRRP areas of interest:

M6C2.2 TRAINING, SCIENTIFIC RESEARCH AND TECHNOLOGICAL TRANSFER - Investment 2.1: Enhancement and strengthening of biomedical research in the NHS - Investment 2.2: Development of technical, professional, digital and managerial skills of the Health System personnel

Objectives and expected outcomes, proposed research activity, methodologies and contents:

People with intellectual developmental disability and/or autism spectrum disorder have greater psychopathological vulnerability, with prevalence rates of psychiatric disorders up to 5 times higher than the general population and clinical needs that are substantially different from those of the general population and therefore cannot be adequately managed by specialists who have not received specific training.

Many people with intellectual developmental disorders and/or autism spectrum disorder who exhibit problematic behaviors undergo drug treatment without having received adequate psychiatric evaluation and diagnosis. Instead, the prescription of psychotropic medication should have specific goals and include interdisciplinary assessment, individualization, and patient and family participation.

TABLE 10 – PhD PROGRAMME in CLINICAL AND TRANSLATIONAL MEDICAL SCIENCES

The project aims to evaluate a sample of users with intellectual disability and/or autism spectrum disorder referred to the "Servizio per le Transizioni" (Transitions Service) of the Azienda Sanitaria "Friuli Occidentale" (Health company "Friuli Occidentale") in order to: a) define the prevalence of psychopathological co-occurrences; b) concordance with existing diagnoses; and c) appropriateness with respect to current pharmacological interventions.

The main expected outcome is the improvement of evaluation and interventionist practices on psychopathological co-occurrences of people with intellectual disability and/or autism spectrum disorder.

Period abroad (mandatory): 6 months

Foreign host entity data: Institute of Psychiatry, Psychology & Neuroscience King's College London, London, UK

Period in enterprise (mandatory): 18 months

Company data: Azienda Sanitaria Friuli Occidentale (ASFO; Health Company "Friuli Occidentale")

Research activities to be conducted in the enterprise:

At ASFO, the observational, analytical, cross-sectional, consecutive-sample study aimed at detecting the prevalence of various psychiatric disorders in people with intellectual disability and/or autism spectrum disorder at the transition age will be carried out. A diagnostic instrument system created specifically for this population, called SPAIDD, which has already completed the validation process, will be used for this purpose.

Consistency of the doctoral program with the specific principles and obligations of the NRRP:

- Cross-cutting priorities: youth and gender equality: the project will enable young researchers to develop skills necessary for employment in senior roles in both public and private research facilities as well as in care facilities.

There will be no gender discrimination in the selection of candidates, and respect for gender equality even during the doctoral course will be ensured by, among others, the "Comitato Unico di Garanzia per le pari opportunità, la valorizzazione del benessere di chi lavora e contro le discriminazioni" (the University of Udine's Single Guarantee Committee for Equal Opportunities, the Enhancement of Workers' Welfare and Against Discrimination), which works to protect and promote equal opportunities.

- twin transitions (ecological and digital): Computerization methodologies and tools to support the evaluation process will be evaluated with a focus on the use of SPAIDD.

- do not cause significant harm - DNSH: The activities under the doctoral track will not cause any harm to the environment.

- open science and FAIR Data: the results of the activities will be published in open access and the collected data (excluding sensitive data) will be shared with colleagues in the scientific world as well as disseminated to the public through public engagement initiatives.

Professor/researcher of reference:

Dr. Marco Colizzi

Research topic 1.3: Prevention and management of infections related to care practices.

D.M. (Ministerial Decree) 118 of March 2, 2023 (NRRP Mission 4 Component 1 Investment/Subinvestment 4.1) - NRRP Research

Consistency of proposed research with NRRP areas of interest:

M6C2.2 TRAINING, SCIENTIFIC RESEARCH, AND TECHNOLOGICAL TRANSFER - Investment 2.1: Enhancement and strengthening of NHS biomedical research - Investment 2.2: Development of technical, professional, digital, and managerial skills of the Health System personnel

Objectives and expected results, proposed research activities, methodologies and contents:

Overall objective is to expand knowledge with respect to the effectiveness of antibiotic delivery subcutaneously compared with the intravenously by device ones.

The following macro-activities are proposed:

1. systematic review of the literature inherent to the pathophysiological and clinical processes that make the absorption of antibiotics through the subcutis plausible/justifiable;

2. definition of a research protocol for conducting a multicenter randomized clinical trial;

TABLE 10 – PhD PROGRAMME in CLINICAL AND TRANSLATIONAL MEDICAL SCIENCES

3. identification of clinical, organizational and patient-related outcomes (PROMs) in order to build an overall framework of reference for evaluating the efficacy of the proposed new method.

4. development of a longitudinal study to explore the frequency with which antibiotics are administered through devices in multicenter settings

Therefore, the development of knowledge and methods on the administration of some antibiotics by subcutaneous rather than intravenous routes are outcomes expected, thereby expanding the methodologies and practices that form the traditional baseline for the administration of some drugs.

Period abroad (mandatory): 6 months

Foreign host entity data: Southampton General Hospital, UK

Period in enterprise (mandatory): 6 months

Enterprise data: "Azienda sanitaria Universitaria Friuli Centrale" (University Health Company "Friuli Centrale")

Research activities to be conducted in the enterprise:

Development of longitudinal study to explore the feasibility, clinical efficacy and frequency with which antibiotics are administered in multicenter, hospital and out-of-hospital settings. Specifically, the efficacy of subcutaneous administration of antibiotics will be assessed by testing serum concentrations and clinical efficacy. In addition, the frequency of infections related to nursing practices as well as the avoidance of the use of such devices in the case of a proposed alternative administration will be evaluated.

Consistency of the doctoral program with the specific principles and obligations of the NRRP:

- Cross-cutting priorities: youth and gender equality: the project will enable young researchers to develop skills necessary for employment in senior roles in both public and private research facilities as well as in care facilities.

There will be no gender discrimination in the selection of candidates, and respect for gender equality even during the doctoral course will be ensured by, among other things, by the "Comitato Unico di Garanzia per le pari opportunità, la valorizzazione del benessere di chi lavora e contro le discriminazioni" (University of Udine's Single Guarantee Committee for Equal Opportunities, the Enhancement of Workers' Welfare and Against Discrimination), which works to protect and promote equal opportunities.

- twin transitions (ecological and digital): the application of the project results will lead to a reduction in medical waste disposal needs and is intended to reduce the duration of hospitalization and the associated load of normal and special hospital waste and thus have a positive impact on the environment.

- Do not cause significant harm - DNSH: The project reduces harm potentially related to nursing practices. The subcutaneous route reduces the risk of nosocomial bacteremia. In addition to being less traumatic for the patient, the subcutaneous route is also more easily managed in the home care setting, with concomitant positive environmental impact due to the reduced need for patients to travel from home to hospital facilities.

- Open science and FAIR Data: the results of the activities will be published in open access and the collected data (excluding sensitive data) will be shared with scientific colleagues as well as disseminated to the public through public engagement initiatives.

Professor/researcher of reference:

Professor Carlo Tascini

TABLE 11 – PhD Programme in ART HISTORY, FILM STUDIES, MEDIA STUDIES AND MUSIC

THE PhD PROGRAMME	
Administrative location	University of Udine, Department of Humanities and Cultural Heritage (DIUM) - vicolo Florio 2, 33100 Udine (+39 0432 556100)
Associated location	-
Location for training, teaching and research activity	Teaching and other training activities will take place primarily at the administrative programme location or in other locations of the University of Udine. The research program will be developed as stated in the "Research Topic Description" section.
Coordinator	Prof. Alessandro Del Puppo (alessandro.delpuppo@uniud.it)
Programme duration	3 years
Curricula	1. Art History 2. Film Studies, Media Studies, Music
Programme website	https://www.uniud.it/en/research/do-research/doctorate-res/our-ph-d-programmes/area-social-science-and-humanities/art-history-film-studies-media-studies-and-music/ph-d-programme/art-history-film-studies-media-studies-and-music?set_language=en https://dium.uniud.it/en/didattica/corsi-di-studio/dottorati-di-ricerca/storia-dellarte-cinema-media-audiovisivi-e-musica/

ADMISSION REQUIREMENTS	
Required degree	Italian Laurea (before DM 509/99) or Italian Laurea Specialistica/Magistrale (ex DM 509/1999 and DM 270/04). Foreign degrees and titles: refer to art. 3 and 4 of the Call.
Knowledge of the following foreign language	One of the following: English, French, German, Spanish

DOCUMENTS AND QUALIFICATIONS TO BE ATTACHED TO THE APPLICATION FOR ADMISSION	
<u>Compulsory</u> documents (art. 5 of the Call)	1. Certification or self-certification (refer to art. 5 paragraph 5 of the Call) of the academic title needed for admission to the PhD programme and list of the exams (with grades) passed during the Italian first level (bachelor) and the Laurea Specialistica/Magistrale programmes, or during the Italian programmes before D.M. 509/99, or during the foreign academic programmes; 2. Master thesis ("Tesi di Laurea") associated to the degree/title providing access to the PhD programme. Applicants who are not graduated on the expiration date of this Call must submit an extended abstract in place of the complete thesis, in Italian or English language, signed by themselves and by their thesis Supervisor (approximate limit 25.000 characters, spaces included); 3. Curriculum vitae et studiorum, dated and signed; 4. Copy of a valid identity document (citizens of countries not belonging to the European Union a copy of a valid passport, comprehensive of the pages containing the holder's photo, personal details, passport number, date and place of issue, date of expiry); 5. A research project, dated and signed, developed, developed in accordance with the topic of interest, which highlights the contribution that the candidate can offer to the development of the topic itself (approximate limit 20.000 character, spaces included, in English/Italian language). The project's structure should touch upon the following questions: - Objectives; - State of the art; - Methodology; - Achievable results; - Timeline; - Bibliography.
<u>Optional</u> documents (art. 5 of the Call)	1. Motivation letter by which the applicant explains the reasons for admission to the PhD programme, dated and signed (approximate limit 2.500 characters, spaces included); 2. Publications (max 5).
All qualifications must be presented exclusively in PDF format, dated and signed by the candidate.	

SELECTION COMMITTEE	
Appointed members	Elena Fumagalli – full professor - University of Modena e Reggio Emilia Donata Levi – full professor – University of Udine Mariapia Comand, – full professor – University of Udine Dimitri Brunetti - associated professor – University of Udine
Substitute members	Linda Borean – professoressa ordinaria – Università di Udine Alessandro Del Puppo – professore ordinario– Università di Udine

TABLE 11 – PhD Programme in ART HISTORY, FILM STUDIES, MEDIA STUDIES AND MUSIC

ADMISSION

GENERAL COMPETITION (art. 8 of the Call for Applications)

Available Positions: 3

Detailed description	*N.*	*Funding*	*Annual gross amount*	*Research Topic*
Positions WITH SCHOLARSHIP: 3	1	D.M. 118 of March 2, 2023 (NRRP Mission 4 Component 1 Investment/Subinvestment 4.1) and University of Udine CUP G23C22001200003	€ 16,243.00	Tematica 1.1 - Materiality of the graphic sign: techniques, media, processes
	1	D.M. 118 del 2 marzo 2023 (PNRR Missione 4 Componente 1 Investimento/Subinvestimento 4.1) e Università degli Studi di Udine CUP G23C22001200003	€ 16,243.00	Tematica 1.2 - "La storica impresa". Preservation and reactivation of the audiovisual heritage for a story of industrial work in FVG
	1	D.M. 118 del 2 marzo 2023 (PNRR Missione 4 Componente 1 Investimento/Subinvestimento 4.1) e Università degli Studi di Udine CUP G23C22001200003	€ 16,243.00	Tematica 1.3 - Theoretical and application model for the establishment of the Historical Archives of the University of Udine, supported by an analysis of the context of documentary production and the archival policies of the institution, as well as the detection of the consistency and nature of the documentation

Competition procedure and test schedule

Evaluation of qualifications and oral examination.
For the evaluation of applicants' attitude for scientific research and their basic skills before the course program, the Selection Committee can attribute up to 100 points to each applicant: max 30 points to the titles and max 70 points to the oral examination. The applicant is admitted to the oral examination if his/her titles receive at least 21 points. The oral examination is passed with at least 49 points. The applicant is eligible to the PhD programme if he/she passes the oral examination. Only for eligible applicants, the points attained in in the oral examination will be added to the points of the titles.
DATE FOR THE PUBLICATION OF ADMITTED APPLICANTS TO THE ORAL EXAMINATION: within September 7, 2023.
DATE FOR THE PUBLICATION OF THE FINAL RANKING LIST: within September 26, 2023.

Foreign language that can be used for examination	Italian, English and/or French		
Evaluation Criteria of qualifications *During the preliminary meeting the Selection Committee may establish sub-criteria for the evaluation*	Curriculum vitae et studiorum		*3*
	Research project		*16*
	Scientific publications		*3*
	Thesis/Abstract		*7*
	Motivational letter for admission to the PhD programme		*1*
Oral examination	The oral examination aims at verifying the research skills of the applicants, with particular reference to the research project.		
Calendar of the oral examintion	**Date**	**September 14, 2023**	
	Time	**10:00 AM**	
	Location	Department of Humanities and Cultural Heritage (DIUM) - Sala del lampadario, Palazzo Caiselli, vicolo Florio 2, 33100 Udine.	
	Based on the number of applicants, the oral examination may take place in more than one day. Applicants must exhibit a valid ID for admission to the oral examination.		

Description of research topics

Research topic 1.1 - Materiality of the graphic sign: techniques, supports, processes
Ministerial Decree 118 of 2 March 2023 (PNRR Mission 4 Component 1 Investment/Subinvestment 4.1) – Cultural heritage

Consistency of the proposed research with topics referred to in art. 10 c. 1 of Ministerial Decree 118/2023:
The proposed research activity is coherent with mission 1 (Digitisation, innovation, competitiveness, culture and tourism) and with mission 4 (Education and research).

Objectives and expected results, proposed research activity, methodologies and contents:
The project must concern the study of drawing as a privileged field for a reflection on the concept of materiality and on the ways in which this concept has been gradually understood, perceived and transmitted over time.
The proposed research activity will start from the analysis of a significant sampling of works in relation to supports, materials and techniques within a broad chronological span (from the 15th to the 18th century) and from a contextual consideration of the numerous and varied sources,

TABLE 11 – PhD Programme in ART HISTORY, FILM STUDIES, MEDIA STUDIES AND MUSIC

not only contemporary (inventories, correspondence, technical treatises, voices of art criticism, etc.), in order to highlight the historical dimension of materiality.
The investigation will have to focus not on a specific tool or a specific technique, but on an artistic production method that presents a very wide range of results (from the sketch to the sketch, from the preparatory drawing to the finished drawing) and, at the textual level, of lexical variety.
The results of the research must provide methods of dissemination through the use of information technology.

Period abroad(obligatory):6 months

Host foreign entity data:
University of Liege
registered office:
Rectorat, Place du 20-Août, 7 B- 4000 Liège, Belgium
operational headquarters:
Faculté de Philosophie et Lettres Bâtiment 1, Place du 20-Août, 7, B- 4000 Liège, Belgium
Musée Wittert, Place du 20-Août, 7 B- 4000 Liège, Belgium

Period in company, research centers or PA, including museums, institutes of the Ministry of Culture, archives, libraries(obligatory): 6 months

Company data, research centers or PAs, including museums, institutes of the Ministry of Culture, archives, host libraries:
Uffizi Galleries
Registered office:
Piazzale degli Uffizi, 6 - 50122 Florence (FI)
Operational headquarters:
Cabinet of Drawings and Prints
Piazzale degli Uffizi, 6 - 50122 Florence (FI)

Research activities to be carried out in a company/research centre/PA/archives/etc.:
The activity will concern the widest possible analysis of drawings (15th-18th century) focusing in particular on techniques and supports, benefiting from the data provided by the (non-invasive) diagnostic instrumentation made available and on any analyzes already present at the Cabinet archive.

Consistency of the doctoral program with the specific principles and obligations of the PNRR:
The proposed research activity is aimed primarily at young people who are familiar with the world of Digital Humanities and aims at an Open Science product, reusable in other fields and exploitable through an adequate circulation of the results achieved, in any case according to the "FAIR Data" principles .

Professor/researcher of reference:
Prof. Linda Borean, Prof. Elena Fumagalli, Prof. Donata Levi

Research theme 1.2 - "La storica impresa". Preservation and reactivation of the audiovisual historical heritage for a story of industrial work in FVG
Ministerial Decree 118 of 2 March 2023 (PNRR Mission 4 Component 1 Investment/Subinvestment 4.1) – Cultural heritage

Consistency of the proposed research with topics referred to in art. 10 c. 1 of Ministerial Decree 118/2023:
The proposed research activity is coherent with mission 1 (Digitisation, innovation, competitiveness, culture and tourism) and with mission 4 (Education and research).

Objectives and expected results, proposed research activity, methodologies and contents:
The research program aims to develop a practice for the restitution and enhancement of the territorial historical and cinematographic heritage, with particular attention to the amateur and industrial forms of cinema and audiovisual. Starting from the identification of company archives or private funds, the intention is to develop a methodological-operational model that combines active preservation and transfer of film and audiovisual materials with a storytelling practice capable of enhancing their historical importance and to disseminate them digitally.
The PhD student's research activities will be organized as follows:
First Year: focuses on the identification of work-themed archives and funds, with particular attention to photographic, film and audiovisual ones and to any non-film materials (cameras, cinematographic equipment, etc.); also on the bibliographic survey useful for focusing on the most suitable theoretical and methodological tools;
Second year: further materials and documents are collected to historically contextualize the audiovisual sources; In this phase, the possible collection of oral memories by means of video-interviews by heirs, workers, witnesses and scholars is also envisaged; good practices are searched for the audiovisual valorisation of the amateur archive(s) and/or fonds.
Third year: starting from the recomposition of the audiovisual materials acquired and the documentary ones consulted, the research will produce an audiovisual narrative product designed for use in a digital context and aimed at disseminating corporate assets (in the forms of visual storytelling) and historical knowledge acquired.

TABLE 11 – PhD Programme in ART HISTORY, FILM STUDIES, MEDIA STUDIES AND MUSIC

Period abroad(obligatory):6 months

Host foreign entity data:
Sorbonne Nouvelle University - Paris 3.École doctorale ED 267 - Arts & Media
MAISON DE LA RECHERCHE Bureau A007 4, rue des irlandais - 75005 PARIS

The period abroad will be dedicated to the following topics:
a. Heritage Science and Digital Humanities: study of best practices and protocols for the documentation and preservation of audiovisual materials and IT tools for the enhancement of archival heritage.
b. Storytelling and Public History: study of tools for enhancing historical knowledge through narrative strategies.

Period in company, research centers or PA, including museums, institutes of the Ministry of Culture, archives, libraries(obligatory): 8 months

Company data, research centers or PAs, including museums, institutes and training institutions of the Ministry of Culture, archives, host libraries:
c. "Archimede and Domenico Taverna" cultural association at Confindustria, Largo Carlo Melzi, 2, 33100 Udine UD in relation to the spaces of the Cantirs Museum – Showcase of Ingenuity.
d. "Luigi Danieli" Foundation, via GB Beltrame 22, 33042 Buttrio (UD).

Research activities to be carried out in a company/research centre/PA/archives/etc.:
The collaboration with the Cantîrs Museum (born to document the historical memory of the building tradition of Friuli) and with the didactic and training exhibition center called "The showcase of ingenuity" of Confindustria Udine and referring to the "Archimede and Domenico Taverna" Cultural Association ", is functional to the identification of the documentary funds relating to the history of the regional enterprise through direct reporting or activation of a "call" via social media aimed above all at favoring the emergence of personal funds. The part of the research that will have to be carried out in the individual archives identified by the members of Confindustria for the collection and inventorying of photographic, film and audiovisual materials to be digitized and for consulting other sources should also be understood as continuing the period spent in the company.
or
The collaboration with the Luigi Danieli Foundation, located in the same spaces that once belonged to the company of the same name Officine Meccaniche SpA of Buttrio, is functional to the identification of the film and audiovisual materials on which the preservation and digitization interventions will be carried out during the first year. The Foundation and the scholars who are part of it will collaborate in the training of the doctoral student by corroborating his research with broader knowledge related to economic history and business history.

Consistency of the doctoral program with the specific principles and obligations of the PNRR:
- cross-cutting priorities: the proposed program is in line with the initiatives envisaged for the cross-cutting priority 4.1 ("Youth"), especially in the areas related to promoting youth employment and enhancing vocational training, and reducing gaps between education and I work.
- twin transitions (green and digital): attention to digital as a tool for the recovery of the company's historical heritage responds to the needs outlined by the transition program of the PNRR.
- not cause significant damage - DNSH: The research activities meet the criteria of minimal/non-significant impact according to the DNSH principles applied to Mission 1 – "Digitalisation, innovation, competitiveness, culture and tourism" (investments in updating and training) and to Mission 4 - Component 1 "Education and Research" (investments in technological transition, training in digital tools)
- *open science and FAIR Data:*the collection and systematization of information on the document corpora considered through the implementation of a database and the creation of a dedicated and usable online map in itself involves a contribution to the principles of findability, accessibility, interoperability and reusability that govern the FAIR Data policies .

Professor/researcher of reference:
Prof. Mariapia Command
prof. Simone Venturini

Research topic 1.3 – University historical archive. Theoretical and applicative model for the establishment and detection of the consistency of the historical documentation of the University of Udine.
Ministerial Decree 118 of 2 March 2023 (PNRR Mission 4 Component 1 Investment/Subinvestment 4.1) – Public Administration

Indication of multidisciplinarity, orientation towards applied PA research and the development of knowledge and skills pursuant to art. 9 c. 1 of Ministerial Decree 118/2023:
The research aims to define the theoretical and applicative model for the establishment of the historical archive of the University of Udine, supported by an analysis of the context of documentary production and of the archival policies of the institution, as well as by the detection of the consistency and nature of the documentation. The research falls within CUN AREA 11 – Historical, philosophical, pedagogical and psychological sciences. Thematic – Archiving. Transversal to the themes: Heritage and cultural heritage.
The archive of a public entity is formed with the sedimentation of the documentation produced and acquired in the course of daily activity for the performance of the functions assigned by the regulations and the achievement of the general and particular objectives of the entity. These documents have been recognized as cultural assets since their formation, as indicated by the Code of cultural and environmental heritage (Legislative Decree 42/2004). In fact, a cultural asset presents an interest as a testimony having the value of civilization (art. 2) and is indispensable

TABLE 11 – PhD Programme in ART HISTORY, FILM STUDIES, MEDIA STUDIES AND MUSIC

for transmitting the history of people, institutions and territories. Therefore, governing the process of creating an archive and the correct conservation of documents allows materials to be made available for historical research,
Managing an archive requires a multidisciplinary approach that involves specific knowledge of archival science, but it also requires cultural and historical sensitivity which is essential for interrogating documents and drawing stories and lessons from them, as well as juridical-administrative skills.
With respect to the knowledge and skills indicated in art. 9 c. 1 of Ministerial Decree 118/2023, the project presented will take place in close collaboration with the institution that owns the archive, within a constructive dialogue regarding the organization and strategic direction of the memory of the University, proposing innovative actions – also drawn from the comparison with similar projects carried out by other universities set up in national and international networks - and the application of strategies strongly oriented towards users and the valorisation of resources. The analysis of the documentation will then lead to the development of autonomous research paths useful for defining and enhancing the history of the institution, its governance, the tools available to top positions, transversal organizational skills and also for rethinking the application models of document management in the context of the IT document and digitization of the current administrative action, finally pursuing the objectives of simplification and transparency above all through the adoption of appropriate innovative technologies and enabling solutions.

Objectives and expected results, proposed research activity, methodologies and contents:
The definition of the objectives and expected results of the research - focused on the enhancement of the historical archive of the University of Udine, which preserves the documentation produced and received since its establishment in 1978 - must necessarily take into account a preliminary analysis of the context of reference, which is made up of the institutional events of the University, of the elements of understanding of its archival collections, as well as of a vision, albeit synthetic, of the national research on university archives.
1. The archive of the University of Udine
Since the Friulian university is a relatively young institution, document management has so far focused on the current archive and on the deposit archive and the "separate archive section" has not yet been established, containing documentation with prevalent cultural value , although provided for by art. 30 of the Cultural Heritage Code approved with Legislative Decree 42/2004.
Significant elements of the University of Udine's constant attention to its documentary heritage are: in 1997 it joined the Titulus 97 project, promoted by the University of Padua, which had as its objective the creation of a national university archival system through the adoption part of the participating universities of the same classification holder; in 1998 it approved the Regulations for the management, keeping and protection of administrative documents from the protocol to the historical archive for the central administration and started the reorganization of the university's document management; in 1998 he started the use of the computerized system, created by the computer offices of the university, for registration of documents; in 1999 it updated the ownership and information system and extended it to all the teaching and research structures then existing (Departments, Faculties, Centres, Libraries); in 2011 it adopted the Titulus national document management system with functions also dedicated to the conservation of IT documents; in 2016 it approved the new Manual for managing the protocol, document flows and archives, required by the regulations on the subject of digital transition, reserving special attention also to the transfer of administrative documents to the historical portion of the archive; in 2021 it integrated the theses catalog with digital theses that can be consulted directly from the online catalog published on the university website; the Document Management Office is currently engaged in the project to launch the Single Protocol.
The University archives, initially arranged in various locations, were reunified in 1999, partially rearranged and placed in a dedicated warehouse in via Sondrio. In the same year, the hard copy degree theses, previously distributed in the university libraries, were also deposited in the archive, launching the first cataloging of the University's theses and the related consultation service. In 2019 the archive was placed in Pradamano, in via Cussignacco, and since then we have been dealing with the arrangement of the entire archival heritage, which can be estimated in five kilometers of paper (about 3,500 linear meters positioned on shelves and about 1,500 linear meters of other documentation in boxes), even if a lot of documentation is still deposited in the university offices.
2. The context of national research on university archives
The theoretical reflection on the conservation and management policies of Italian university archives was launched by the Center for the history of the University of Padua on the occasion of the conference "The history of Italian universities. Archives, sources, research addresses" of 1994. The research path was consolidated during the first organizational conference of 1998, which was followed by others until 2019, and supported by numerous specific projects. Subsequently, the Inter-university Center for the history of Italian universities and the Studium 2000 project, for the protection and enhancement of the historical archives of universities, arose, which in 2002 concluded the first census of Italian university archives with the participation of 58 universities. At the same time the CRUI created the Museums Commission, Archives and Centers for university collections, which although it is no longer active has triggered numerous local initiatives. To date, a unitary archival service prototype has not yet been identified and the universities autonomously define their own management models. Approximately 75% of them maintain separate current and historical archives, with relative affiliations and administrative managers, and the deposit archive is linked to one or the other. An integrated archiving system, calibrated over the entire life cycle of the document, albeit more functional and responsive to the needs of transparency, effectiveness and administrative efficiency, is chosen by only 25% of Italian universities. To date, a unitary archival service prototype has not yet been identified and the universities autonomously define their own management models. Approximately 75% of them maintain separate current and historical archives, with relative affiliations and administrative managers, and the deposit archive is linked to one or the other. An integrated archiving system, calibrated over the entire life cycle of the document, albeit more functional and responsive to the needs of transparency, effectiveness and administrative efficiency, is chosen by only 25% of Italian universities. To date, a unitary archival service prototype has not yet been identified and the universities autonomously define their own management models. Approximately 75% of them maintain separate current and historical archives, with relative affiliations and administrative managers, and the deposit archive is linked to one or the other. An integrated archiving system, calibrated over the entire life cycle of the document, albeit more functional and responsive to the needs of transparency, effectiveness and administrative efficiency, is chosen by only 25% of Italian universities.
3. Objectives and expected results, proposed research activity, methodologies and contents
The research intends to facilitate the establishment of the University Historical Archive through the formation of a reasoned list of documentation, from its foundation to the year 2000, and with the inventory of a small archival fund supported by a digital collection as a model for subsequent interventions . Furthermore, the research aims to reflect on the role of the Archive within the national debate and in the context of other university archives.
The methodological framework employed is interdisciplinary and draws tools from the following fields:

TABLE 11 – PhD Programme in ART HISTORY, FILM STUDIES, MEDIA STUDIES AND MUSIC

- Historiography: it will be essential to define an institutional historical profile of the University of Udine and relate it to national, regional and neighborhood events.
- Archiving: for the identification of the nature, structure and documentary series of the historical archive, to define descriptive models, to provide research paths and narratives, to set up services for users and to develop traditional and online enhancement tools.
- digitalhumanities: in the application of IT tools and archival information systems for the description and sharing of knowledge.

The research activity includes:

- A first year dedicated to the mapping of archival cores with the production of a summary list of the entire heritage.
- A second year dedicated to the elaboration of a proposal for the reorganization of the archival heritage and to the identification of digital filing and sharing tools, as well as to carrying out the six-month stay atthe foreign collaborating body dedicated to identifying the methods of inserting the specificity of Udine in the international arena.
- A third year dedicated to the creation of an exhaustive model of representation (descriptions and digitizations) of a small portion of documents, chosen among the most significant of the documentary heritage (e.g. students, teachers, acts of bodies, relations with the territory), and the design of the University Historical Archive website for the public return of research results.

The main objectives are:

- Know the nature, consistency and ordering status of archival documents.
- Preserve materials by identifying them and providing indications for organization and good conservation.
- Sharing the richness of the university archival heritage with a diversified public (in presence and online) and with the city and the territory for proximity and non-local research.

The achievement of the following results will contribute to the achievement of these general objectives:

- A detailed guide to the archival nuclei of the University Historical Archive and a summary list of the entire heritage.
- An inventory of a significant portion of documents from the university historical archive accompanied by at least two thousand digital objects.
- A proposal for the reorganization of the archival heritage with the identification of digital filing and sharing tools.
- The design of the University Historical Archive website and the online services to be provided.

Period abroad(obligatory):6 months

Host foreign entity data:
Alma Mater Europaea AMEU-ECM
Slovenska ulica 17, 2000 Maribor (Slovenia)

Period in company, research center or host PA (mandatory): 6 months

Company data, research center or host PA:
Administration of the Department of Cultural Heritage of the University of Bologna
Registered office: via Zamboni 33, Bologna. Operational headquarters: via degli Ariani 1, Ravenna.

Research activities to be carried out in the company/research centre/PA:
The Historical Archive of the University of Bologna (since 2013 a Research Center belonging to the Department of History Culture Civilization) is configured as one of the main poles of excellence in the context of Italian universities for the methods of safeguarding, management and enhancement of the documentary heritage kept , as well as the services offered to users and researchers. A stay at the Archive is functional for acquiring methods, operating models and best practices on keeping university archives and their organization and promotion. The Historical Archives of the University of Bologna and the professor in charge of archiving courses are involved in the definition of highly specialized training moments that can complement those offered at the University of Udine.

Consistency of the doctoral program with the specific principles and obligations of the PNRR:
- transversal priorities:
The proposed program is in line with the initiatives envisaged for cross-cutting priority 4.1 ("Youth"), especially in the areas related to promoting youth employment and enhancing vocational training, and reducing the gap between education and work. Assuming a "hybrid" path between tertiary university and professional training, the project intends to calibrate the skills acquired during doctoral studies on the needs of public administration and business services, thus facilitating direct entry into the world of work.
- twin transitions (green and digital):
Attention to digital as a tool for the recovery of the historical university heritage responds to the needs outlined by the transition program of the PNRR, with particular reference to the objectives of offering digital services to citizens and to support the public administration in the digital transition (M1C1 – Digitalisation, innovation and security in the PA objectives) and the objectives of increasing the level of cultural attractiveness of the country and supporting the digital transition in the world of culture (M1C3 – Tourism and culture).
- not cause significant damage - DNSH:
The research activities meet the criteria of minimal/non-significant impact according to the DNSH principles applied to Mission 1 - "Digitalisation, innovation, competitiveness, culture and tourism" (investments in updating and training) and to Mission 4 - Component 1 "Education and Research" (investments in technological transition, training in digital tools).
- *open science and FAIR Data:*
The collection and listing of document assets, systematized through the implementation of a database integrated in an advanced information system for the management of the entire document life cycle, in itself involves a contribution to the principles of findability, accessibility, interoperability and reusability that govern FAIR Data policies, all the more significant when one considers documents relating to public administration assets and university historical archives traditionally not easily accessible to researchers.

Professor/researcher of reference:
prof. Dimitri Brunetti

TABLE 11 – PhD Programme in ART HISTORY, FILM STUDIES, MEDIA STUDIES AND MUSIC

TABLE 12 – PhD Programme in LINGUISTICS AND LITERATURE

THE PHD PROGRAMME	
Administrative location	University of Udine, Department of Languages and Literatures, Communication, Education and Society (DILL) - Palazzo Antonini - Via Petracco, 8 – Udine 33100 (ph. +39 0432 556750).
Associated location	University of Trieste (Department of Law, Language, Interpreting and Translation Studies; Department of Humanities) - Piazzale Europa 1, 34127 Trieste.
Locations of lectures, seminars, and research activities	Lectures, seminars and research activities will be held at the Universities of Udine and Trieste. The research program will be developed as stated in the "Research Topic Description" section.
Coordinator	Prof. Elena Polledri (elena.polledri@uniud.it)
Programme duration	3 years
Curricula	1. Foreign Literatures; 2. Linguistics, Translation, Interpretation; 3. Italian Studies.
Programme website	https://www.uniud.it/en/research/do-research/doctorate-res/our-ph-d-programmes/area-social-science-and-humanities/language-and-literature/ph-d-programme/language-and-literature?set_language=en

ADMISSION REQUIREMENTS	
Degree required	Italian "Laurea Magistrale/MA degree" (ex DM 270/04): LM-5 in Archival and Library Studies; LM-14 in Modern Philology; LM-15 in Classical Philology, Literature and History; LM-37 in Modern European and American Languages and Literatures; LM-38 in Modern Languages for International Communication and Cooperation; LM-39 in Linguistics; LM-94 in Specialized Translation and Interpreting; LM-85bis five-year degree in Primary Education. Italian "Laurea" (prior to DM 509/99) or Italian Laurea specialistica (ex DM 509/1999) equivalent to the MA degrees mentioned above (in accordance to DI 9/07/2009). For foreign degrees and titles: see articles 3 and 4 of the Call for applications.
Knowledge of at least one of the following foreign languages	Spanish (Topic 1.1), English (Topic 1.2) - THE ATTENDANCE OF THE COURSE REQUIRES KNOWLEDGE OF THE ITALIAN LANGUAGE

APPLICATION REQUIREMENTS	
<u>Mandatory</u> Documents (art. 5 of the Call)	1. Proof of BA and MA degree (refer to art. 5 paragraph 5 of the Call) and transcripts of records from all Universities attended prior to the application, including degrees conferred prior to the implementation of the Bologna process (i.e. prior to D.M. 509/99) and degrees obtained abroad; 2. Curriculum Vitae, dated and signed; 3. Copy of a valid identity document (for citizens of countries not belonging to the European Union: a copy of a valid passport, comprehensive of the pages containing the holder's photo, personal details, passport number, date and place of issue, date of expiry); 4. A copy of the candidate's thesis submitted in fulfilment of the master's degree. Applicants who have not graduated before the application deadline must submit an extended abstract in place of the complete thesis, in Italian or English Language, signed by themselves and by their thesis supervisor (min 15,000 - max 25,000 characters, spaces included); 5. A research project, dated and signed, developed in accordance with the topic of interest, which highlights the contribution that the candidate can offer to the development of the topic itself (maximum 10.000 characters, spaces included, in Italian or English language).
<u>Optional</u> documents (art. 5 of the Call)	1 Publications (max 2).

SELECTION COMMITTEE	
Appointed members	Renata Londero – full professor – University of Udine Katerina Vaiopoulos – associate professor – University of Udine Elisa Perego - – associate professor – University of Trieste Monica Randaccio – researcher – University of Trieste
Substitute members	Federico Vicario – associate professor – University of Udine Alessandro Zuliani – researcher – University of Udine Marella Magris – associate professor – University of Trieste Maria Teresa Musacchio - – full professor – University of Trieste

ADMISSION
GENERAL COMPETITION (art. 8 of the Call for Applications)

TABLE 12 – PhD Programme in LINGUISTICS AND LITERATURE

Available Positions: 1				
Detailed description	***N.***	***Funding institution***	***Annual gross amount***	***Research Topic***
Positions WITH SCHOLARSHIP: 2	1	D.M. 118 of March 2nd, 2023 (NRRP Mission 4 Component 1 Investment/Subinvestment 4.1) and University of Udine CUP G23C22001200003	€ 16,243.00	Topic 1.1 – Critical edition of the play *El rayo de Andalucía y genízaro de España (parte II)* by Álvaro Cubillo de Aragón (1590-1661)
	1	D.M. 118 of March 2nd, 2023 (NRRP Mission 4 Component 1 Investment/Subinvestment 4.1) and University of Udine CUP G23C22001200003	€ 16,243.00	Topic 1.2 – Inclusive, accessible and multilingual tourism and museum communication as an expression of a public administration that pays attention to the communicative needs of visitors.

Competition procedure and test schedule			
Evaluation of application materials and oral examination. For the evaluation of the applicants' aptitude for research and study, the Selection Committee can assign up to 100 points to each candidate: - max 30 points for the evaluation of the candidates' application materials: CV, research project, publications and MA thesis (or thesis abstract); - max 70 points for the oral examination. The applicant is admitted to the oral examination if his/her application materials receive at least 21 points. Applicants are considered eligible for the PhD programme if they receive at least 49 points in the oral examination. Only for eligible applicants, the points assigned to the application materials will be added to the points obtained in the oral examination. **DATE FOR THE PUBLICATION OF ADMITTED APPLICANTS TO THE ORAL EXAMINATION: within September 8, 2023** **DATE FOR THE PUBLICATION OF THE FINAL RANKING LIST: within September 26, 2023**			
Language in which the exam can be taken	Italian		
Criteria for the evaluation of CVs, research projects, publications, and thesis *The Selection Committee may establish sub-criteria for the evaluation*	Curriculum vitae		*6*
	Research project		*14*
	Publications		*3*
	Thesis/Abstract		*7*
Oral examination	The oral examination will consist of a discussion of the candidate's research project. The oral examination will also include a conversation in Spanish (Topic 1.1) o in English (Topic 1.2)		
Oral examination schedule	**Date**	**September 19, 2023**	
	Time	**03.00 PM**	
	Location	Università degli Studi di Udine, Palazzo Antonini - Via Petracco 8, 33100 Udine	
	Depending on the number of applicants, the oral examination may take more than one day. Applicants, in person or via Teams, must produce a valid ID for admission to the oral examination.		

Reserach topic description
Research Topic 1.1 – Critical edition of the play *El rayo de Andalucía y genízaro de España (parte II)* by Álvaro Cubillo de Aragón (1590-1661) *D.M. 118 of March 2, 2023 (NRRP "National Recovery and Resilience Plan" Mission 4 Component 1 Investment/Subinvestment 4.1) – Cultural Heritage* Consistency of the proposed research with the PNRR areas of interest: The proposed research project is entirely consistent with the following PNRR areas of interest, pursuant to art. 10 c. 1 of Ministerial Decree 118/2023: **1.** It concerns a research subject that "aims to bring about a significant development of knowledge, also applied, in the areas of interest of the PNRR"; **2.** From the point of view of intellectual property, it is in keeping with the PNRR aim "to enhance the validation of research results", in this case carried out by young scholars by means of wider circulation of the results pursued, and is in accordance with the principles of "Open science" and "FAIR Data"; **3.** It adheres to the principle "do no significant harm" (DNSH) pursuant to art. 17 of regulation (EU) 2020/852; **4.** It foresees a research period of 6 months at a leading Spanish University closely linked to the research project and research activity at an Italian research centre in the Hispanic field that is highly qualified for the proposed research project, in the context of wider collaborations between Universities; **5.** It involves drawing on the digitized assets of some of the most important public libraries in Spain (but also in France, such as the Arsenal in Paris) as regards the phase of witness retrieval and bibliographic research. Goals and expected results, proposed research activity, methodologies and contents: **1. Goals**

TABLE 12 – PhD Programme in LINGUISTICS AND LITERATURE

The scientific research which concerns the seventeenth-century playwright Álvaro Cubillo de Aragón (Almagro, 1590-Madrid, 1661) is conducted thanks to the contribution of scholars such as Professor Francisco Domínguez Matito and his collaborators from the University of La Rioja (Spain), who are engaged in preparing the critical edition of the author's complete dramatic work. The project proposal fits within this framework and is aimed at producing the critical edition of a play which does not have any modern edition: *El rayo de Andalucía y genízaro de España* (part II). Starting from the results obtained by Leticia Viñuela Soto in her PhD thesis, based on the proposal of a critical edition of the first part of the play mentioned, and discussed at the Universidad de La Rioja in July 2021, the project aims at offering an overview (both ecdotic and exegetical) of the two parts of the text. The work in question, believed to have been written by Cubillo at the end of the 1620s, enjoyed considerable success from its contemporary public, as witnessed by its staging in the "*corrales*" of the time. Therefore, the project has a twofold objective:

1). In the context of its recent rehabilitation within the studies on Golden Age drama, to contribute to deepening knowledge and understanding Cubillo de Aragón's dramatic production, which, despite being highly interesting, original and of excellent literary workmanship, has received little scholarly investigation by specialist critics, and is largely unknown to the public;

2). contribute to further enriching the Spanish theatrical heritage related to the Golden Age, which is vast and of significant importance in the history of Hispanic and European culture of the Modern Age.

2. Expected results

The critical edition that we intend to make available to the scientific community interested will enrich the knowledge of an important and little-known sector of the dramatic production of the Golden Age, a fundamental socio-cultural phenomenon of great impact in the history of modern Spain, which is still extensively studied by specialized scholars, as well as being highly appreciated by theatre audiences. Furthermore, in the phases of retrieval of documentary sources and bibliographic research, the project will make extensive use of the "digital humanities" sector in the Hispanic literary field, thereby contributing to the aim of digitalization (innovative and inclusive) in the field of literary and documentary heritage and putting technological progress at the service of humanistic knowledge.

3. Contents and proposed research activities (subdivision of work during the three-year period)

The proposed project can be divided into three phases. The first consists in the *recensio* of the witnesses known up to nowadays, including manuscripts and printed texts (17 in total). To date, only one manuscipt of the comedy is available. This is kept in the British Library (ms. Add. 33.474, vol. IV, *El Raio de Andaluçía y Geníçaro de España. Comedia famosa*, ff. 93r-135r). On the other hand, there are many printed editions (16). In the first place, it is significant that Cubillo included both parts of the play among the ten he chose, considering them the best in his repertoire, in the volume *El Enano de las Musas* (Madrid, María de Quiñones, 1654, part II, pp. 183 -212). The printed tradition continues with 15 eighteenth-century "*sueltas*", published from 1734 to 1770 in various Spanish towns (Barcelona, Madrid, Salamanca, Valencia): 8 are located in the Bibliothèque de l'Arsenal of Paris, and the remaining 7 are kept in various Madrid and Barcelona libraries, in the British Library and in the University Library of Fribourg. As a second step, the editions not yet digitized will be reproduced by means of a scanner, in order to have texts in electronic format (text files), with all the consequent advantages in terms of editing and modifying the texts themselves. We will then move on to the *collatio* of the witnesses gathered, followed by the possible *eliminatio codicum descriptorum*, and subsequently we will proceed to the analysis of significant errors according to the neo-Lachmannian method, to construct the *stemma codicum*, if possible.

The second phase, corresponding to the second year of research, will therefore focus on the reconstruction of the critical text.

Finally, during the third and final phase, which will coincide with the last year of the three-year PhD course, the critical edition will be completed, drawing up the critical apparatus, the linguistic-literary notes and, finally, the introduction to the play.

During the first and second year, the candidate will carry out part of his/her activity at the host foreign University institution, i.e., the Department of Filologías Hispánica y Clásicas of the Universidad de La Rioja (Spain), directed by Professor Francisco Domínguez Matito, the leading expert in the works of Cubillo de Aragón. Important and recent outcomes of the work carried out by Professor Domínguez Matito and his collaborators from the Universidad de La Rioja not only include extensive studies on Cubillo's figure and theatrical *corpus*, published in prestigious miscellaneous volumes and academic reviews, both in Spain and abroad, but also rigorous critical editions of some of his plays. The first of these were published by the well-known academic publishing house "Academia del Hispanismo" (Universidad de Vigo, Spain), while later studies and editions (starting from 2020) have been published by the two most prestigious publishing houses dedicated to the dissemination of texts and studies of Spanish Golden Age literature (Reichenberger, based in Kassel; Ibero-Americana/Vervuert, based in Madrid and Frankfurt am Main). Professor Domínguez Matito and his closest collaborators (Juan Manuel Escudero Baztán, Rebeca Lázaro Niso, Isabel Sainz Bariain) will collaborate with the candidate in various aspects, providing bibliographic, critical and methodological support, and making available the rich library heritage linked to Cubillo de Aragón, housed in the University library of the Universidad de La Rioja. The candidate will therefore be directly involved in the critical edition project of Álvaro Cubillo de Aragón's complete dramatic works, coordinated by prof. Dominguez Matito: the edition of *El rayo de Andalucía y genízaro de España (parte II)* will be included in the series "Comedias de Álvaro Cubillo de Aragón" of the renowned German publisher Reichenberger (the third volume of the series is in print).

First year:

- Detection and retrieval of manuscript and printed witnesses (*recensio*).
- Systematic collation of all witnesses and examination of their mutual relationships (*collatio* and *examinatio*).

Second year:

TABLE 12 – PhD Programme in LINGUISTICS AND LITERATURE

- Reconstruction of the text according to the neo-Lachmannian method, with possible construction of the *stemma codicum* (*constitutio textus*).

Third year:
- Preparation of the critical edition: drafting of the critical apparatus, the notes and the introduction.

4. Methodology

The methodology to be adopted for the preparation of the critical edition in its various parts will be manyfold, because from the ecdotic point of view the neo-Lachmannian method will be employed, while drama semiotics will be used for the textual analysis of the play. The contribution provided by digital humanities will also be of great importance, both for textual and bibliographic research, as well as for stylometric research.

Period abroad:

6 months overall, divided into two periods: January-March 2024 and January-March 2025.

Data of foreign host subject:

Universidad de La Rioja, Spanish public University institution. Department of Hispanic and Classical Philology - Building of Philology - c/San José de Calasanz, 33 - 26004 Logroño (La Rioja)- SPAIN www.unirioja.es

Research Centre involved in the definition of the training pathway:

"Centre for Studies on Spanish Seventeenth and Eighteenth Centuries (CSSS)" ("Centro Studi sul Seicento e Settecento spagnolo" - CSSS), Department of Modern Languages, Literatures and Cultures of the University of Bologna – Via Zamboni, 33 – 40126 Bologna (ITALY)
Centre website: https://site.unibo.it/csss/it

Research activities to be carried out at the Research Centre:

The research activity will be carried out in close collaboration with the prestigious "Centre for Studies on Spanish Seventeenth and Eighteenth Centuries" ("Centro Studi sul Seicento e Settecento spagnolo") of the Department of Modern Languages, Literatures and Cultures of the University of Bologna, co-directed by Prof. Valentina Nider, Full Professor of Spanish Literature, and well-known expert in Golden Age literature, and by prof. Luigi Contadini, Associate of Spanish Literature. The centre, founded in 1976 by prof. Rinaldo Froldi, an internationally renowned scholar of the Hispanic Golden Age and eighteenth century literature, is dedicated to studies on both seventeenth- and eighteenth-century Spanish letters, and has a rich and specialized library of primary and secondary bibliography (antique volumes or modern editions, in photocopies or microfilm, concerning literature, history, non-fiction, critical bibliography and the arts in general), also containing editions of seventeenth-century plays published in the eighteenth century. The candidate will carry out bibliographic research and in-depth reading of texts concerning the dramatic production in Spain during the seventeenth century, the historical-cultural context, and the theory and practice of critical editions of Golden Age comedies.

Consistency of the doctoral programme with the principles and specific obligations of the PNRR:

- cross-cutting priorities:
Transversality as well as multidisciplinarity and cross-cutting issues are fundamental elements of this project. It will draw on different disciplines (semiotics, ecdotics, drama studies, "digital humanities").

- twin transitions (green and digital):
the project will use numerous online databases (stylometric studies, databases of manuscripts of Golden Age drama, online research projects related to Spanish Baroque drama, such as the CATCOM database of the University of Valencia or the CALDERÓN DIGITAL portal of the University of Rome III, the ISTAE project – *Impresos sueltos del teatro antiguo español* of the Universidad Internacional de La Rioja, etc.).

- do no significant harm - DNSH:
the project does not cause significant harm or damage to the environment, since the structures involved are public establishments and certified according to European and public standards.

- open science and FAIR Data:
the results of the research will be made public and usable by anyone, by disseminating the findings on the web. This practice contributes to the construction of an inclusive and participatory society, breaking down barriers and extending the democratic right of access to information.

TABLE 12 – PhD Programme in LINGUISTICS AND LITERATURE

Reference Professor:

Prof. Renata Londero

Research Topic 1.2 Inclusive, accessible and multilingual tourism and museum communication as an expression of a public administration that pays attention to the communicative needs of visitors.
D.M. 118 of March 2, 2023 (NRRP "National Recovery and Resilience Plan" Mission 4 Component 1 Investment/Subinvestment 4.1) – Cultural Heritage

Consistency of the proposed research with the PNRR areas of interest:

The project proposal presented here focuses on the issue of inclusion and accessibility in tourism and museum communication, understood as one of the possible forms that public administration uses to communicate not only with its own citizens, but also with domestic and foreign visitors. This proposal deals with multilingual tourism and museum communication, especially in Italian and English, declined in inclusive and accessible forms and therefore achieved through linguistic simplification operations carried out by rewriting and translating. The aim is to analyse, from a contrastive point of view, the strategies for inclusive and accessible communication in Italian and/or English used by local authorities with a strong tourist orientation, and to apply the most effective ones in a case study on the municipality of Grado, with which the University of Trieste has recently started a collaboration, and its museums. The present project proposal therefore fits fully into the topics provided for in the curriculum "Linguistics, Translation and Interpretation" of the doctoral programme in Linguistics and Literary Studies. One of the aims of this course is to offer an interdisciplinary and intercultural approach to the study of languages and foreign languages, including applied ones, as well as the theories and practise of translation in a wide variety of fields and in relation to reference language cultures, including Italian and English (the latter lingua franca in tourist communication).

Specify why this proposed doctoral program can be defined as multidisciplinary, oriented towards applied PA research and the development of knowledge and skills referred to in Art. 9 Clause 1 of Ministerial Decree 118/2023.

The research proposal is consistent with the following NNRP areas of interest:

- It surveys the reference regulatory framework, both national and supranational, on the right to inclusive and accessible communication in relations with the public administration;
- It presupposes synergistic collaboration with public administrations at regional and local level in order to: a) implement inclusive and accessible communication strategies strongly oriented towards users and b) optimize and enhance the resources of the subjects involved;
- develops research paths useful for defining and enhancing effective communication skills in Italian and English for public organisations, with particular reference to the management, development and training of human resources;
- Through collaboration with public administrations at regional and local level, it raises their awareness of the issue of inclusive and accessible communication in Italian and English, potentially relevant in relation to the formulation, design and implementation of public policies;
- Through the creation of accessible and inclusive materials for the web, it favors the digital and ecological transition of public administrations;
- The project provides for the implementation of the entire doctoral course, training, research and evaluation, at the administrative and operational offices of the beneficiary University, with the exception of periods of study and research in Italy and abroad, planned in line with the training and research activities envisaged at the offices of the beneficiary University;
- It includes a 6-month period of study and research in a public administration over the three-year period and also provides for a study and research period abroad of 6 months over the three-year period;
- It ensures that the doctoral student can take advantage of qualified and specific operational and scientific structures for study and research activities;
- It promotes, in compliance with intellectual property, the valorisation of research results through an adequate circulation of the results pursued, in any case according to the "Open science" and "FAIR Data" principles.

Goals and expected results, proposed research activity, methodologies and contents:

Goals
- To advance the state of research in the field of inclusion and accessibility, especially through linguistic simplification, translation and rewriting, in multilingual (Italian/English) tourist and museum communication;
- To conduct a survey of good practices for inclusive and accessible tourism and museum communication;
- To raise awareness among the public administrations operating in the tourism sector of the Friuli Venezia Giulia Region of the need to profile users in order to allow for an adequate modulation of multilingual tourist and museum communication based on the communication needs of each profile, with particular attention to English as the language franca of tourist communication;
- To enhance the role of the translator in the production of textual materials intended for users belonging to different profiles, taking into account various factors such as intellectual and sensory abilities, linguistic competence and age ranges;

TABLE 12 – PhD Programme in LINGUISTICS AND LITERATURE

- To strengthen collaborative relationships between universities, local public administrations, interested bodies and associations, in order to enhance and optimise resources for efficient multilingual institutional communication;
- To expand the offer of inclusive and accessible tourist and museum communication in Italian and English in the Friuli Venezia Giulia Region through a pilot project in the Municipality of Grado and its museums;
- To promote awareness of the cultural heritage of the Friuli Venezia Giulia Region through inclusive and accessible communication in Italian and English adopted in a pilot project in the Municipality of Grado and its museums.

Expected results
- Profiling of tourists and visitors to the Municipality of Grado and its museums, and identification of the related communication needs;
- Application and/or development of good practices for inclusive and accessible multilingual communication suitable for a municipality with a strong tourist vocation and its museums;
- Creation of textual materials, including multimedia ones, in Italian and English, for an inclusive and accessible multilingual communication suitable for the Municipality of Grado and its museums;
- Dissemination of results: presentation of the materials created to the Municipality of Grado and its museums; organization at some museums of events dedicated to users belonging to the profiles to which the materials are addressed.

Contents and proposed research activities (subdivision of work during the three-year period)

First year

- literature review on the following topics: tourism and museum communication in Italian and English, linguistic simplification and accessible tourism and museum communication;
- recognition of clear and simple communication strategies in English, traditionally reader-oriented (vs text-oriented), and possible applications in Italian;
- reconstruction of the national and supranational regulatory framework on the right to inclusive and accessible communication in relations with the public administration;
- profiling of tourists and visitors to the Municipality of Grado and its museums and identification of communication needs in a multilingual perspective; this will take into account a variety of users in terms of previous knowledge, cognitive and sensory abilities, linguistic competence, age, etc.;
- selection, in collaboration with the Tourist Office of the Municipality of Grado and the Directorates of the Museums involved, of the profile/s of users for which to produce inclusive and accessible texts (for example, users with intellectual disabilities, children and teenagers, blind and visually impaired people, deaf people).

Second year

In order to optimize collaboration with the Municipality of Grado, the PhD student will carry out a period of study and research at the Municipality itself (6 months - October 2024-March 2025).

The student will define, in collaboration with the Municipality of Grado and with the Directorates of the Museums involved, of the text types and resources (semiotic, multimedia) most suitable for satisfying the communicative needs of the profile(s) of selected users, and of the contents to be included in the texts to be produced to satisfy the communication needs of the profile/s of selected users.

The student will also identify similar tourist realities, in Italy and abroad, which provide for communication adapted to the profile(s) referred to above, and build a corpus of texts in Italian and English, in order to identify good practices for an inclusive and accessible multilingual tourist and museum communication that can be implemented or further developed in the local reality.

In order to carry out an in-depth analysis of the corpus of reference and to consult experts in inclusive and accessible tourism communication, the PhD student will also carry out a period of study and research at the Departament de Traducció i d'Interpretació i d 'Estudis de l'Àsia Oriental de la Universitat Autònoma de Barcelona (UAB) for 6 months (October 2025-March 2026). UAB is a leading Spanish public university that is highly ranked in world rankings.

The student will then produce texts in Italian, such as simplification of the texts of the Museum panels and production of maps and brochures on the city, specific itineraries and short guides for recipients with intellectual or sensory disabilities, as well as texts suitable for school-age children and teenagers, involving the users themselves through collaboration with associations and entities operating in the relevant sectors.

These texts will be translated into English.

Third year

- publication of the textual material produced according to the indications of the Municipality of Grado and its museums;
- drafting of the thesis.

Over the three-year period, the doctoral student will be encouraged to participate, both as auditor and speaker, in international workshops and conferences related to the research project such as communication and inclusive translation and accessible, tourism and museum

TABLE 12 – PhD Programme in LINGUISTICS AND LITERATURE

communication and translation, institutional communication and translation, linguistic simplification, language easy to read and understand, English as the lingua franca of museum communication.

Methodology

Given the composite and interdisciplinary nature of the project, this will use different approaches and tools:
- semi-automated creation of a corpus of materials in Italian and English;
- analysis of the corpus according to the methodologies developed in the field of corpus linguistics using e.g. the Sketch Engine tool;
- semi-structured interviews with the staff of the Municipality of Grado and Promoturismo FVG employees;
- semi-structured interviews with the personnel of bodies and associations interested in the project;
- semi-structured interviews with user representatives (test groups) targeted by inclusive and accessible multilingual museum and tourism communication.

Content

The project focuses on multilingual (English/Italian) tourism and museum communication with a view to inclusion and accessibility. In particular, it is part of an increasingly visible research line within the Section of Modern Languages for Interpreters and Translators (SSLMIT) of the Department of Legal, Language, Interpreting and Translation (IUSLIT) which has as its object of analysis the inclusive and accessible language and the simplification of language. The project consists of the elaboration of a case study aimed at inclusive and accessible communication through the creation of materials in Italian and English that take into account the communication needs of different profiles of visitors and tourists of the Municipality of Grado, a municipality with a strong tourist vocation that attracts many visitors from abroad.

Period abroad:

6 months: October 2025-March 2026

Type of institution - Public university
Full name - Universitat Autònoma de Barcelona
Registered Office - Campus de la UAB, Plaça Cívica, 08193 Bellaterra, Barcelona, Spain, Telephone: + 34 93 581 11 11, Email: informacio@uab.cat

Location of activities
Departament de Traducció i d'Interpretació i d'Estudis de l'Àsia Oriental de la Universitat Autònoma de Barcelona
Despatx K-1002, Campus de la UAB, Plaça Cívica, 08193 Bellaterra, Barcelona, Spain
TEL +34 93 581 27 61
FAX +34 93 581 27 62
d.traduccio@uab.cat

Period in companies, research centers or PAs
6 months: October 2024-March 2025

Type of institution - Public administration
Full name - Municipality of Grado
Registered office - Piazza Biagio Marin, 4, 34073 Grado (GO), Telephone: 0431 898111, e-mail: comune.grado@certgov.fvg.it
Location of activities: See institution data above

Research activities to be carried out at the Research Centre:

The research activity will require close collaboration with the Tourist Office of the Municipality of Grado and the Directorates of the museums involved, which is essential for the following phases of the project:
- selection of the visitor profile(s) of the Municipality of Grado and its museums, for which inclusive and accessible texts in Italian and English should be produced;
- definition of the types of texts and resources (semiotic, multimedia) best suited to meet the communicative needs of the profile(s) of selected users;
- definition of the contents to be inserted in the texts to be produced to satisfy the communicative needs of the profile/s of selected users.

Collaboration during these phases of the project will guide the PhD candidate in the choice of materials that will form the reference corpus on which the linguistic analysis necessary to identify communication strategies and good practices will be based. These can then be implemented or further developed, according to a circular workflow, in the local reality of the Municipality of Grado and its museums.

Consistency of the doctoral programme with the principles and specific obligations of the PNRR:

- cross-cutting priorities:
The central theme of this proposal, i.e. inclusive and accessible communication from an Italian-English multilingual perspective, applied to the public administration and, in particular, to a tourist and museum reality focused on local cultural heritage, makes the project a necessarily transversal, multidisciplinary and multimodal activity, also given the variety of methodologies adopted and the tools necessary for research aimed at the creation of materials aimed at an audience of recipients with different needs and at the very realization of these materials. It should be emphasized that the project intends to promote multilingualism, internationalisation, the strengthening of relations between

TABLE 12 – PhD Programme in LINGUISTICS AND LITERATURE

universities, public administrations and local bodies and associations with the ultimate aim of guaranteeing a greater degree of inclusion and accessibility through a use of languages modulated on the basis to the communication needs of the recipients.

- twin transitions (green and digital):
The recognition of the reference regulatory framework, national and supranational, on the right to inclusive and accessible communication in relations with the public administration, will be performed starting from legal databases available online. The material necessary for the creation of the Italian/English reference corpus and the tools necessary for the analysis of this corpus are available online. The material created within the project will be made available online in an open-access perspective.

- do no significant harm - DNSH:
the project does not cause significant harm or damage to the environment, since the structures involved are public establishments and certified according to European and public standards.

- open science and FAIR Data:
The research results will be made public and usable by anyone through online publication, in order to contribute to the construction of an inclusive and participatory society, breaking down barriers and extending the democratic right of access to information.

Reference Professor:
Prof. Elisa Perego