

# Università di Pisa

## Excerpt from the Rector's decree n. 1693/2021

## Call for the selection of n. 43 Junior Research Fellows

(Under the Italian Law 240/2010 article 24, subparagraph 3, point a)

The University of Pisa announces a call for 43 Junior Fixed-Term Research Fellow for the Department and the scientific area or sector as listed in Annex A.

The fixed-term contract is to carry out research activities, teaching, integrative teaching activities and services for students, for a 350 hours commitment, on a full-time basis.

The Junior Research Fellow is required to perform lectures for a minimum of 36 up to a maximum of 60 hours per academic year, allocated as an institutional assignment for Bachelor's and Master's degree programmes, Specialization Schools and PhD programmes. It is possible to provide a further derogation up to a maximum of 72 hours, in order to avoid an excessive partitioning of teaching modules.

Contract duration: 3 years

Gross annual salary: € 36.344,04

Deadline for application: 4/11/2021 1 p.m.

## Admission requirements:

PhD or equivalent academic qualification awarded in Italy or abroad and recognised as eligible for admission.

medical specialization, for the sectors concerned

As for a qualification awarded abroad, equivalency or comparability documentation has to be provided as stated under:

D.Lgs.165/2001, article 38:

http://www.funzionepubblica.gov.it/sites/funzionepubblica.gov.it/files/modulo\_equivalenza\_Titoli\_Accade mici.pdf

Or under:

D.P.R. 382/1980, article 74:

http://www.miur.gov.it/documents/20182/0/Equipollenza\_Dottorato\_ricerca\_dpr382.pdf/f5ff98ae-ddff-4166-a822-83ef1b57c7f0

As for an equivalent or comparable academic qualification, the candidate shall be admitted within the application's deadline and shall provide the qualification equivalency or comparability before the signing of the contract.

No admission to this selection for:

- Professors or Research Fellows with permanent position at the university, currently employed or currently retired;
- Fixed-term Research Fellowship or Post PhD research grants at the University of Pisa or other Italian universities, either public, private or online, and other public institutions (Under the Italian Law Italian Law n. 240/2010, articles 22 and 24) for a period that, totalled over this contract, would exceed 12 years altogether, even when not consecutive. As for the duration of the working period mentioned above, parental leave or medical leave, are excluded (under the existing legislation).

# Applications:

Applications are to be submitted online only, using the following link: https://pica.cineca.it/unipi/

or shall be invalid. It is necessary to have an email address to login and complete the application.

Applicants should fill in all the required data and upload all documents in PDF format.

The system allows saving a draft of the application within the application deadline. The system will register the online application date and send a receipt with an automatic e-mail reply. After deadline, the system will not allow login nor application submission.

In order to be valid, application shall include all the required data, applicant's signature and a valid identification document.

Each application will be assigned a tracking number to be cited in all subsequent communications, together with the selection code provided by the application form.

Applicants undertake to communicate in writing any variations of what declared in the application form.

The communication shall be edited in PDF format, signed and forwarded to the University of Pisa Rector via the Italian certified e-mail system address (P.E.C. Posta Elettronica Certificata): protocollo@pec.unipi.it or via e-mail at: concorsi@adm.unipi.it. Applicant's valid identification document shall be annexed.

For further information on application submission, please refer to concorsi@adm.unipi.it

For any IT malfunctioning please refer to unipi@cineca.it.

Applications shall be completed with the following annexes:

1. A self-attested Curriculum of the personal didactics, teaching and scientific activities, dated and signed;

2. The Publications applicant considers eligible for this selection with the corresponding list dated and signed;

3. A complete list of all Publications, dated and signed;

4. A copy of the fiscal code (if applicable) and identification card/passport, dated and signed;

All publications should not exceed 30 megabyte and are to be submitted in PDF format only, using the specific section of the application form.

Selection procedure:

A Rector's Decree will appoint the Selection Committee, consisting of three members.

The selection will be made according to a preliminary assessment of the candidates with an accurate and evidenced analytic evaluation of the Curriculum, of qualifications and scientific results, including PhD thesis.

After the preliminary assessment, the candidates that have comparatively proven to be the most meritorious, will be admitted to an open interview; they will represent between 10 and 20 % of the total and will be not

less than six. The interview will concern applicant's qualifications and scientific results. In the event the number of applicants is six or less, all candidates are admitted. All admitted candidates will be summoned by registered post at least twenty days before the interview; the failed attendance to the interview will be considered as a voluntary renunciation.

During the interview, all candidates will be furthermore tested on the foreign language skills requested by the selection.

In compliance with the provisions adopted following the COVID-19 epidemiological emergency, interviews will take place on virtual mode to ensure the simultaneous connection between the members of the Commission and the candidates, under the regulations on the protection of personal data for confidentiality conservation.

During the interview it will be forbidden the audio / video recording through the IT platforms used as well as the broadcasting of the audio / video recording made with tools other than the platform.

The interview disclosure will be guaranteed inviting all candidates and any third part who has requested, with a link to the event; the link will be published at https://www.unipi.it/index.php/concorsi-gare-e-bandi in the section "Prove e colloqui in modalità telematica - Aule virtuali" and will allow the connection to the telematic session.

"The list of candidates admitted to the interview will be published on the university website at https://www.unipi.it/index.php/concorsi-gare-e-bandi in the section dedicated to the procedure in this call "

Please note that the English version is given as a matter of courtesy, for the only purpose of information. It cannot be legally used in the event of a dispute or a claim arising from the interpretation of this translation and concerning the contents, a possible uncertainty, contradiction or discrepancy. Should this occur, the Italian version of the call shall prevail as the only valid. For full Italian text see: https://www.unipi.it/ateneo/bandi/ricercat/ricercator/index.htm

(1) If applicable

Dipartimento di Biologia Settore Concorsuale 05/C1 - Ecologia SSD BIO/07 - Ecologia

n. 1 posto

Commitment regime: Full time

Principal Investigator: Lisandro Benedetti Cecchi

Thematic Area: Green

### Motivation and agreement with the Green Innovation Area:

Focusing on biodivresity and vulnerable ecosystems that provide key ecosystem services, the project contributes to the Green Deal vision of the EU and to the targets of the UN Sustainable Development Agenda to reverse the decline of seas and oceans

#### Research title:

Biodiversity, functioning, stability and resilience of macroalgal forests

### Research topic:

Macroalgal forests are iconic on rocky reefs around the world's temperate coasts. These highly diverse ecosystems provide many important functions and services including high primary production, provision of nursery areas, human food resources, and protection from coastal erosion. Owing to their high photosynthetic rates, macroalgal forests contribute disproportionally to carbon sequestration, mitigating ocean acidification and providing important sink habitats for "blue carbon". Macroalgal forests are vulnerable to global threats such as ocean warming and to regional stressors resulting from intensifying human activities along the coast, including habitat degradation, pollution, eutrophication, and spread of invasive species. The increasing demand of food from the ocean to support a rapidly growing human population is an emerging threat to macroalgal forests. The report "Food From The Ocean" of the "High Level Group of Scientific Advisors" of the EU Commission, already in 2017 pointed to macroalgae as a key food resource for our society. Thus, threats to macroalgae are doomed to increase in the near future. The compounded effects of global and regional stressors are eroding the resilience of these systems, making regime shifts and population collapses more likely. Regime shifts, such as the replacement of macroalgal canopies by less productive, low-diversity assemblages of turf-forming algae and barren habitat are increasingly observed on many reefs around the world. Vulnerability begets sensitivity and macroalgal forests respond quickly to deteriorating environmental conditions, potentially allowing the early detection of impending regime shifts. The ultimate goal of the project is to generate the necessary understanding to support regulators and decision makers confronted with the conservation and sustainable use of macroalgal forests and associated biodiversity and their employment as an early warning system. Specifically, the project aims at:

1) Characterize the biodiversity and functioning of macroalgal forests and associated biodiversity (microbiome and understory species) through innovative molecular tools, novel methods of automated sampling and genomic analysis of environmental DNA.

2) Quantify the effect and direction of multiple stressors (additive, synergistic or antagonistic) on macroalgal forests, including extractive, pollution and extreme climate events (e.g., heat waves).

3) Identify the mechanisms underpinning the stability and resilience of macroalgal forests to cumulative stressors.

4) Probe early warning signals of loss of resilience and collapse for macroalgal forests and the use of these systems as indicators of Good Environmental Status as required by the EU Marine Strategy.

Scientific activities focusing on the interactions between autotrophic and heterotrophic organisms and their environments, including their distribution, responses to environmental change and intra- and inter-specific interactions. Specific activities include: dynamics and regulation of populations in relation to resource availability and biotic interactions (predation, competition, parasitism, symbiosis); mechanisms and processes underpinning biodiversity and spatiotemporal variation of ecological communities in natural, human-dominated and urban environments; effects of anthropogenic stressors and climate change on ecosystems; conservation and managements of biological resources, control of exotic species, strategies of biodiversity conservation and sustainability of the biosphere, indicators of environmental quality; methodological approaches for the analysis of ecological systems, including monitoring and modeling methods and integration of ecological data into environmental information systems.

Scientific targets:

Four publications in high impact journals.

Location of activities:

Department of Biology

Teaching:

One credit for supporting practicals in the Ecology (Undergraduate Degree in Biology) and in the course of Experimental Ecology and Biodiversity of Rocky Shores (Master Degree in Marine Biology).

### Internship in Private Companies:

MDMTeam Via Venezia 4, 50121 Firenze (FI) ITALY - 6 months

**Date e time of the interview:** November 30, at 9:30 a.m. (remote)

The interview will include a test of language skills for: English

Candidates can present a maximum of 12 publications

Dipartimento di Biologia Settore Concorsuale 06M1 - Igiene generale e applicata, Scienze infermieristiche e Statistica medica SSD MED42 - Igiene generale e applicata n. 1 posto

Commitment regime: Full time

Principal Investigator: Prof. Annalaura Carducci

Thematic Area: Green

Motivation consistency and compliance with the restricted thematic areas of Innovation or Green:

Green Area: Water treatment represents one of the major problems related to environmental protection and the reuse of treated water is an increasingly need in the perspective of sustainability and circular economy. At present, however, reuse is not yet fully widespread due to the difficulties attributable to potential side-effects of reused water. A study on such critical issues and their possible solutions completely fulfils into the Green theme.

### Research title:

Risk analysis for human health and the environment, related to the treatment of sewage and in the perspective of their reuse.

### Research topic:

Treatment of urban wastewaters should ensure their safety in the perspective of their discharge into surface waters, including the sea. Therefore, the legislation establishes limits for some chemical substances and for E. coli, as an indicator of faecal contamination. The evolution of scientific knowledge and environmental and health needs (such as the COVID-19 emergency) highlights some critical issues, such as the conflict between the need to disinfect the treated sewage and to avoid the discharge of toxic chemicals. In addition, the 2030 Agenda for sustainable development promotes the reuse of water in a circular economy perspective, but for this purpose much more stringent treatment processes and quality standards suitable for possible uses are required. To meet such needs, the project aims to apply the principles of risk analysis for human health to the treatment of urban wastewaters, also seeking to identify additional control parameters with respect to those required by current legislation. The Water Safety Plan will be applied to the treatment process through the systematic assessment of hazards and the management of health and hygiene risks, with identification of the critical control points at which monitoring programs will be implemented for microbiological and chemical-physical parameters. The microbiological parameters will include pathogens with fecal-oral transmission (e.g., adenovirus, norovirus, coronavirus, Cryptosporidium, Campylobacter) and various indicators, not only of the guality of the effluent (such as E. coli), but also of the effectiveness of the treatment process, such as bacteriophages. Microbiological risk will be assessed using Quantitative Microbial Risk Assessment (QMRA) models. Regarding chemical contamination, the classical parameters (e.g., salinity, heavy metals, macronutrients) will be considered as well as emerging contaminants, such as disinfectants and their by-products. The chemical risk will also be assessed through models for human exposure to pollutants. The application of risk assessment models will allow to compare the risks and benefits of the various types of treatment and disinfection and to assess their effectiveness in reducing the risk at acceptable level.

#### Specific research activity:

Hygiene applied to the environment, with a particular focus on the search for pathogens in environmental matrices. Human health risk analysis, epidemiology.

Publication in Scopus and WOS indexed scientific journals ( $n^2/year$ ) and contributions to national and international conferences ( $n^2/year$  of studies relevant to the scientific disciplinary sector MED 42 and to the specific research theme.

### Places of activities:

Hygiene and Environmental Virology Laboratory, Department of Biology, University of Pisa, Via S. Zeno 35/39 - 56127 - Pisa (PI)

- Acque SpA, Via A. Bellatalla, 1 - 56121 - Ospedaletto (PI)

#### Specific teaching activities:

Collaboration in teaching provided by SSD MED/42 in the degree courses of the Biology Department. Exercises and practical activities to support courses in the sector: general and environmental hygiene, especially regarding water. Laboratory exercises with molecular and cultural techniques for the analysis of water matrices, epidemiology exercises (case studies), designing of Water Safety Plans.

#### Research period in the Company:

Company: Acque Spa Number of months: 12

**Date e time of the interview:** 22/11/2021 ore 9:30 (remote)

#### The interview will include a test of language skills for: English

Candidates can present a maximum of 12 publications

Dipartimento di Biologia Settore concorsuale: 05/12 - Microbiologia SSD: BIO/19 - Microbiologia n. 1 posto

Commitment regime: Full time

Principal Investigator: Prof.ssa Arianna Tavanti

Thematic Area: Green

#### Motivation consistency and compliance with the restricted thematic areas of Innovation or Green:

The present project perfectly integrates into "Green" research topics aimed at the environmental monitoring of greenhouse gases (CO2, NOx, CH4, SO2) associated to global warming. The use of microorganisms or microbial enzymes could represent innovative tools to develop multiplexed platforms or biosensors to simultaneously detect the presence of pollutant greenhouse gases.

#### Research title:

Development of a microorganism related multi-enzymatic electrochemical platform for the simultaneous detection of different greenhouse gases.

#### **Research topic:**

The climate change resulting from continuous and increasing release of greenhouse gases (CO2, NOx, CH4, SO2) associated to anthropogenic activities has a significant effect on the sustainability of life on our planet. In this context, the analysis and control of the generated greenhouse gases at their source is becoming a crucial information for the survival of the species. In nature, microorganisms exploit the presence of different enzymes to use greenhouse gases as the sole carbon source or as intermediates of their biochemical pathways (e.g. methane monooxydase). Taking advantage of the biochemical properties of microorganisms and their enzymes, in this project we propose the development of a multi-enzymatic electrochemical platform made of ecofriendly materials for the simultaneous detection of different greenhouse gases. Industrial, livestock farming, agricultural activities, just to mention a few, are known to release huge quantities of pollutant gases. In the present project, methane detection will be achieved by encapsulating the methane monooxydase enzyme obtained from Methylococcus capsulatus into a conductive substrate. Upon reaction with methane, the decrease of the O2 concentration will be revealed by the current flowing through the conductive substrate when a negative potential is applied. Similarly, other relevant microbial enzymes will be used as sensing molecules (e.g. Pseudomonas spp. NosP for NO detection, E. coli carbonic anidrase for CO2 detection, Thiospirillopsis spp. enzymes for SO2 detection). The combined information of multiple analytes and the potentiality of pattern recognition applied to the sensor array would greatly increase the device performance and applicability.

#### Specific teaching activities:

Research activity will be focused on morphological, genetical and physiological traits of microorganisms as a model for the study of biological processes. The role played by microorganisms in the environment will also be investigated by using general and applied methodologies, such as the biotechnological use of microorganisms for biosensor development.

#### Objectives for the scientific production:

Scientific production will be aimed at publishing scientific papers on peer reviewed international Journals with impact factor, at presenting research results at national/international meetings and at participating to national/international projects.

### Location of activities:

Department of Biology

### Specific teaching activities:

Teaching activity will follow BIO/19 sector themes, encompassing topics close to the proposed research project (microorganisms and biosensors) and will consist in lectures (3CFUs) and laboratory activities (1CFU) for students. Supervision of undergraduate and PhD students will also be included as well as seminar activities.

Internship in Private Companies:

Company: Metitech S.R.L. Number of months: 12

Date e time of the interview 23/11/2021 ore 11:30 (telematica)

### The interview will include a test of language skills for: English

Candidates can present a maximum of 15 publications

Dipartimento di Chimica e Chimica Industriale Settore Concorsuale 03/C2 - Chimica Industriale SSD CHIM04 - Chimica Industriale n. 1 posto

Commitment regime: Full time

Principal Investigator: Prof. Anna Maria Raspolli Galletti

Thematic Area: Green

### Motivation and agreement with the Green Innovation Area:

The project promotes the transition from fossil to renewable waste resources as starting materials for the production of chemicals and the adoption of green reaction conditions.

#### Research Title:

Green processes for the catalytic and bio-catalytic exploitation of waste industrial products in a perspective of circular economy

#### Focus of Research:

The research involves the preliminary characterization of the different waste materials from industrial processes, with particular attention to agrifood and tanning waste. These waste materials will be completely exploited by catalytic, bio-catalytic and thermochemical conversion for the production of platform chemicals, chemicals, solvents, biofuels, active carbons, hydrochars, which in most cases can be circularly employed also in the industry of origin. Agrifood waste will be exploited by extraction of antioxidant, antimicrobial, cosmetic substances, then polysaccharides and lignin will be completely converted adopting novel catalytic and bio-catalytic strategies. The reactions will be performed according to green chemistry rules, preferring water medium or bio-based solvents, if possible adopting novel microwave/ultrasonic reactors, non thermal plasma or ohmic heating. The synthesis of novel tanning or finishing agents by chemical and biochemical conversion of agrifood and tannery wastes will be studied.

#### Specific research activity:

Research activity in the field of renewables exploitation, studying alternative processes with low environmental impact and biotechnological processes. Study of chemical products, materials and process development, considering thermodynamic, kinetic, catalytic and technological aspects related to the synthesis of chemicals of industrial interest, to the process optimization and management and to the environmental impact and safety problems.

#### Goals of scientific productivity:

Publication of papers in high impact journals, book chapters and patents in the field of Industrial Chemistry and Green Chemistry.

#### Head office:

Department of Chemistry and Industrial Chemistry - University of Pisa

#### Specific didactic activity of the contract:

Teaching of courses of the academic discipline CHIM/04 (Industrial Chemistry) related to green chemistry topics.

## Research period in enterprise:

Enterprise: Laboratori ARCHA S.r.l. Number of months: 6

Date e time of the interview: 26 novembre 2021, ore 14:30 (telematica)

Candidates will be required to demonstrate an adequate knowledge of English language

Candidates may present a maximum number of 12 scientific publications, including PhD thesis.

Dipartimento di Civiltà e Forme del Sapere Settore Concorsuale 10/A1- Archeologia SSD L-ANT10 - Metodologie della ricerca archeologica n. 1 posto

Commitment regime: Full time

Scientific director: Maria Letizia Gualandi, Gabriele Gattiglia

Thematic Area: Green

#### Motivation, consistency and compliance with the restricted thematic areas of Innovation or Green:

The research aims to collect and process archaeological, ethnographic and paleoenvironmental data to support the development of local and broader planning aimed at conserving cultural landscapes. The project will produce useful information to understand better the dynamics of depopulation and abandonment of mountain areas, which have caused hydrogeological instability of the slopes and loss of biodiversity. The aim is to develop resilient strategies in view of the consequences caused by the climate crisis. Finally, the production of guidelines and proposals "bottom-up" will actively contribute to creating community strategies for the ecological transition based on the recovery of mountain areas and traditional land maintenance practices

### Research title:

Forsaken ecologies. Environmental archaeology and conservation of cultural landscapes in the Apuan-Versilian mountains.

#### Research theme:

The Apuan mountain, and in particular the Versilian slopes, are part of a multifaceted and polysemic territory, resulting from a process of abandonment that has triggered the disappearance of cultural landmarks and the ecological niches linked to them. The mountains are marked by the proliferation of long-lasting mining extractions, which have caused a strong environmental impact, with the loss of biodiversity and increased instability of the slopes. For this type of environment, characterized by a high vulnerability, the IPCC reports envisage scenarios in which extreme climatic events will induce severe erosion and hydrogeological instability, causing the loss of crucial cultural landscape elements.

The continuous renegotiations of the relations between human communities and the environment, which have always characterized the Apuan-Versilian slopes, can provide indications for envisaging future sustainable developments. The combined analysis of the material traces of anthropic activities, the situated knowledge of local communities and the paleoenvironmental evolution of the territory constitutes a powerful resource for promoting sustainable policies in mountain areas.

By developing transdisciplinary and diachronic maps, it will be possible to explore alternative territorial planning developed within the framework of sustainability of socio-ecological systems and the green transition. The work will follow a protocol that integrates (through qualitative and quantitative methods) archaeology, paleoecology, ethnography and participatory approaches to map environmental transformations, the tangible products of human action, and the set of intangible practices aimed at maintaining the cultural landscape. The archaeo-anthropological analysis of the forms of human settlement and the creation of participatory maps of local knowledge will be driving forces for experiences of landscape regeneration. The development of portable and non-destructive diagnostic systems for the study of paleoenvironmental proxies will allow better monitoring of ongoing changes and predictive modelling of the impact of environmental change on the archaeological record.

This process will help strengthen the pact between land and memory by constructing a shared sentiment of awareness and care for mountain areas in times of climate crisis, constituting a repeatable model that could be applied to other contexts.

### Specific research activities:

The scope of the research will concern studies relating to archaeological methods, with particular reference to specific methods of investigation such as archaeometry, computer application in archaeology, and other skills, including those of disciplines belonging to hard sciences applied in environmental archaeology

### Scientific products and goals:

- Participation in international scientific conferences
- Development of innovative protocols and investigation models that make use of portable diagnostic tools
- Production of scientific articles for international journals

- Organization of a workshop on the topics of "environmental humanities" and the contribution of environmental archaeology to the ecological transition

#### Offices for carrying out activities:

The University of Pisa- Department of Civilisation and Forms of knowledge, Offices of Miningful Studio srls (Pisa, Italia), Offices of Mazomos Landscape and Heritage Consultants BVBA (Damme, Belgio)

### Specific pedagogical activities:

The successful candidate will teach undergraduate and graduate courses in Archaeological Methods and Theory as lectures and seminars. He/she will be a co-teacher in the "Archaeological Methods and Theory" class with lectures dedicated to environmental archaeology and environmental Humanities in collaboration with foreign institutions.

### Research period in the company:

Company: Miningful Studio srls (Pisa, Italy) Number of months: 6

## Date and time of the discussion of qualifications and publications:

11/30/2021 h. 10.00 (online video conference)

Candidates will be required to demonstrate an adequate knowledge of English language

Candidates may present a maximum number of 12 scientific publications, including PhD thesis.

Dipartimento di Civiltà e Forme del Sapere Settore Concorsuale 11/A1 - Storia medievale SSD M-STO/01 - Storia medievale n. 1 posto

Commitment regime: Full time

Principal Investigator: Alma Poloni

Thematic Area: Green

#### Motivation and agreement with the Green Innovation Area:

This project aims to give historical depth to the phenomenon of geothermal exploitation, in view of the implementation of the 'green transition' and the increase in the importance of alternative energy sources. Even though the energy of the subsoil has been turning the turbines of the power stations in the sorroundings of Larderello just for a few decades, the crucial role of the fumaroles and the resources they produce (alum, vitriol, sulphur) is anything but recent. To bring to light the importance that these assets had in the Tuscan economy throughout the centuries could contribute to an informed use of geothermal energy, respectful of the environment, its specific features and its history.

#### Research title:

Persistent centrality. The geothermal area and its resources between the Middle Ages and contemporary times

#### **Research topic:**

The resources of the geothermal area in the territories of Pomarance, Castelnuovo Val di Cecina, Monteverdi Marittimo and Monterotondo Marittimo have been exploited for centuries. Before the take-off of the borax industry and the installation of power plants in the contemporary age, local inhabitants extracted from the fumaroles alum, vitriol, and sulphur, which were very much in demand by the Florentine woollen industry: in a single year, between 1434 and 1435, 32 tones of extracted raw material, destined for the cloth industry, passed through Volterra. The geothermal area was therefore a driving force in the economy of Medieval and Renaissance Tuscany (E. Fiumi).

The link between the fumaroles and textile manufacturing was so close that, according to some historians, it was the changes in the woollen industry that triggered the changes in the dynamics of use of the geothermal lakes. In fact, an entire ecosystem came into being around the geothermal lakes, in which settlements, the natural landscape and anthropic changes were based on what the subsoil had to offer. The Middle Ages were a crucial phase in the history of this area; by emphasizing the relationship between nature and man (R. Hoffmann), the most up-to-date research proposes to consider man as an integral element of the environmental context, linked to it by a two-way relationship.

This change in historiographical perspective can be linked to the new centrality of geothermal power stations. Recent studies (E. Palomo-Torrjón, E. Rosales-Asensio) suggest that extending the use of subsoil energy beyond the domestic sphere is not only an opportunity, but, thanks to the lower impact of this kind of energy, a real chance for economic revival. In a time of ecological transition, when geothermal energy is going to represent one of the forms of green energy supply that can support Italian industrial recovery, the historian's specialized skills can give an important contribution: a reflection on the importance of borax resources for Tuscan economy in the past centuries, in synergy with the Consorzio Sviluppo Aree Geotermiche (Cosvig), can increase the awareness of the communities affected by a possible further expansion of the geothermal power plants, and support the information campaigns designed to promote the understanding of geothermal energy among people.

Research activity concerns the wide chronological span that goes from the fifth to the fifteenth centuries. It is characterized by interdisciplinarity and a wide range of methodological approaches that take into account the characteristic European and Italian connotation of the discipline, but are also open to investigate the different aspects of European expansion and therefore the contacts with other cultures. It includes the historical study of political institutional, social economic and religious phnomena, and of gender, cultural and military relations in the Middle Ages.

### Scientific targets:

At least five original publications, in the form of journal articles, book chapters, research books or editions of sources.

### Location of activities:

Dipartimento di Civiltà e Forme del Sapere.

### Teaching:

Monographical courses (6 cfu) or series of seminars aimed at students and PhD students on the exploitation of borax resources, its economic consequences and the connected environmental transformations in the Middle Ages.

### Internship in Private Companies:

Enterprise: Co.Svi.G. (Consorzio per lo Sviluppo delle Aree Geotermiche) S.R.L, Via Tiberio Gazzei 89, 53030 Radicondoli (Si) Number of months: 6

#### Date e time of the interview:

November 25, at 10:00 a.m. (remote)

Candidates will be required to demonstrate an adequate knowledge of English language

Candidates may present a maximum number of 12 scientific publications, including PhD thesis.

#### Dipartimento di Economia e Management Settore Concorsuale 13/B5 - Scienze Merceologiche SSD SECS-P/13 - Scienze Merceologiche

n. 1 posto

Commitment regime: Full time

Principal Investigator: Prof.ssa Angela Tarabella

Thematic Area: Green

### Motivation and agreement with the Green Innovation Area:

The research project aims to analyze the environmental impacts of companies in the agri-food sector with a high digital content and to compare them with those of traditional companies operating without Industry 4.0 tools. The analysis will also include an assessment of the costs incurred over the entire life cycle of the product analyzed. The results of the research will make it possible to evaluate the mechanisms of green transition and conservation of the ecosystem as well as biodiversity thanks to advanced mechanisms applied to the agri-food sector, currently characterized by areas of uneven development both in terms of technology and the enhancement of human capital. The methodologies used (Life Cycle Assessment and Life Cycle Costing) allow the measurability of results and a more accurate assessment of the environmental impact of the panel of companies included in the research. The quantification of the results is the main step to evaluate the replicability of the business models of virtuous companies, the extension of the models to other similar realities in order to create conditions of resilience for overcoming the pandemic crisis and the start of structural growth of the agri-food sector thanks to smart digitalization.

### Research title:

The development of Precision Agriculture for the resilience and sustainability of the Italian agro-food sector

#### Research topic:

The application of LCA (Life Cycle Assessment) and LCC (Life Cycle Costing) analysis for the evaluation and optimization of the environmental and economic efficiency of various production processes in the agri-food sector in light of the growing rate of adoption of innovations technologies of Precision Agriculture models, increasingly pervasive within the Italian context. These tools constitute a strong methodological basis used by companies in order to enhance the management aspects for improving internal efficiency, communication with stakeholders and in the employee training process. The main purpose of the research project will be the comparison of different business realities that use Precision Agriculture application models to evaluate environmental and economic performance in relation to traditional agricultural models with a view to reducing environmental impacts and to favor the green transition process. In this scenario, the LCA analysis finds its application as a quantitative analytical methodology which aims to compare and analyze the environmental impacts of products, processes or services in accordance with the fundamental principles defined by the International Organization for Standardization, in the family of ISO 14040 standards. The application of the LCA methodology makes it possible to evaluate and quantify the impacts and energy loads associated with all phases of a production process, starting from the extraction and processing of raw materials, passing through the manufacture of the product, transport, use, reuse, storage, recycling, up to disposal. LCA analysis is a valid tool capable of identifying the potential environmental improvement of products at various stages of their life cycle, supporting strategic decisions in industry and in governmental and non-governmental organizations, selecting relevant environmental performance indicators, define territorial environmental marketing strategies through certification tools and assume a support function in the implementation of highly efficient innovative production processes and for industrial sustainability. The application of the LCC methodology completes the previous analysis and makes it possible to evaluate the costs along the entire life cycle of the product, from production to the disposal phase, a further strategic element for the evaluation of the feasibility of Precision Agriculture applications.

#### Specific research activities:

Research activities in the specific disciplinary fields of the selected sector. The sector includes scientific and teaching activities in the research field of the production of goods, products and services in the process that goes from the study, analysis and evaluation of resources to production and transformation technologies up to valorization and disposal of final products, with the consequent implications on innovation, quality and the environment, including certification management systems. It uses its own and specific research and analysis tools of a technical-economic and experimental nature, in an integrated and multidisciplinary approach.

### Scientific targets:

Articles published in qualified national and international journals and participation in conferences on Commodity Science issues.

### Location of activities:

Dipartimento di Economia e Management

### Teaching:

Teachings given on topics included in the SSD SECS-P/13 "Commodity Sciences", consistent with the SNSI and the PNR and, in particular, with the research areas included in the green thematic issues and focused on the themes of quality, innovation and sustainability in economic, social and environmental aspects.

#### Internship in Private Companies:

Impresa: Sfera Agricola SrL Numero di mesi: 8

#### **Research period abroad:**

Istituzione: Aalborg University (AAU) Numero di mesi: 6 (minimo 6 massimo 12)

#### Date e time of the interview:

29 novembre 2021 ore 10:00 (modalità telematica)

Candidates will be required to demonstrate an adequate knowledge of English language

Candidates may present a maximum number of 12 scientific publications, including PhD thesis.

Dipartimento di Economia e Management Settore Concorsuale 13/A1 - Economia politica SSD SECS-P/01 - Economia politica

n. 1 posto

Commitment regime: Full time

Principal Investigator: Simone D'Alessandro

Thematic Area: Green

#### Motivation and agreement with the Green Innovation Area:

The Ecoesione project aims at training specific skills necessary for the identification and selection of strategies for a "green" and fair recovery within the framework defined by the National Strategy for Sustainable Development, directly related to the social and economic impacts of the ecological transition in the national territory, and aspires to generate scientific impacts able to guide recovery and resilience plans in the medium and long term. Ecohesion also aims at the development of integrated and transversal interdisciplinary competences between economic, sociological and environmental analysis, related to various scientific fields. The expected results are measurable in terms of scientific publications, contributions to conferences and other dissemination tools, including active participation in academic and institutional debate.

The research contract guarantees a period of research in collaboration with Banca Etica, which has already developed in-house expertise in social and environmental impact analysis, offering the researcher the opportunity to analyze case studies and socio-economic contexts involved in the financing activities of the bank.

#### Research title:

Social Cohesion in the Ecological Transition (Ecohesion)

#### Research topic:

Environmental and climate policies have widespread social impacts, which can become barriers to the transition to a low-emissions economy. The Ecohesion project explores the relationship between these policies, behavioral changes, innovation within firms, and redistributive mechanisms in order to identify (i) potential social barriers and (ii) social policies to overcome them. The project focuses on three dimensions of social impact. First, the use of regulation and economic incentives has unpredicted effects on individual behavior, purchasing decisions, and lifestyles. These effects can be adverse to transition processes, delaying or inhibiting the adoption of pro-environmental behaviors. Second, by influencing the dynamics of innovation within companies, environmental policies produce a structural change whose social consequences are not easy to predict. These consequences are having and will have an impact on the quality and quantity of employment. Third, environmental policies entail potentially inequitable impacts in distributional terms, imposing high costs (or benefits) on some social groups and low costs (or benefits) on others. The inequalities thus generated involve not only economic parameters, but also the quality of life as a whole. The researcher will contribute to the development of the analysis of behavioral, social, distributional and welfare barriers to the ecological transition with the aim of developing tools to support decision-making and learning processes that are activated in private entities and public administration with which the research group has already established collaborations. In this perspective, the collaboration with the Ethical Finance Department of Banca Etica will offer to the researcher the opportunity to analyze case studies of companies and socio-economic realities involved in the financing activities of the Bank, pursuing the opportunity to integrate the assessment tools with the criterion of the effects of social cohesion, developing specific skills to the formulation of policy solutions related to the so-called "green recovery" and "just transition".

#### Specific research activities:

The research activity includes the study of economic phenomena at the micro-economic and macroeconomic levels, using inductive, deductive, static and dynamic methods. The fields of investigation will be the theory of the consumer, the firm, markets and general equilibrium; the macro-economic analysis of real markets; the examination of the historical-evolutionary process of the theories and methods of the disciplines in the field.

### Scientific targets:

Publications in prestigious journals and participation to national and international research projects

### Location of activities:

Dipartimento di Economia e Management

### Teaching:

Teaching courses in the field of "Economcs" (SSD SECS-P/01) and related courses activated in the courses of the Department of Economics and Management mainly related to ecological economics, sustainable development and behavioral economics.

#### Internship in Private Companies:

Company: Banca Popolare Ética Società Cooperativa per Azioni Number of months: 6

**Date e time of the interview:** November 25, at 10:30 a.m. (remote)

Candidates will be required to demonstrate an adequate knowledge of English language

Candidates may present a maximum number of 12 scientific publications, including PhD thesis.

Dipartimento di Economia e Management Settore Concorsuale 13/D1 - Statistica SSD SECS-S/01 - Statistica n. 1 posto

Commitment regime: Full time

Principal Investigator: Prof. Stefano Marchetti

Thematic Area: Innovation

### Motivation and agreement with the Green Innovation Area:

The project is consistent with paragraph "a.a" and "a.b" of "azione IV PON 2014-2020". It will have a positive impact on the Italian socio-economic environment, facilitating the education of experts to respond to the demand of innovation and competitiveness, proposing the jointly analysis and integration of big data and sample survey data. The goal of the project will be achieved by developing new methods that combine statistical models and machine and deep learning techniques. These new methods could be used by the private sector as well as public institutions, where the combination and integration of sample surveys data, population registers and big data could improve the knowledge obtained using traditional data science methods.

The aims of this research project are fully consistent with the SNSI and the PNR, because they facilitate innovation and transfer of competencies from research to production world. Innovation and transfer of competences can add value to the human capital, which is a determinant to develop research and innovation in Italy.

### Research title:

Statistical machine learning applied to complex survey sample

#### Research topic:

The researcher will carry out research on the topics of innovative methods of supervised and unsupervised statistical machine learning and deep learning methods, with particular attention to the field of sample surveys. In particular, the researcher will have to develop new prediction methods that combine the data from sample surveys with data of a complex nature (textual, functional data) and large dimension (big data, time series).

The results of the research will find wide application in numerous fields such as economics (for example, estimating the level of income and the level of poverty in unplanned domains), health (the prediction that a disease will develop based on parameters measured on the patient), and finance (for example, stock market prediction) which are typically characterized by heterogeneous, non-standard, large and often flow data. The contribution of research in the context of forecasting could result in a support system for public and private decision-makers.

The project foresees a period of 6 months to be spent at Propheta s.r.l. - innovative startup - which deals with prediction in the financial field. The researcher will have access to data of a financial nature and data of a complex nature (textual data) that he/she will have to combine to train the machine learning and deep learning models to produce predictions on the price trends of stocks. The developed models could also be used in other areas such as economic and health care with particular attention to the interpretation of the effect of the covariates on the outcome of the prediction.

#### Specific research activities:

The sector includes scientific and teaching-training activities in the research field of data analysis, design and implementation of sample surveys and experiments in various application sectors, for descriptive, interpretative and decision-making purposes. Therefore, it includes the theoretical and applied developments of descriptive, exploratory, inferential and decision-making statistics in their various fields such as: mathematical statistics, survey design and analysis of survey data, sample theory, the design of experiments, the analysis of multivariate data, time series and spatial analysis, reliability and statistical quality control, biostatistics, medical and environmental statistics. These developments also include computational statistics, the problems of management and processing of data and the applications of the methodology to both observation and experimental data.

### Scientific targets:

At least one publication in journals of recognized prestige, participation and at least one presentation of scientific work at national or international conferences, participation in national and international research projects. Development of specific software for the integration of data in socio-economic and financial applications.

## Location of activities:

Dipartimento di Economia e Management - Università di Pisa

### Teaching:

Teaching activity and tutoring to students of the courses of the scientific sector Statistics (SC 13 D/1 "STATISTICA" SSD -SECS-S/01 "STATISTICA") and/or the alike sectors, which are consistent with SNSI and PNR. In particular, the teaching activity will be consistent with the research topic "innovation".

### Internship in Private Companies:

Impresa: Propheta s.r.l. Numero di mesi: 6

#### Date e time of the interview:

November the 24th, 2021 at 10:00 a.m. (remote)

Candidates will be required to demonstrate an adequate knowledge of English language

Candidates can present t most 12 publications, including the PhD thesis if presented.

Dipartimento di Economia e Management Settore Concorsuale: 13/B1 - Economia aziendale SSD SECS-P/07 - Economia aziendale

n. 1 posto

Commitment regime: Full time

Principal Investigator: Riccardo Giannetti e Marco Allegrini

Thematic Area: Innovation

### Motivation and agreement with the Green Innovation Area:

The research proposes the development of a strategic and managerial control system for supporting technological innovation in start-ups starting from research and development up to the sale of innovative products and services. The research proposal has a cross-section impact with respect to key enabling technologies, since, with some adaptations, the developed model can be applied, for example, both in start-ups where digital technologies are implemented to promote the provision of innovative services, both in the case of technologies designed to create innovative, highly efficient production processes. The main expected benefits are a reduction in the risk of economic failure of technological innovation, the improvement of company competitiveness deriving from the organizational learning mechanisms implicit in the system and, consequently, greater resilience of companies with positive effects on employment.

#### Research title:

Development of a management control system to manage innovation in start-up companies

#### Research topic:

The project aims to develop a strategic and managerial control system (SCSM) to promote the value creation of technological (and business) innovation in start-ups (SU). SUs will be identified according to national legislation (D.L. 179/2012) and according to the criteria adopted in well-known international research (Davila & Foster, 2005, 2007). The SCSM will be developed taking into account three main aspects (Davila et al., 2015; Giannetti et al, 2021a;):

1) peculiarities of the SUs;

2) integration between the technological and the economic-strategic perspective;

3) promotion of the development of technological and managerial skills of the SUs.

(1) The SCSM will have an adequate level of complexity for the SU, in this regard it will be designed through theoretical approaches already tested in previous researches carried out in innovative small companies (Dello Sbarba et al., 2020; Giannetti et al., 2021a).

(2) The integration of strategic, technological and economic aspects will be achieved through a strategic analysis of the innovative technology that will make it possible to link the competitive positioning of the SU to the main cost and value drivers of technological innovation. This analysis will be useful for designing and governing a sustainable business model (Giannetti et al., 2016). In this phase, the logic and tools of strategic analysis (Bianchi Martini, 2009) and strategic management accounting (Bromwich, 1990; Tenucci, 2010) will be used.

(3) Control systems can represent an effective mechanism for promoting organizational learning (Giannetti et al., 2021b). Therefore, the SCSM will include mechanisms and processes suitable for promoting the development of the intellectual capital (human, relational and organizational) of the SU, with particular regard to technological and managerial profiles. The research will follow an interventionist qualitative approach (Dumay, Bard, 2017; Suomala Lyly-Yrjänäinena, Lukka, 2014), applied on multiple cases (Lee, Humphrey, 2017); at least three SUs will be involved.

The project will last three years, the expected outputs are:

- creation of an SCSM model suitable for the US and consistent with the above purposes;

- a report for each of the SU participating in the research, with the results of the experimentation of the SCSM in the SU;

- at least two papers to be presented at national and international conferences.

### Specific research activities:

The sector includes scientific and teaching-training activities in the context of the study of the main organization constituents and of the factors contributing to the long- term economic development of companies, considering profit, non-profit organizations and public administrations, including healthcare organizations.

The sector of Business Administration includes two closely linked research fields: the studies of business administration, which involve theories of the firm and of business groups, strategies and business policies, governance, analysis and design of business processes, business ethics, financial statements, business evaluation, auditing and consulting; the studies of Accounting which regard the evaluation, analysis and use of data to support decision making and control processes, accounting and financial statements (including financial auditing and financial analysis), accounting for decision making (cost analysis, planning and control), accounting history.

### Scientific targets:

Chapters in books and articles published in qualified national and international journals in the field of business administration.

#### Location of activities:

Dipartimento di Economia e Management

### Teaching:

Teaching courses in the "Business Economics" sector (SSD SECS-P / 07) activated in the teaching programs of the Department of Economics and Management, consistent with the SNSI and the PNR and, in particular, with the research lines included in the thematic of innovation.

## Internship in Private Companies:

Impresa: Indiana srl; Tocket srl; United Converting Tissue S.r.l. Numero di mesi: 6

## Date e time of the interview:

23st of November at 10:00 a.m. (remote)

The oral exam will verify the knowledge of the English language (it will be ascertained during the discussion of titles and publications)

Candidates may submit a maximum number of 12 (minimum 12) scientific publications including the doctoral thesis, if submitted.

Dipartimento di Farmacia Settore Concorsuale 03/D1 - Chimica e tecnologie farmaceutiche, tossicologiche e nutraceuticoalimentari SSD CHIM/08 - Chimica farmaceutica

n. 1 posto

Commitment regime: Full time

Principal Investigator: Prof. Marco Macchia

Thematic Area: Green

### Motivation and agreement with the Green Innovation Area:

The ecological transition represents one of the founding objectives of the Recovery and Resilience Plan (Mission 2); in this context, the C1 component "Sustainable agriculture and circular economy" aims to pursue two lines of action towards full environmental sustainability; one of these lines aims to develop a smart and sustainable agri-food supply chain, reducing the environmental impact in one of the Italian excellences, through green supply chain. This research project fits into this context.

### Research title:

Development of a technological platform for the study of the nutraceutical properties of biomolecules and biomaterials present in the waste deriving from the food supply chain

#### Research topic:

This project will be focused on the development of a technological platform able to connect, through a constructive loop, the world of companies with the scientific-university world, and then returning to companies for the exploitation of the achieved results. It will be carried out the study of the nutraceutical properties of biomolecules and biomaterials present in the waste deriving from the food supply chain, which can be valorized for their content of healthy substances and appropriately disposed of to protect the environment.

The platform will be created through a multidisciplinary approach of Big data analysis, target fishing and artificial intelligence models, with particular attention to the possible metabolism of the various substances. Hence, the development of methodologies for extraction, purification and characterization of the different components will be carried out, and the results obtained from these studies will be then validated on different experimental models (cells, isolated organs, etc.), also evaluating the metabolic activity, the absorption and interactions with transporters.

#### Specific research activities:

The study of natural, biotechnological, and synthetic products endowed with biological activity, developing their design and synthesis; the study of the properties, mechanisms of action at the molecular level and chemical-toxicological aspects; the use and relationships between chemical structure and biological activity of the main drug classes. Extractive and synthetic drug preparations, analysis of substances with biological activity (in particular drugs and their metabolites) are also studied.

### Scientific targets:

Gain full scientific independence, also through the supervision of BSc and MSc theses. Acceptance, during the three-year period, of an appropriate number of papers on international journals coherent with the scientific sector. Dissemination of the obtained results in national and international meetings, and on the web.

## Location of activities:

### Department of Pharmacy

### Teaching:

Teaching courses in BSc and MSc programmes of the Department Pharmacy and other Departments of the University of Pisa in which the SSD (disciplinary scientific sector CHIM/08) skills are requested.

## Internship in Private Companies:

Impresa: PharmaNutra Spa Numero di mesi: 6

**Date e time of the interview:** 2 dicembre ore 10 (remote)

### The interview will include a test of language skills for: English

Candidates can present a maximum of 12 publications

Dipartimento di Farmacia Settore Concorsuale 05E1 SSD BIO10

n. 1 posto

Commitment regime: Full time

Principal Investigator: Prof.ssa Eleonora Da Pozzo

#### Thematic Area: Green

#### Motivazione coerenza e rispondenza con le aree tematiche vincolate dell'Innovazione o Green:

La presente proposta si inserisce nella prima Componente della Missione 2 del PNRR, Rivoluzione Verde e Transizione ecologica, in cui ricade il tentativo di accelerazione della transizione ecologica verso l'economia circolare, migliorando la capacità di gestione efficiente e sostenibile dei rifiuti e degli scarti di lavorazione (M2C1 "Miglioramento della capacità di gestione efficiente e sostenibile dei rifiuti e avanzamento del paradigma dell'economia circolare", PNRR).

#### Research title:

Identification of new candidates for therapy of neurodegenerative proteinopathies, through the processing optimization of the plasma from donors.

#### Research topic:

Over 2.5 billion tons of waste are produced every year in the European Union; to address this, the European Commission presented, under the aegis of the European Green Deal, the action plan for a new circular economy, an economy model that extends the life cycle of resources, helping to minimize the production of waste. This project, for a RTDA profile, is part of this scientific segment as it has the goal to improve the management capacity of waste from biomedical production, to facilitate the paradigm of the circular economy (Sector C1 of the PNRR).

Indeed, the aim of the project will be to enhance the human capital dedicated to green research, offering the opportunity to conduct studies for the advancement of research in the biomedical sector, while following experimental procedures capable of reducing the environmental impact of the research itself. Specifically, the project aims to optimize the use of the plasma resource from donations, studying the possible therapeutic components that can be recovered from processing waste. The research, which will take place at the Department of Pharmacy of the University of Pisa and at the company Kedrion Biopharma, Italian leader in the plasma supply chain, will be oriented to the study of new therapeutic candidates for neurodegenerative proteinopathies (Alzheimer's, Parkinson's and Huntington).

Although the plasma proteome contains thousands of proteins, fewer than 20 therapeutic products are usually made from the industrial processing of human plasma. This process produces large volumes of waste fractions, which require high costs, high handling and high environmental impact. However, the waste fractions may contain other molecules useful for the biomedical sector, such as potential new therapeutic candidates of biological origin. The analysis of the components in the waste fractions, which can take place through proteomics techniques or by determining the presence of proteins of interest (based on the known plasma proteome reported in the human protein atlas), can, using bioinformatic approaches, lead to the identification of new therapeutic candidates. In this perspective, the waste fractions, normally waste from industrial processing, represent an opportunity to optimize the use of the plasma resource collected from donations, therefore also with a strong ethical and social value, as well as an opportunity to reintegrate waste in the production cycle, thus decreasing the environmental impact of the R&D activity, with a view to full environmental sustainability.

Specifically, the project aims first of all to identify, through appropriate bioinformatics and data mining approaches (conducted in collaboration with Prof. Paolo Milazzo, Department of Informatics, UniPI), new therapeutic candidates, who will then be isolated, if present, from the waste fractions of the plasma, during the period that the researcher will spend at the company. Subsequently, potential candidates will be tested in advanced cell models of neurodegenerative proteinopathies, obtained with mutagenesis and recombinant DNA techniques or with induced pluripotent stem cell differentiation. The use of these pathological models plays a crucial role in the advancement of research; the lack of use of adequate in vitro models, capable of mimicking the behavior of mature human neurons, is certainly one of the limiting factors in understanding the biochemical basis of neurodegeneration and related therapeutic strategies. The advanced cell models will be available at the Laboratory of Biochemistry and Molecular Biology of the Department of Pharmacy, UniPI.

### Specific research activities

Study of the biochemical basis of pathological states; study of biochemical methodologies for the identification, characterization and analysis of biomolecules; study of molecular and recombinant biotechnologies and biochemical and biotechnological applications in the medical, pharmaceutical, industrial and environmental fields.

### Scientific targets:

Publications of a congruous number of articles in international journals and patents consistent with the SSD. Collaboration in the supervision of degree theses. Dissemination of research results in national and international conferences.

### Places of activities:

Dipartimento Di Farmacia Kedrion Biopharma Spa

## Teaching:

Teaching courses requiring BIO/10 skills in the Bachelor's, Master's and single-cycle degrees activated at the Department of Pharmacy and at the other Departments of the University of Pisa. Courses on the specific project themes, such as advanced cellular models of neurodegenerative proteinopathies, processing techniques to obtain biomolecules from the waste of organic material processing or thematic lessons in doctoral courses.

#### Internship in Private Companies:

Impresa: KEDRION BIOPHARMA SPA Numero di mesi: 12

**Date e time of the interview:** 2 Dicembre 2021 ore 10:00 (remote)

#### The interview will include a test of language skills for: English

Candidates can present a maximum of 12 publications

Dipartimento di Filologia, Letteratura e Linguistica Settore Concorsuale 10/F3 SSD L-FIL-LET/13

n. 1 posto/i

Commitment regime: Full time Principal Investigator: Michelangelo Zaccarello Thematic Area: Green

### Motivation and agreement with the Green Innovation Area:

The coding and querying of textual *corpora* using web ontologies has proven to be an innovative method of guaranteeing quality and reliability in increasingly complex searches and reducing the "background noise" through the URI specification of such resources as web links. Reused or specifically designed, web ontologies are the most effective and productive means of storing scientific knowledge on literary texts; defined by Resource Description Framework (RDF) languages, digital resources are automatically processed in the context of an expandable semantic network. For years, UNIPI (in collaboration with the Pisa unit ISTI-CNR) has been at the forefront in promoting the semantic mapping of textual resources, starting with Dante's works - Latin and vernacular - (Dante Search, Dante Sources, Dante Medieval Archive, Hypermedia Dante network). An area in which standards have proved particularly effective is the study of sources and intertextuality, on which important results have already been internationally acknowledged, placing Pisa in a paramount position in the Italian context as regards the description of bibliographic resources by means of semantic tags.

#### Research title:

A semantic mapping of Medieval Italian Literature: the Tre Corone on the web.

#### Research topic:

In order to effectively express the shared knowledge on the authors cited or alluded to in the text, the project aims to expand the experience gained in the design and development of the HDN digital library and similar previous applications of descriptive languages based on web ontologies, such as the Dante Sources tool on Dante's minor works. We can reasonably expect that, in the aftermath of Dante's centenary, this and other initiatives of UNIPI may on the one hand perpetuate the interest of a public not only specialized in the "Comedy", on the other consolidate the eminent role of the University of Pisa both in Dante studies and in humanistic computer science in general. At the heart of the semantic mapping of ancient texts lies the definition of valid categories that define their relationships in a way that is understandable to artificial intelligence, that is, in terms of logical inferences. For example, intertextual relations can present themselves as quotations, direct allusions or interdiscursive phenomena (i.e. generic concordances), and decisive in this sense is the point of view of the ancient or modern commentator (i.e. the source text, which recognizes and establishes the relationship between the texts). Through the adaptation of categories already formalized in the main repertoires and / or the formulation of new ontologies, the research aims to define an articulate grid to define not only the various forms of intertextuality, but for example the rhetorical and stylistic strategies implemented by the authors (parallels, metaphors, similes etc.). Thus, our research intends to experiment the adaptation of the tool built for HDN to different Italian literary corpora, using the specific ontologies experienced there on the basis of the existing repertoires (CIDOC\_CRM, FRBRoo, DublinCore). At the same time, it will help us test and adapt the existing tool to represent increasingly complex forms of knowledge about Dante's poem, according to the logical elaboration of the assertions contained in the relative comments. Once the HDN tool has been developed and expanded in this sense, the RTD fellow will have the task of testing its application to other authors and works, starting with Boccaccio and Petrarca, where the textual basis is more varied and diversified (literary genre, metrics, language) but more manageable (and mainly modern) is the commentary tradition.

## Specific research activities:

The RTD fellow will develop research on texts produced in Italy from the Middle Ages, with special attention to Dante's works and the literary productions of Humanism and Renaissance, written in the languages of cultures of Western Europe and analysed with predominantly philological method in order to attain a full reconstruction of their textual and literary tradition.

### Scientific targets:

Thanks to the lessons learned in designing and developing an expandable semantic network, we shall implement ways of automatic processing of the inferential relationships between the resources described using the data input tool (which uses languages from the Resource Description Framework family such as OWL). In this way, the development process of the semantic network is promises to help design and build high-quality digital libraries, and the consequent definition of perfectly communicating virtual study environments, ideal for teaching and research. Buinding on HDN's experience of semantically mapping Dante's poem, the RTD researcher will apply its standards to the work of Giovanni Boccaccio (1313-1375).

### Location of activities:

Dipartimento di Filologia, Letteratura e Linguistica - Università di Pisa

### Teaching:

Semantic Markup of Digital Resources for Early Modern Italian Literature in Degree Courses and PhD Courses of the FiLeLi Department.

### Internship in Private Companies:

Impresa: FabricaLab - Firenze

Numero di mesi: 6

## Date e time of the interview:

martedì 30 novembre ore 15:00 (telematica)

## The interview will include a test of language skills for: English

Candidates can present a maximum of 12 publications

Dipartimento di Informatica Settore Concorsuale 01/B1 SSD INF/01

n. 1 posto

Commitment regime: Full time

Principal Investigator: Alessandro Lenci

Thematic Area: innovation

# Motivation and agreement with the Green Innovation Area:

Today, the digital universe is populated with unstructured contents consisting mainly of texts and images. The research, analysis and interrogation of these materials requires the availability of Artificial Intelligence tools equipped with advanced linguistic knowledge, supplemented by "multimodal reasoning" capabilities. The international state of the art is represented by transformer-based multimodal neural language models that extract general knowledge from large amounts of data, and then specialize it in solving specific tasks. The lack of such tools for Italian prevents the development of innovative applications. Furthermore, it is still unclear which linguistic and visual characteristics are learned by deep neural networks, nor how these are affected by i) common-sense knowledge and ii) dynamic information sources.

## Research title:

Multimodal semantic models for industry 4.0 and digital humanities

# Research topic:

GOALS. Development of a multimodal neural framework for Italian, specialized through transfer learning methods on the following tasks: i) visual question answering, to answer questions in natural language on visual inputs (e.g., the question "What object is on table?" must produce an answer based on the recognition of the objects in the image and their spatial relationships); ii) multimodal inference, to verify inferential relationships between texts and images (e.g., the image of a glass on the table contradicts the sentence "There is a container under the table"). To achieve these main goals, i) different probing tasks will be designed in order to identify the semantic information encoded by multimodal models, and ii) aspects of continuous learning will be explored to update predictive models with respect to different tasks and data distributions.

INNOVATION. The innovative impact of the project concerns both industry 4.0, to develop systems that can rapidly verticalize itself in various business areas, and the digital humanities sector, to develop applications for querying the textual and iconographic cultural heritage.

## Specific research activities:

Research activities will be conducted in the fields of the academic discipline INF/01 Informatics with particular focus on describing, design and development of machine learning models. Research will aim at developing the techniques of Deep Learning for computational linguistics, aiming in particular

at integrating textual and visual data. Specific areas of investigation include transfomer-based multimodal neural language models for visual question answering and multimodal inference.

# Scientific targets:

1. publication of the research results in peer reviewed international journals and in the proceedings of the main conferences of computational linguistics (e.g., ACL, EMNLP)

2. development of software prototypes for visual question answering and multimodal inference that will be engineered by Bnova srl

# Location of activities:

Dipartimento di informatica

# Teaching:

Consistently with the themes of research and innovation, the teaching activity will be carried out in the courses of Computational Linguistics I and II within the bachelor and master degree in Digital Humanities (Informatica Umanistica) and the master degree in Linguistics and Translation.

Internship in Private Companies: Impresa: Bnova srl Numero di mesi: 6

**Date e time of the interview:** 2 dicembre 2020, ore 10

## The interview will include a test of language skills for: English

Candidates can present a maximum of 12 publications

Dipartimento di Fisica Settore Concorsuale 02/B2 SSD FIS/03

n. 1 posto

Commitment regime: Full time

Principal Investigator: Maria Luisa Chiofalo

Thematic Area: Green

#### Motivation and agreement with the Green Innovation Area:

Il progetto di ricerca riguarda sistemi avanzati di modelling indirizzati all'agricoltura del futuro, ai sistemi bio-based ed alla rigenerazione dei suoli, e come tale rientra pienamente nelle tematiche di interesse per la transizione verde e la sostenibilità ambientale, come anche rientra nelle tematiche menzionate nel PNR e nella SNSI.

#### Research title:

New quantum-inspired models and algorithms to enhance bio-based systems and catalytic processes with application to future sustainable agriculture technologies

#### Research topic:

The research work aims at developing integrated methods for the modelling of environment-relevant problems, with special regard to advanced systems addressing future agriculture. As a highly innovative tool, the research will use quantum computers - though presently limited in qubits and reliability associated to variational algorithms, which is at the heart of the mission of Algorithmiq, the company that will host the researcher. Among the applications that are conceptually accessible with such a combined methodology, are materials engineering to capture and transform  $CO_2$  or to store energy in a sustainable manner, and achieving molecules relevant for environmental applications with reduced time-span and costs. The long-term goal of the research concerns the production of fertilizers that be more efficient and less polluting than the artificial ones, which indeed exhaust about the 2-3% of the planet energy resources in front of the crucial need for food. Diverse catalytic nitrogen-fixing processes would be modelled, and the resulting knowledge exploited to engineer new molecules that mimic the natural process, with its efficiency and effectiveness. In fact, this is an emerging strategy in the design of molecules of interest in biology, the so-called biomimicry. Part of this frontier research work, highly interdisciplinary, will be devoted to investigate via coarse-grained models the existence of quantum coherence effects in biological systems, after combining theoretical, experimental, and applied knowledge. The existence of such effects can be enhanced by the presence of noise under given conditions, as emerging from open quantum systems studies, and it is relevant for the energy transfer in photosynthesis, as it has been observed via new experimental techniques combined with quantum theoretical and simulational methods: the results of such investigation might be exploited to design new bio-based systems in the more general context of the new technologies for sustainable agriculture.

#### Specific research activities:

Research activities in the fields of the academic discipline 02/B2

## Scientific targets:

Contributions beyond the state of art of the research in the field, with focus in the specific research theme and in modelling of advanced systems addressing future agricultural technologies, bio-based systems and soil regeneration. Gaining of scientific independence, possibly including the supervision of BSc, MSc, and PhD theses. Research papers in peer-reviewed, international journals. Dissemination of the results of the performed research in national and international conferences. (in inglese)

### Places of activities:

Dipartimento di Fisica, Università di Pisa e Algorithmiq Oy

### Teaching:

Courses on basic physics and specialist courses in the SSD sector to which the researcher belongs

### Internship in Private Companies:

Impresa: Algorithmiq Oy, Linnankatu 55 K 329, 20100 Turku, Finland Numero di mesi: 6

### Date e time of the interview: 3 Dicembre 2021 ore 9:00 (remote)

### The interview will include a test of language skills for: English

Candidates can present a maximum of 12 publications

# Dipartimento di Giurisprudenza Settore Concorsuale 12/D2 – Diritto tributario Ssd IUS/12 - Diritto tributario

n. 1 posto

Commitment regime: Full time

Scientific coordinator: Brunella Bellè

Thematic Area: Green

### Motivation, consistency and correspondence with the Green's restricted thematic areas

as expressly stated by the initiatives contained in the Green Deal of the European Commission and through the proposals of the new CAP 2021-2027, the efficiency, the increase of the sustainability of the productions and the pursuit of an economy that is increasingly circular and green are objectives that have become cornerstones in European policies. Hence, for individual countries, the urgency and need for a general rethinking of the tax systems which are now entrusted with the task of contributing to common objectives through the adoption of solutions capable of enhancing the environment, territory and agricultural activities aimed at promoting sustainable development. From this perspective, the research topic identified certainly appears to be coherent and responsive to the issues identified by Ministerial Decree 1062..

### Research title:

Green deal: fiscal policies and sustainable development of agricultural enterprises

### Research topic:

Environmental protection has affected our legal system only recently, when the Kyoto Protocol and, more generally, European legislation began to exert a decisive impulse on the issue. The Italian Constitution does not specifically focus on the subject, but in recent years the institutions have shown a growing attention to the agricultural sector, with the aim of developing sustainable production through conservation and growth policies, in harmony with the evolution of techniques and markets, while not forgetting to protect farmers. Faced with a changed reality, the tax system has remained anchored to past schemes: on the one hand, there are a series of so-called environmental revenues, which only indirectly perform the function for which they are assigned. These are real taxes, compliant with the principle of ability to pay, which pursue the further objective of protecting the environment. With some exceptions that identify the prerequisite of the performance in the material fact that determines a possible environment ascertained, through a redetermination independent of a greater economic capacity. On the other hand, the link between green protection and the tax system is manifested by the encouragement of activities aimed at protecting the environment, through various instruments. Tax concessions, in particular, are legitimized by needs external to the levy and act as an instrument of reconciliation between constitutional values of equal rank, which justify the removal of de facto inequalities, through differentiated tax treatment. Environmental protection is thus pursued through a different propensity to contribute by taxable persons dependent on the various social costs associated with the promotion of sustainable development. It appears evident, therefore, how the tool, in conjunction with the various contributions of different character, is considered as a lever and an opportunity for a restructuring and modernization process of Italian farms. Aimed at improving efficiency, increasing the sustainability of production and the pursuit of an increasingly circular and green economy, objectives that now serve as European political cornerstones, as stated by the initiatives contained in the Green Deal of the European Commission and through the proposals of the new CAP 2021-2027.

## Specific research activity

The research activity, which cannot disregard the studies relating to the financial administration of the State, the Regions and the local public bodies, with particular reference to the taxation regime, as well as those

relating to the sanctioning, procedural, Community aspects, international and comparative matters, however, will mainly focus on the study of the tax system intended as an essential tool for starting a process of restructuring and modernization of farms with a view to making them more efficient and increasing sustainability of production, in the context of a circular and green economy.

### Scientific productivity goals;

Monographs, contributions in volumes and articles in qualified national and international journals, participation in conferences and seminars.

## Location of activities:

Department of Law

### Specific didactic activity of the contract

The overall annual commitment for the performance of supplementary teaching and student service activities is 350 hours (full time). The researcher is required to carry out the program of activities that will be defined annually by the Department during the didactic planning, in compliance with the provisions in force for the attribution of teaching tasks to university professors and researchers. The researcher will carry out his teaching activity in the context of the teachings present in the three-year master's and single-cycle master's degree programs offered by the Department of Law, also in English, paying particular attention to the topics covered by the specific research activity, recalling in the context of individual courses, the theme of green. The researcher will also be required to contribute to the supplementary and service activities to students and to the activities related to the preparation of the final exam for graduation. He may possibly carry out organizational tasks within the Department of Law.

## Research period in the company

Company: Tenuta la Casetta simple agricultural company

Number of months: 6 months

#### **Research period abroad:**

6 mesi

## Date and time of the discussion of qualifications and publications:

December 3, 2021 ore 10:00

The oral exam is aimed at ascertaining the knowledge of the language: English

Candidates can submit a maximum number of **12** scientific publications, including the doctoral thesis if submitted.

Cod. RIC2021PON\_A17

Dipartimento di Giurisprudenza Settore Concorsuale 12/C1- Diritto costituzionale SSD IUS 09 - Istituzioni di diritto pubblico

n. 1 posto

Commitment regime: Full time

Principal Investigator: Prof.ssa Elisabetta Catelani

Thematic Area: Green

### Motivation and agreement with the Green Innovation Area:

The research is fully integrated into the green sector in order to provide guidance for the European, state and regional regulatory activity while taking also into account the relevant corporate context.

### Research title:

Green revolution and ecological transition: between public policy and the new social contract

### Research topic:

The research aims at investigating not only the impact of the principles of sustainable development and ecological transition on the management of public services, but also the possible adoption of new models of production of sources of law (experimental clauses, regulatory sandbox): a new governance of the economy supporting the ecological transition and becoming an instrument for protecting the planet and future generations. In particular, moving from the notion of "sustainable development" developed in the past and taking into account the inconsistencies of environmental protection both at economic and legal level, the research aims at suggesting in an innovative way to approach the issues of ecological transition in the light of the sustainable development goals now encouraged by the National Recovery and Resilience Plan (Piano Nazionale di Ripresa e Resilienza, NRRP), focusing in particular on technological innovation. The notion of sustainable development was in the beginning conceived in the international landscape as a right inherent in sovereignty and related to the independence of developing countries (Stockholm, 1972). It has subsequently become a criterion of social justice, or rather as an oxymoron for economists and jurists of classical approach (Brundtland 1987). It satisfied the rule of law (Aarhus 1998) and in the 2015 Paris Agreement it was conceived as the human and inalienable right to a healthy environment. This evolution was even more significant at the EU level, where a notion of administrative and procedural sustainable development - art. 3, par. 3, TEU - has been expounded in several directives on environmental impact assessment, waste, energy and circular economy. The most interesting transformation of the idea of sustainable development, however, took place in 2019 with the adoption of the Green Deal, an agreement with the same strength of the financial constraints of the EU economic government and of the Stability and Growth Pact. This approach has been followed by the national legal system, in particular by art. 1 bis, d.l. 111/2019, which starting from January 1, 2021, replaced the CIPE - the core institution of the government of the economy - with CIPESS, the Interministerial Committee for Sustainable Development. Therefore, the sustainable development, in connection with the digital transition and the use of emerging technologies, as a cornerstone of the government of the economy and the transformations of the European Union fiscal rules deserve to be thoroughly analysed by legal scholarship, also within Mission 2 of the NRRP.
Joining the study of the issues concerning the adoption of innovative sources of the law with the needs of companies which work for the environment, even in the light of new technologies.

#### Scientific targets:

Scholarly works on the research topic and publication of a monograph on public/constitutional law

#### Places of activities:

Universita' Di Pisa

#### Teaching:

The overall annual commitment for supporting teaching and student assistance is 350 hours (full time). The researcher is required to carry out the program of activities that will be defined annually by the Department within its teaching program, in accordance with the regulations concerning the teaching duties of professors and researchers. The researcher will carry out his teaching activity - both in Italian and English - within the courses of the three-year master's and single-cycle master's degree programs offered by the Department of Law. The researcher will also be required to contribute to the supplementary activities for students and to the supporting activities for the preparation of the final dissertation and exam. He/she might also carry out organizational tasks within the Department of Law. He/she will also be involved in educational activities designed for companies, as well as to local institutions

# Internship in Private Companies:

Imprese: Belvedere S.p.A.; Acque S.p.A.; Alia Servizi Ambientali S.p.A.; REVET S.p.A.

Numero di mesi: 6

# Date e time of the interview:

30/11/2021 ore 12,30 in via telematica

The oral exam will ascertain proficiency of the English language

Candidates may submit no more than 14 scientific publications, including the PhD thesis, if submitted

Dipartimento di Informatica Settore Concorsuale 01/B1 - Informatica SSD INF/01 Informatica

n. 1 posto

Commitment regime: Full time

Principal Investigator: prof. Antonio Brogi

Thematic Area: Green

#### Motivation and agreement with the Green Innovation Area:

The Italian national development plans clearly indicate the need to invest resources to improve and increase the competitiveness of the country, pursuing objectives of energy efficiency and environmental sustainability, combined with technological innovation, thus contributing to a green, digital and resilient recovery and overcoming the effects of the crisis in the context of the COVID-19 pandemic, as foreseen by REACT-EU. This project targets the green and sustainable management of the life-cycle of applications within fog/edge ecosystems, pursuing the development of methodologies for the so-called "green ICT".

In this regard, the project is in line with the objectives set by the National Research Plan 2021-27, with particular reference to the area "5.4.1 Digital transition - i4.0" (art. "5 Networks of intelligent systems"), by investigating the "dynamic optimization of edge/fog network systems", and to the area "5.4.3 High performance computing and big data" (art. "3 Distributed and decentralized computing and data, for IoT, i4.0 and social and network"), by investigating the "development and standardization of processes for managing the life cycle of fog/edge ecosystems" and "environments and software frameworks for the development of applications for IoT devices to be coupled to cloud resources and fog/edge nodes".

In addition, the project contributes directly to the National Strategy for Intelligent Specialization's objectives for the national theme area "Smart and sustainable industry, energy and environment" and combines "productive development with environmental sustainability and technological innovation", also including a research period of six months in a company in the sector. More generally, the project responds to the need to enable the (energy- and QoS-aware) deployment and management of innovative IoT applications (e.g., Smart City, AR / VR, remote surgery) related to other objectives envisaged by the national and European recovery plans (e.g., sustainable mobility, transition 4.0, health). Therefore, considering the numerous strategic application areas, the results of the project will also indirectly contribute to the objectives set for the national theme area "Digital Agenda, Smart Communities, Intelligent Mobility Systems".

Finally, the objectives of the project are related to objectives 7, 8, 9, 11 and 13 of the "UN Agenda for Sustainable Development".

#### Research title:

Energy-aware management of software applications in Cloud-IoT ecosystems

#### Research topic:

Next-gen applications will leverage Internet of Things (IoT) devices and will consist of various services. These will have to be deployed on large-scale, heterogeneous, and pervasive distributed infrastructures, which will connect the Cloud to the IoT, through multiple fog/edge "layers" capable of (pre)processing the collected data. The deployment of applications must meet all their (hardware, software, IoT, QoS) requirements and, at the same time, reduce energy consumption as much as possible: (i) by combining the use of the Cloud with the use of fog/edge resources close to the IoT, (ii) by reducing energy consumption related to the transmission of data to "central" Clouds and (iii) by preferring the use of devices powered by renewable energy sources. The study of methodologies capable of describing the requirements, including energy requirements, of each application and the resources available on Cloud-IoT infrastructures will therefore be crucial to decide on the energy-aware management of Cloud-IoT ecosystems.

The project aims at applying automated reasoning techniques to decide on which Cloud-IoT nodes to deploy the services of one or more next-gen applications. Suitable models will be exploited to estimate the load, energy consumption and carbon emissions to reduce the impact due to the use of nodes and data transmission. The proposed methodologies will thus pursue the joint objectives of making application deployment sustainable and, at the same time, ensuring meeting application requirements and satisfactory performance for end-users. By exploiting the incremental properties of automated reasoning, the proposed methodologies will also be oriented towards containing energy consumption, requiring reduced computational resources to make even complex informed decisions.

The project aims at contributing to increasing the competitiveness of the country by pursuing objectives of energy efficiency and environmental sustainability, combined with objectives of technological innovation. More generally, the project will contribute to the enabling of next-gen applications (e.g., Smart City, AR / VR, remote surgery) related to other objectives set by national and European recovery plans (e.g., sustainable mobility, transition 4.0, health).

#### Specific research activities:

Research activities in the fields of the academic discipline INF/01 Informatics, according to the sector declaration, with reference to the description, design, and development of methodologies to support the energy-aware software management in fog/edge ecosystems. Development of automated reasoning techniques that enable the life-cycle management of distributed applications in a sustainable way and in compliance with their functional and non-functional requirements with demonstrations on real use cases. Areas of investigation include green and sustainable software engineering, distributed and decentralized systems, and automated reasoning applications to complex systems.

As reported in the declaration of the SSD INF / 01, the sector covers scientific and teaching/training activities in the fields of computer science research and information theory, as the bases of the informatics approach to the study of problems and, jointly, to the design, production and use of computer systems for innovating society. Particular attention is paid to the method, based on modeling, formalization, and experimental verification. Therefore, the sector includes, alongside all the basic and general aspects, the logical, semantic, methodological and algorithmic foundations (design and analysis of algorithms, computability and complexity, information theory, codes and cryptography) of information technology, therein including classical and quantum computational models; the skills necessary to model and design (in an adequate way from a logical, technical and economic viewpoint) computers, distributed systems, networks, telematic systems (reliability, performance and security of computer and telematic systems), languages (environments and methodologies of programming, software engineering), information systems, databases and information access systems. Finally, the sector includes the application and experimental areas related to the innovative uses of information technology, such as image and sound processing, recognition and artificial vision, neural networks, artificial intelligence and soft computing, computational simulation, computational graphics, user-computer interaction, and multimedia systems.

The competences of this sector concern the methodologies and tools of information technology that provide the conceptual and technological basis for the variety of applications required in the Information Society to enable individuals and organizations, and private and public companies, organizing, managing and accessing information and knowledge; they also concern all the institutional aspects of basic IT.

#### Scientific targets:

Contributions to the advancement of the state of art in Computer Science by means of international publications with a focus on the research fields framed by the project.

#### Location of activities:

The activities will take place at the Department of Computer Science, except for the research period in the company.

The duties of the role include delivering teaching to all levels of students (undergraduate and graduate) of the academic discipline INF/01 - Computer Science.

The scientific director of this project has proposed on October 7<sup>th</sup>, 2021 to activate a specific course of 6 ECTS on "Green computing", as an elective course for the BSc Degree in Computer Science, whose approval will be decided in the next meeting of the Board of the BSc and MSc degrees in Computer Science of the University of Pisa.

# Internship in Private Companies:

Impresa: Extra Red SRL, via Salvo D'Acquisto 40/P, 56025 Pontedera Numero di mesi: 6

## Date e time of the interview:

23/11/2021 ore 9 (telematica)

# The interview will include a test of language skills for: English

Dipartimento di Informatica Settore Concorsuale 01/A6 -SSD MAT/09 -

n. 1 posto

Commitment regime: Full time

Principal Investigator: : Antonio Frangioni, Laura Galli

Thematic Area: Green

#### Motivation and agreement with the Green Innovation Area:

The project is completely aligned with the issues envisaged by the Ministerial Decree 1062/2021, with particular reference to the "Green" ones, for the following reasons:

- The required RTD-A position is in the Operations Research area at large (Settore Concorsuale 01/A6, Settore Scientifico-Disciplinare MAT/09), which studies mathematical optimization methods whose importance in the efficient management of energy and logistics systems for the purpose of reducing emissions is widely recognized (see, among many others, http://www.energy-opt.eu).
- The required RTD-A position has to be viewed in the context of the multi-decades research collaboration between the Department of Computer Science of the University of Pisa and M.A.I.O.R. S.r.l., an "ante litteram" spin-off of the Department which, in over 30 years of activity, has attained a dominant position in the national market of Decision Support Systems for Local Public Transport companies, with a growing international projection, This guarantees that a highly relevant company is involved in the definition of the research lines; combined with the high scientific quality of the researchers of the Computer Science Department of the University of Pisa this guarantees the RTD-A access to highly qualified operational and scientific structures for carrying out her/his research activity, in the context of a broad and stable collaboration between the University and the company. The existing agreement, already utilised in several previous joint projects between the Department of Computer Science of the University of Pisa and M.A.I.O.R., also provides a clear and stable regulatory framework for the exploitation of the research results and the protection of Intellectual Property for all actors involved.

The research aims at increasing the efficiency of the Local Public Transport systems managed by M.A.I.O.R.'s customers through the development of innovative algorithms capable of more effectively and efficiently solving the complex optimization problems that arise in planning and management of those systems. Even incremental improvements in M.A.I.O.R. products due to the enhanced algorithms developed within the project may, when viewed in the context of the many involved operators and a long time horizon, help in significantly curtailing the emissions produced by LPT. This is all the more relevant as the optimization problems to be solved are becoming more and more challenging due to the technological evolution of TPL systems (electrification, integration of micro-mobility elements, in perspective autonomous vehicles). The ability to respond to these challenges with appropriate improvements in the algorithmic methodologies is crucial for M.A.I.O.R. to maintain and consolidate its position as one of the country's technological excellences in this field, thereby also contributing to the digital transition objectives of the PNRR. Above all, this will allow M.A.I.O.R.'s existing and future customers to offer their users a service that better satisfies their fundamental mobility requirements while safeguarding economic and environmental sustainability. thereby ultimately increasing the share of transportation demand intercepted by the LPT. All this therefore has the potential to trigger a virtuous cycle in which the economic and organizational resources freed by the use of M.A.I.O.R. products allows the improvement of the Quality of Service the LPT systems, thereby leading to a decrease in emissions both through the decarbonisation of the LPT vehicles themselves and through the reduction of transport with own vehicles, typically much less efficient and with much higher emissions. All this has a clear relevance for the horizontal priorities established by the PNRR, mainly the fight against climate change of anthropogenic origin but also the quality of life and social inclusiveness in urban centers.

# Research title:

A contribution to greenhouse emissions reduction by a more efficient Public Local Transport

# Research topic:

The Computer Science Department of the University of Pisa (DI) has a long-standing collaboration with M.A.I.O.R. S.r.l., which in over 30 years has attained a prominent position in the national and international market for support software to Local Public Transport companies. A crucial component of this software is a suite of algorithms for the solution of the optimization problems that arise in the efficient planning and management of LPT systems. These problems, which have always been complex, are becoming more and more challenging due to a confluence of factors relating to current (electrification, micro-mobility) and future (self-driving, possibly flying, vehicles) technological developments. Addressing these challenges, thereby allowing M.A.I.O.R. to consolidate its role as a technological excellence, requires the development of methods and algorithms that improve with respect to the state of the art, using a combination of techniques such as decomposition methods, column generation, implicit enumeration, and others. The research will focus on some of the several required algorithmic techniques, possibly exploiting the SMS++ software framework developed by the DI for the solution of large-scale optimization problems with multiple nested structures. As such, the project combines a high scientific value, due to the complexity of the problems addressed, with the potential for a significant reduction in emissions due to individual mobility together with an increase in the quality of life in urban centers.

# Specific research activities:

As customary for research positions within the Operations Research area (Settore Concorsuale 01/A6), the research activity will address decision-making processes in organized systems (with particular focus to, but not exclusively, those relating to Local Public Transport): models and methods for predicting the behavior of such systems, evaluating the consequences of given decisions, and identifying the decisions that optimize their performance, using methodologies such as optimization theory and algorithms and graphs and network flow theory. The problems under study have several applications, including production, transportation, distribution and logistic systems as well as planning, organization and management of activities and projects. The research considers all the different phases that characterize the decision-making process: the definition of the problem, its mathematical formalization, the formulation of constraints, objectives and action alternatives, the development of solution algorithms as well as their implementation, evaluation and certification. Besides the methodological and theoretical aspects, the research will focus on the development of efficient and well-engineered software implementing the proposed approaches for the solution of either large-scale structured optimization problems or of sub-problems with specific structures that can result from the application of algorithmic methodologies (decomposition, implicit enumeration, large-scale local search, ...) to the original problems. A proper balance will be struck between the development of algorithms for general classes of problems and for the specific problems encountered by M.A.I.O.R. within planning and management (operational and real time) of Local Public Transport systems.

# Scientific targets:

Publications in high-quality international journals and book chapters, related both to mathematical optimization methodologies and to the several possible application fields, such as logistics and transportation. Dissemination of the scientific results via presentations at high-profile national and international conferences, related both to mathematical optimization methodologies and to the several possible application fields, such as logistics and transportation. Possible application fields, such as logistics and transportation. Possible application fields, such as logistics and transportation. Possibly, release of the developed software under appropriate open source licenses.

# Location of activities:

Dipartimento di Informatica, Università di Pisa.

# Teaching:

Bachelor or Master course in the field of Operations Research at large, to be decided in the context of the overall planning of the courses of the area. Ideally this should be an advanced (Master) course related to practical applications of optimization methodologies, such as "Optimization for Decision Support Systems" (Master of Management Engineering), as this would allow to better exploit the skills related to improving the efficiency (organizational, economic and ecological) of logistics and production systems developed during the research, and would therefore be maximally consistent with the the "green" issues envisaged by the Ministerial Decree 1062/2021. The activation of a specific complementary course in Engineering or Computer Science is currently under discussion. However, a more basic or methodological course could also be appripriate in view of the necessary methodological component of the research.

# Internship in Private Companies:

Impresa: M.A.I.O.R. S.r.l., con sede in Lucca, Via San Donato 512 - P.IVA 01319860464 Numero di mesi: 6

# Date e time of the interview:

22 / 11 / 2021, ore 9:00 (telematica)

# The interview will include a test of language skills for: English

Dipartimento di Informatica Settore Concorsuale 01/B1 - Informatica SSD INF/01 - Informatica

n. 1 posto/i

Commitment regime: Full time

Principal Investigator: Davide Bacciu

Thematic Area: Innovation

#### Motivazione coerenza e rispondenza con le aree tematiche vincolate dell'Innovazione o Green:

Il contratto di ricerca riguarderà lo sviluppo di metodologie e tecnologie abilitanti per l'Intelligenza Artificiale (IA) sostenibile e green, a supporto di applicazioni I4.0. L'attività di ricerca è incentrata in particolare sullo sviluppo di metodologie per l'apprendimento continuo. Quest'ultimo mira a realizzare algoritmi in grado di addestrare incrementalmente le reti neurali, senza separazione tra fase di addestramento e di predizione, incorporando nuovi dati nel modello man mano che questi si rendono disponibili e senza dimenticare quanto precedentemente appreso. L'apprendimento continuo offre quindi una soluzione efficace per ridurre il costo economico, ambientale e computazionale della gestione dei modelli predittivi e delle applicazioni 14.0. Inoltre, esso si configura come uno dei fattori abilitanti per la transizione dell'IA pervasiva nei dispositivi integrati, che è chiave nelle strategie di sviluppo industriale a livello Europeo. Questo aspetto è confermato dalla centralità della tematica dell'apprendimento continuo nei bandi Horizon EU su ricerca ed innovazione (es. bando HUMAN-01-01). Si tratta quindi di una metodologia di IA dall'enorme potenziale trasformativo per le industrie e le aziende che lo adotteranno ed è quindi pienamente coerente con l'ambito tematico "Innovazione". D'altra parte va notata anche la sua rilevanza per quanto riguarda il tema del "Green Computing". Questa doppia natura è supportata anche dal coinvolgimento in qualità di partner industriale di Enel, che permetterà di valutare concretamente sia l'impatto in termini di creazione di tecnologie innovative in ambito industriale che l'impronta "verde" della tecnologia sviluppata.

#### Research title

Continual learning for Sustainable Artificial Intelligence Applications to Industry 4.0

#### Research topic:

The research activity will focus on the design and development of efficient neural models and continual learning methods. Particular attention will be placed on the development of learning mechanisms and models capable of being deployed in contexts characterized by limited computational and energy resources, such as Edge and IoT devices. Such methodological research will be complemented by a use case validation in an Industry 4.0 context, which will favour technology transfer of the developed methodologies. In particular, applications to plant maintenance, monitoring and production optimization tasks will be considered. These activities will be carried out in collaboration with the industrial partner who will provide concrete application use cases.

#### Specific research activities:

Research activities will be conducted in the fields of the academic discipline INF/01 "Informatics" with particular focus on modelling, design and development of machine learning models. Research activities will deal with studying efficient models and algorithms rooted in the artificial neural network paradigm, with focus on continual learning mechanisms. Development of models and technologies for embedded and edge artificial intelligence.

# Scientific targets:

Contribute to the progress of the state of art in Computer Science by means of international-level publications

## Location of activities:

Dipartimento di Informatica

# Teaching:

The duties of the role include delivering teaching to of the academic discipline INF/01 -Informatics, prioritizing a course on "Continual Learning" as part of the AI Curriculum of the M.Sc. in Computer Science.

# Internship in Private Companies:

Impresa: Enel Ricerca, sede di Pisa e sede di Roma Numero di mesi: 9

**Research period abroad:** mesi: 6

Date e time of the interview: 01 Dicembre 2021 ore 12.00 (telematica)

The interview will include a test of language skills for: English

# Dipartimento di Ingegneria Civile e Industriale Settore Concorsuale 09/D3 - impianti e processi industriali chimici SSD ING-IND/27 - chimica industriale e tecnologica

n. 1 posto

Commitment: full time

Scientific director: Sandra Vitolo, Monica Puccini

Thematic area: GREEN

# Motivation consistency and compliance with the restricted thematic areas of Innovation or Green:

The research activity aims to the development of strategies for the conservation of ecosystems and biodiversity as well as reducing the effects of climate change, through the study of an innovative technology for the  $CO_2$  capture.

# Research title:

Innovative technologies for  $CO_2$  capture from flue gases at high-temperature using solid regenerable sorbents

# **Research theme:**

The proposed research activity is part of the decarbonization strategies through the development of innovative materials and technologies for the removal of carbon dioxide from flue gases. The activity is focused on the development of ceramic-based sorbents for reversible adsorption of  $CO_2$  at low concentrations and high temperatures.

For this scope, the research will be carried out in collaboration with a leading industrial company in the manufacture of ceramic materials. The activity aims to reach the technological maturity TLR7 level (system prototype demonstration in an operational environment). The research output is the development of industrial process of sorbent production and the implementation of a pilot plant for the validation of CO<sub>2</sub> capture technology based on the use of innovative solid sorbents.

The advantage in terms of sustainability compared to conventional absorbents in the liquid phase and other solid materials will be evaluated from the technological point of view and through the application of methodologies used for environmental sustainability assessment (LCA, Life Cycle Assessment).

# Specific research activity:

The activity involves the application of methods for the synthesis and implementation of chemical processes from raw materials to products. The scope is a quantitative evaluation of the process under study, by means of material and energy balances, and from an economical and environmental point of view. The process study starts from the evaluation of the thermodynamic, kinetic and transport aspects, and proceeds accounting the problems related to the sizing, operating conditions and control of equipment and systems. The activity is aimed to the engineering of the new process with a focus on chemical reactions, separation and purification operations, environmental impacts involved, as well as the choice of raw materials, equipment and their materials.

# Scientific production objectives:

Editing of scientific articles for publication in international and national scientific journals, and participation in scientific congresses. Participation in research projects funded by public and private companies. Possible filing for industrial patents. Scientific productivity must be consistent with the themes of the SSD ING-IND/27 (Chemical technologies).

# Location of the activities:

Dipartimento di Ingegneria Civile e Industriale dell'Università di Pisa – Laboratorio di processi chimici industriali – for 24 months

Industrie Bitossi S.p.A. for 12 months

# Specific teaching activity:

Teaching activities in the field of the SSD ING-IND/27 (Chemical technologies), in the degree and master's degree courses of the School of Engineering of the University of Pisa.

Supervising activities in the preparation of master's degree and doctoral theses.

#### **Research period in industry:**

Company: Industrie Bitossi S.p.A.

Number of months: 12

# Date and time of the discussion of qualifications and publications:

november 24, 2021, 15:00

The oral interview will assess the knowledge of: English

Candidates could present up to 12 scientific publications included the PhD thesis (if presented).

# Dipartimento di ingegneria civile e industriale Settore Concorsuale 08/A3 - Infrastrutture e Sistemi di Trasporto, Estimo e Valutazione SSD ICAR/04 Strade, Ferrovie e Aeroporti

n. 1 posto

Commitment: FULL TIME

Scientific Director: MASSIMO LOSA

Thematic area: GREEN

Motivation consistency and compliance with the restricted thematic areas of Innovation or Green:

The project will promote a culture of recovery, repurposing and reduction of wastes, with important impacts on climate change and on ecosystem and biodiversity conservation.

The results will also produce social benefits, leading to the creation of new production chains and therefore new jobs. In accordance with the framework b.a of art. 3 paragraph 5 of Ministerial Decree 1062/2021, the project will create highly qualified and specialized professionals of sustainable materials and in particular of biomaterials, in the road construction sector.

The research activities, carried out in collaboration with an Italian industrial reality at the forefront in the specific sector, will allow to produce a strong technological innovation that will have an impact on the activity of Green Technologies, in particular on sections 5.6.1 (sections 1 and 4) and 5.6.3 (sections 1 and 2) of the PNR.

The research is also part of the SNSI topic "Intelligent and sustainable industry, energy and environment", and in its development trajectories: "Innovative and environmentally friendly materials", "Technologies for biomaterials and biobased products and Biorefineries" and "Highly innovative production processes efficiency and industrial sustainability ".

#### Research title:

Biomaterials and circular technologies for the ecological transition of the road construction sector.

#### Topic of the research:

The aim of this research is to develop a new technological process for design, produce, characterize and model the behavior of innovative bio-circular mixtures to be used in road construction, which are composed with materials from biomass and recycled materials.

In particular, the project will minimize the use of natural resources (aggregates, binders, additives and polymers deriving from petroleum), the energy consumption, the pollutants emissions, increasing the use of local materials (biomass, reclaimed asphalt planings, construction and demolition wastes).

#### Specific research activity:

The Candidate will carry out scientific research activities on the theoretical and practical aspects relating to the design, construction, functional upgrade and maintenance of roads, railways and airports. The research activity will concern the analysis, the experimental observation and interpretation, also by means of numerical models, of the mechanical behavior of the materials used for the construction of the pavement and of the infrastructures, with particular reference to innovative and recycled materials that foster the sustainable development and the circular economy, including the study of related production processes.

#### Scientific productivity goals:

Scientific activity involves the participation and coordination of national and international research projects as well as contracts founded by public or private bodies, the preparation of scientific papers for publication in international journals and presentation at international conferences.

Location of the activities: Department of Civil and Industrial Engineering

# Specific didactic activity foreseen:

Teaching of Fundamentals of Road Engineering (60 h) - Degree in Civil and Environmental Engineering; coteaching, supplementary teaching and assistance to students on thematics related to circular economy in transportation infrastructure for the other courses of the ICAR/04 SSD.

**Research period in the company:** Name of the company: ITERCHIMICA S.p.A. - Suisio (BG). Number of months: six

**Research period abroad:** Institution: TU BRAUNSCHWEIG (D) Number of months: six

# Date and time of the discussion of qualifications and publications: 29/11/2021 at 11:30 (online)

The oral exam will verify the knowledge of the language: English (it will be ascertained during the discussion of qualifications and publications)

The candidates can present a maximum number of 12 scientific publications, including the PhD thesis, if presented.

Cod. RIC2021PON\_A23

Dipartimento proponente: Dipartimento di Ingegneria Civile e Industriale Settore Concorsuale 08/B3

## SSD ICAR09

n. 1 posto

Commitment: full time

Scientific director: Pietro CROCE

# Thematic area: Green

# Motivation of consistency with the thematic areas of innovation and green:

Constructions and infrastructures are influenced by climate change not only by the expected variations of intensity of climatic actions, but also by its impact on environmental degradation processes. Degradation, which is produced by physical, chemical and biological causes, contributes to the reduction of durability and structural reliability of constructions, by varying their life cycle and affecting their sustainability.

# Title of research:

Climate change effects on the life cycle and the durability of existing constructions and infrastructures

# Focus of research:

Evidence of climate change is confirmed at a global scale by the increasing number of extreme events and by the variation of statistical parameters of the main climatic variables. According to the EU Regulation No. 305/2011 (Construction Products Regulation, or CPR), civil engineering works shall satisfy not only the basic requirements of mechanical resistance and stability, safety and accessibility in use, but also those of durability and sustainability. Climate change affects constructions not only modifying frequency and intensity of climatic actions, but also accelerating environmental degradation processes. Degradation, which is produced by physical, chemical and biological causes, contributes to the reduction of durability and structural reliability of constructions, by varying their life cycle, thus affecting their sustainability.

Understanding and quantifying the influence of climate change on the degradation of building materials is thus fundamental not only to plan adequate prevention, mitigation and adaptation strategies for the built environment, but also to design less exposed and more resilient constructions. The study of the relationship between climate parameters and durability of constructions is a key issue in modern research, also in view of the high costs related to degradation. Particularly complex is the interaction between climatic variables, such as relative humidity, precipitation, wind and temperature, and the amplification of typical degradation phenomena of building materials (increase of corrosion rate for steel elements or increase of the rate of infiltration of harmful substances in reinforced concrete structures, with the corresponding increment of the steel reinforcement corrosion rate, facilitating cracking and spalling of concrete).

Aim of the research is to define physical-mechanical models able to describe the variation of structural reliability with time caused by resistance degradation, as a function of the expected variations of climate variables derived by the available climate model projections. The development of such models will contribute to the definition of adaptation strategies for the design of new constructions and for planning maintenance interventions on the existing ones, preventing and mitigating the effects of degradation phenomena.

#### Specific research activity:

The disciplinary scientific contents consist of theory and methods concerning structural conception and design of new constructions, as well as structural verifications and rehabilitation of the existing ones. Therefore, they include the issues related to actions on structures and the consequent structural behavior as function of the typologies and morphologies, the building materials and technologies, the interaction with soil and environment, the strategies of use and monitoring; the assessment of vulnerability, reliability, comfort, safety and durability; methods and tools for structural design and construction of structures; the experiment, testing and monitoring of structures. Moreover, they include historical investigations on existing structures, as well as safety verifications and solutions for structural interventions on historical buildings and monuments.

#### Scientific productivity:

Annual reports, papers presented at international conferences, papers on indexed journals

#### Location:

Department of Civil and Industrial Engineering - University of Pisa

# Specific didactic activity of the contract:

The researcher will be employed in didactic activity included in the Academic Discipline: ICAR/09 (Structural Engineering) and in seminar activities and dissemination of research results.

## Research period in company (mandatory):

Company: C.E.M.E.S. S.p.A. - via delle Trincere 11 - 56127 Pisa

Number of months: 6

# Research period abroad:

Number of months: 6

#### Date of the interview on titles and publications:

29th November 2021 at 10 am (held remotely using a video meeting platform)

Candidates will be required to demonstrate an adequate knowledge of English language (it will be verified during the discussion of titles and publications)

Candidates may present a maximum number of 15 scientific publications including the doctoral thesis, if presented.

Cod. RIC2021PON\_A24

Dipartimento di Ingegneria Civile e Industriale Settore Concorsuale 09/G2 SSD ING-IND/34

n. 1 posto

Commitment regime: full time

Scientific managers: Maria Grazia Cascone and Serena Danti

## Thematic area: green

Motivation consistency and compliance with the restricted thematic areas of Innovation or Green: The research activity aims to create a high added value in terms of scientific, social and economic impacts on the national territory, with reference to the issues of the green transition (ACTION IV.6 DM 1062/2021), in particular by boosting, at an industrial level, the use of antibacterial and antiviral molecules of natural origin to develop nano-coatings for medical devices, thus promoting a green recovery and overcoming the effects of the crisis in the context of the COVID-19 pandemic.

# **Research title:**

Extraction from biomass, and chemical and biological characterization of molecules with antimicrobial and antiviral activity to create functional coatings of biomedical and sanitary devices.

# Research topic:

The ongoing global pandemic has highlighted a need to investigate and develop new antimicrobial coatings for a range of applications, such as high-traffic exposed surfaces (e.g., in hospitals), coatings of protective clothing fabrics (e.g., lab coats, surgical masks, etc.), as well as prostheses and medical devices. Generally, antimicrobial nano-coatings are inherently cytotoxic; as such, their impact on health and environment needs to be evaluated. At the same time, the development of technologies that reduce the environmental impact and preferentially avail themselves of renewable sources is required. In nature, various materials and biomolecules with antibacterial activity and some molecules with antiviral activity have been identified, being those with photocatalytic activity highly interesting (e.g. hypericin, TiO2-based nanoceramics), especially if activated by ambient light. However, the use of biomolecules in commercial products available on a large scale requires the extraction processes to be implemented, also through the use of low-impact methodologies (e.g., green solvents), and a precise characterization of the pre- and post-manufacturing to be provided, especially to verify if and to which extent the activity of the biomolecules is preserved. The proposed research focuses on the identification of specific biomasses and natural sources for the extraction of biomolecules with antimicrobial and in particular antiviral activities (e.g., Ulva Lactuca). Low-impact extraction processes will be developed and the extract will be characterized by chromatographic, spectroscopic and immunological tests. Finally, through collaboration with Linari Engineering s.r.l. the usability of biomolecules will be tested in industrial processes of electrospinning and electrospray, in order to produce coatings of tissues, surgical masks and biomedical devices. Cytotoxicity towards human skin and airway cells assessed via in vitro models using the 3R's principles, together with the evaluation of antimicrobial activity, considering generic pathogens such as S. aureus, nosocomial pathogens such as P. aeruginosa, and viral pathogens, such as SARS-CoV-2, in collaboration with the experts of the Department of Translational Research and New Technologies in Medicine and Surgery, will constitute a validation of the effectiveness of the process and of its possible industrial exploitation.

# Specific research activity:

The research activity will concern the study, design and development of methodologies to extract and characterize bioactive molecules obtained from natural sources entitled with antimicrobial properties to be applied in combination with biomaterials, in order to produce nanocoatings of prosthetic devices and biomedical implants via unconventional technologies (e.g., electrospray). The analysis of the structure-property linkage characteristic of biomaterials and the analysis of the biological-artificial interfaces will be at the basis for the design of the nanocoatings, as well as for their functional evaluation through in vitro interaction with cells and three-dimensional tissue models to establish their cytocompatibility, and with pathogens to establish their efficacy.

#### Scientific productivity goals:

The scientific activity includes the participation in national and international research projects funded by public or private bodies, the publication of articles for qualified scientific journals and the attendance at national and international conferences.

#### Location of the activities:

Department of Civil and Industrial Engineering and Otolab Laboratory, U.O. Otolaryngology, Audiology and Phoniatrics, AOUP.

**Specific didactic activity foreseen:** Teaching activity in the scientific disciplinary sector ING-IND/34, in particular on green issues.

## Research period in the company (mandatory):

Company: Linari Engineering s.r.l., Via G. Malasoma - 56121 Pisa Number of months: 6

Date and time of the discussion of qualifications and publications: December, 2nd 2021 at 10:00 a.m. (online)

The oral exam will verify the knowledge of the language: English (it will be ascertained during the discussion of qualifications and publications)

Candidates may submit a maximum number of 12 scientific publications including the doctoral thesis, if submitted.

Cod. RIC2021PON\_A25

Dipartimento di Ingegneria Civile e Industriale

# Settore Concorsuale 09/A3 SSD ING-IND/14

n. 1 posto

Commitment: Full time

Scientific director: Leonardo Bertini

## Thematic area: Green

#### Motivation consistency and compliance with the restricted thematic areas of Innovation or Green:

The researcher will deal with machine design topics applied to modern vehicles endowed with electric or hydrogen engines and with the development of products originally designed for their use in internal combustion engines that can be reconverted for green applications, also considering other possible applications in addition to the automotive sector.

#### Research title:

Development and conversion of automotive devices within a green perspective: the decarbonisation of vehicles and reconversion of thermo-hydraulic systems.

# Research theme:

In recent years, epochal changes have affected the automotive industry, especially regarding propulsion, which is rapidly moving from internal combustion engines to electric or hydrogen/fuel cell motors, in order to reduce the CO2 emissions and the use of non-renewable fossil fuels. This change has effects on the automotive companies but also on related industries, in particular on the OEMs (Original Equipment Manufacturers). Indeed OEMs needs to reconvert their products, originally designed to be used in internal combustion engines, and develop new green products.

In particular, the Rheinmetall company (whose main Italian automotive R&D headquarters is in Livorno), which collaborates with UniPi in this research activity, aims to develop devices to be used in propulsion that aim at decarbonisation (electric cars or hydrogen) and to convert products, already present in their portfolio, to be used in green applications. A topical example is the Data Cooling Server (refrigeration and thermal management of server processors such as "Aruba", "Cisco" and similar), which presents important energy and efficiency optimization challenges.

Within this context, the researcher will deal with:

1) a revision of the design methodologies, which may include the use of components made by additive manufacturing (a 3D printer for metal powders is available at DICI facilities), the use of intelligent materials aimed at energy harvesting (which represents the subject of a previous research co-operation between Rheinmetall and the research group), and the simulation of the operating conditions of materials and systems operating with gaseous hydrogen (mainly mechanics of materials, dynamic simulation and rotordynamics).

2) the durability of materials and products which will experience usage conversion (change of the mission profile and the operating life of the product), or which will be used in environments with a high concentration of hydrogen, where materials' embrittlement represents an issue. Regarding this topic, the proposing group has been working since many years; research in this area led to the birth of the Letomec spin-off, which will be part in the research project.

The research activities will lead to publications in indexed journals and in proceedings of international conferences, as well as the possible filing of patents.

# Specific research activity:

Design, construction and testing of machines, structures and mechanical systems: principles and methodologies of mechanical design, from the constructive elements of the machines and the mechanical behavior of materials to the reliable design of mechanical systems, optimization, integrated product design and process; numerical modeling, design and testing relating to quality, safety, human-machine interaction, economic evaluation, environmental compatibility, manufacturability and maintainability; design and construction of mechanical and mechatronic systems, motors, pressurized vessels, automatic machines and robots, lifting and transport machines, biomechanical systems, micromechanical systems and components, components and structures for industrial plants, mechanical components for aeronautical and space applications; experimental methods of measurement and analysis of the state of strain and stress, local and

full-field methods of the experimental mechanics of solids, methods for dynamic and modal analysis, mechanics of materials subjected to typical operating stresses, tests on prototypes, testing and control in operation, structural diagnostics, non-destructive testing design of experiments, statistical analysis and model building; theoretical and design aspect of land vehicles design, mechanical and systemic design and experimentation of motor vehicles, railway vehicles, agricultural and earth-moving machinery and their components, including the engine.

## Scientific production goals:

Publication of scientific articles in indexed journals and participation, as speaker, in Italian and/or international conferences; filing of patents.

#### Location:

Department of Civil and Industrial Engineering - University of Pisa Pierburg Pump Technology Italy S.p.A. - Plant of Livorno

#### Specific teaching activity:

Teaching activity will be carried out within the freamework of SSD ING-IND / 14 classes. During the teaching activities, explicit reference will be made to the impact of the environmental protection and green issues in general and to the results of the research activities, i.e. the impact of those topics on mechanical design and machine construction, in particular.

#### Period in industry (obbligatorio):

Company: Pierburg Pump Technology Italy S.p.A. - Gruppo Rheinmetall Number of months: 9

Period abroad: months: 6

## Date and time of the discussion of qualifications and publications:

december 2, 2021, 3 pm (online)

The oral exam will verify the knowledge of the language: English (it will be ascertained during the discussion of qualifications and publications)

Candidates may submit a maximum number of 12 scientific publications including the doctoral thesis, if submitted.

Cod. RIC2021PON\_A26

# SSD CHIM/07 "FONDAMENTI CHIMICI DELLE TECNOLOGIE"

n. 1 posto

Commitment regime: full time

Scientific director: Prof. Maurizia Seggiani

## Thematic area: green

Motivation consistency and compliance with the restricted thematic areas of Innovation or Green:

The position is coherent with the thematic areas of the green transition (Action IV.6 DM 1062/2021) relating to the ecosystem conservation and reduction of the environmental impacts deriving from industrial activities with scientific, social and economic repercussions on the national territory. In particular, the proposed research activity is aimed at valorisation of wastes, deriving from important national industrial sectors, as a primary or secondary material to be used in the same production process, from a circular economy perspective, or in other production processes, in order to reduce the use of resources and the amount of waste to be disposed of, significantly reducing disposal costs and the resulting environmental impacts.

# Research title:

From waste to resource: "zero waste" industry

# Research theme:

The proposed research will focus on the development, with an integrated and multidisciplinary approach, of processes and protocols with low environmental impact for a better management of wastes, such as tanning/paper sludge and blast furnace slag, deriving from important national industrial sectors to recover as primary or secondary materials with a view to circular economy and environmental and socio-economic sustainability.

#### Specific research activity:

The research activities, consistent with those of the SSD, will concern the study of the chemical and chemical-physical foundations of the technologies applied in the various fields, with particular regard to those relating to materials, their production, their properties and their interaction with the environment in which they are used and their environmental sustainability.

Specifically, the following research activities will be carried out:

- Development and validation of a pilot plant for the treatment of VOC (volatile organic solvent) emissions from leather painting cabins, based on scrubber system using water added with specific surfactants followed by adsorption on sorbent derived from a by-product of the treatment thermal treatment of the tanning sludge. The use of VOCs recovered downstream of the sorbent regeneration will be validated in the same tannery in alternative to fresh solvents;

- Validation of the use of paper sludge, rich in cellulose, and tanning by-products (e.g. protein hydrolysates) as fillers and/or plasticizers in the compounding of plastics and bioplastics in alternative to virgin raw materials with consequent reduction of management and disposal costs of such industrial wastes or by-products

- Development of a protocol for the sustainable treatment of the metallurgical slag produced in the process of iron and steel smelting, with particular reference to the inertization and plasticization processes, with the aim of using them safely in the formulation of bituminous conglomerates and road substrates, obtaining a significant reduction of natural resources and wastes to be disposed of, with consequent economic and environmental benefits.

The environmental and socio-economic sustainability of the several processes and protocols proposed and validated for the identified wastes will be assessed using internationally recognized methodologies, such as LCA (Life Cycle Assessment), S-LCA (Social Life Cycle Assessment) and LCC (Life Cycle Costing), respectively. The results of the three assessments will lead to an exhaustive description of the impacts that the various actions, implemented, will have on the environment, society and economy, thus allowing to have an overall and comprehensive view of their sustainability.

# Scientific productivity goals:

Dissemination of results to the scientific community through publications in international scientific journals with IF through peer review procedures by experts, oral presentations of results at national and international conferences, participation in the submission of national and European projects on ecological transition.

## Location:

Department of Civil and Industrial Engineering

#### Specific teaching activity:

Specific teaching and didactic activities of the SSD, related to both basic courses and more advanced disciplines such as green chemistry courses in industrial engineering study courses. Tutoring in master's and doctoral degree theses on "green" topics.

# Research period in industry (obbligatorio):

Enterprises: BCN Conceria - Via Enrico Fermi, 56029 S.Croce Sull'Arno (PI)

Number of months: 6

#### Date and time of the discussion of qualifications and publications:

26 November 2021, 2 p.m. (in remote)

The oral exam will verify the knowledge of the language: English (it will be ascertained during the discussion of qualifications and publications)

Candidates may submit a maximum number of 12 scientific publications including the doctoral thesis, if submitted.

Cod. RIC2021PON\_A27

Settore Concorsuale 09/D2 - Sistemi, Metodi e Tecnologie dell'ingegneria Chimica e di Processo SSD ING-IND/24 - Principi di Ingegneria Chimica

n.1 posto

#### Commitment regime:: full time

## Scientific head: Prof. Roberto Mauri, Prof.ssa Chiara Galletti

Topic: Green

#### Motivation and correspondence to the Innovation or Green topics:

The research activity supports the green transition and decarbonisation through the development of numerical models to improve the know-how of the conversion of green energy carriers, such as hydrogen, ammonia and mixtures, and to provide tools for the advancement of related technologies.

#### Title of the research:

Analysis and development of mathematical models based on Computational Fluid Dynamics to improve technologies for the conversion of green energy carriers.

#### Focus of the research:

The massive integration of renewable energy sources, needed to fight climate change, is hindered by their seasonality and variability. In this context, hydrogen and its carriers (such as ammonia) produced from solar and wind power, can play a fundamental role as energy carriers capable of being stored and distributed through the existing infrastructure. It is believed that these vectors will be decisive in the decarbonisation of energy-intensive industries, such as petrochemicals, steel, concrete and glass. However, hydrogen and ammonia have very different characteristics and reactivity from those of traditional fuels, requiring the development of innovative and flexible conversion technologies suitable for operating safely, efficiently and with low impact.

The research intends to develop numerical models, based on Computational Fluid Dynamics techniques, to improve the know-how of the energy conversion of hydrogen, ammonia and mixtures, and to provide tools for the development of related technologies, such as gas turbines, also through collaboration with a leading company in the sector.

#### Specific activity of the research:

The activity aims to develop methodologies and technologies for the conversion of hydrogen, ammonia and mixtures, based on the analysis of related physical phenomena and chemical transformations. The study is addressed through the tools of thermodynamics, chemical kinetics and transport phenomena, to develop theoretical and numerical models aimed at identifying operating and design solutions. The application regards new technologies addressing the energy needs and environmental compatibility to pursue the ecological transition. The characterizing skills include transport phenomena (heat and mass transfer, even in the presence of chemical reactions); kinetics and chemical reactors; chemical and process thermodynamics.

#### Goals of the scientific productivity:

Participation in research projects supported by public or private entities, with possible filing of industrial patents. Production of scientific articles in indexed international journals and participation in national and international scientific conferences for the dissemination of research results. The scientific productivity must be consistent with that of reference of the ING-IND / 24 SSD.

#### Location of the activity:

Department of Civil and Industrial Engineering of the University of Pisa for 30 months and Baker-Hughes (Firenze) for 6 months.

## Teaching activity:

Teaching activity in the courses of the scientific disciplinary sector ING-IND / 24 and similar for the degree and master's degree courses of the School of Engineering of the University of Pisa. Supervision of master's and doctoral degree theses.

#### Research period in the enterprise:

Impresa: Baker-Hughes, Piazza Enrico Mattei, 50127 Firenze. Numero di mesi: 6

# Date and time of the discussion of qualifications and publications:

November 26, 2021 ore 9:30 (online)

The oral exam will verify the knowledge of the language: English

Candidates may submit a maximum number of 12 scientific publications including the doctoral thesis, if submitted.

Cod. RIC2021PON\_A28

Dipartimento di Ingegneria dell'Energia, dei Sistemi, del Territorio e delle Costruzioni Settore Concorsuale: SC 09/E4 Misure

# Settore Scientifico Disciplinare: SSD ING-IND/12 Misure Meccaniche e Termiche

n. 1 posto

Commitment regime: Full time

Principal Investigator: Prof. Bernardo Tellini

Thematic Area: Green

#### Motivation, coherence, and compliance with the Research Theme:

The green transition and the relaunch of the railway transport sector find motivation, consistency, and correspondence with the green thematic areas relevant to Action IV. 6 of DM 1062 and PNR.

#### Research Title:

Development of measurement techniques to support the ecological transition and the standard update for the railway system concerning the use of electric batteries

# Research subject:

The railway system is strategic for the ecological transition in the transport field. The EU has decided that 2021 is the European year of railways to promote trains as a safe and sustainable means of transport. Faced with the need for a transition to smart and low-carbon mobility, rail transport is among the most environmentally friendly and energy efficient system. In this context, the use of electric batteries plays a key role for the storage of energy regenerated by trains, the reduction of the consumption of hybrid rolling stock compared to current conventional systems, the increase of safety for the management of emergencie in the absence of energy from the grid, the support for electric traction for short non-electrified lines or for the last mile, better exploitation of the environmental advantage represented by renewable energy sources by compensating for their intermittent nature. On the other hand, the current battery technology needs to be developed; safety, costs and useful life are elements at the basis of a real success of their use, especially in a complex system such as the railway transport system. With the development of new rolling stocks and infrastructure networks, it is also necessary to provide for an update of the standard regulation at an international level. The definition of accurate measurement procedures recognized by the international community, to monitor such devices during their operation, is essential to better manage the ecological transition in this sector with a strong environmental and social impact.

The research activity aimed specifically at the development of advanced and innovative measurement techniques for the railway system on the use of new generation batteries fits into this area. Among the objectives to be achieved:

development of multi-sensor measurement systems for the real-time dynamic characterization of the single cell in the different operating conditions foreseen in the railway system;

development of measurement techniques based on impedance spectroscopy for the characterization of the aging state of the cells;

development of measurement methodologies for the characterization of temperature distribution and effects due to vibrations and mechanical stresses;

contribution to the discussion and preparation of new measurement protocols for the development and update of the regulations in this field.

Research activity:

Research activities in the cultural areas of SC 09 / E4 and, in particular, of the SSD ING-IND / 12, concerning the definition of methods and procedures for the measurement and design, implementation, characterization, calibration and testing of measurement systems, modeling of measurement methods, the metrological characterization of components and systems for measurement, as well as the extraction, interpretation and representation of measurement information.

# Scientific productivity:

The aims of the scientific production include the publication of scientific articles in international journals and conference proceedings, the participation at national and international conferences, the participation at national and international research projects and technology transfer. The scientific production must be consistent with the research topics of the SC 09/E4 and, in particular, of the SSD ING-IND/12.

# Places of activities:

Dipartimento di Ingegneria dell'Energia, dei Sistemi, del Territorio e delle Costruzioni

ITALCERTIFER S.p.A.

# Didactic commitment:

The researcher will have to carry out teaching activities, including frontal teaching activities, in the context of the themes of SC 09 / E4 and mechanical and thermal measurements, with particular reference to the metrological aspects for the ecological transition in the railway transport sector, according to the needs teaching programs for degree courses and doctoral courses. Tutor activities during the preparation of degree and PhD theses are also included.

# Internship in Private Companies:

Impresa: ITALCERTIFER S.p.A.

Numero di mesi: 9 mesi

### Date e time of the interview:

23 novembre 2021 ore 15.00 (remote)

# The interview will include a test of language skills for: English

Dipartimento di Ingegneria dell'Energia, dei Sistemi, del Territorio e delle Costruzioni Settore Concorsuale 09/C2 "Fisica Tecnica e Ingegneria Nucleare" SSD ING-IND/10 "Fisica Tecnica Industriale"

n. 1 posto

Commitment regime: Full time

Principal Investigator: Prof. Daniele Testi

Thematic Area: Green

#### Motivation, coherence, and compliance with the Research Theme:

The research activity supports the green transition of the air conditioning sector in buildings through advanced methods aimed at saving energy and reducing climate-change emissions.

#### Research Title:

Renewable and integrated air conditioning systems, equipped with advanced controls, for the sustainability of buildings and the reduction of the environmental impact

#### Research subject:

The evolution of current design and handling methodologies for air conditioning systems is a needed step for buildings decarbonization. Current trends aim at increasing the use of multi-technology hybrid systems, fed by renewable energy sources (e.g.: reversible heat pumps, solar thermal and photovoltaic collectors), integrated with thermal and electrochemical storages for the self-consumption of local energy production. At the same time, the "digital" evolution is providing a large amount of data that can be used to develop and run advanced controllers. In this perspective, the research activity is functional to that "green" and "digital" transition thanks to the development of innovative technologies and methods for the thermooriented control of HVAC systems in civil buildings. In particular, the researcher will investigate technology development, predictive and machine-learning controls for hybrid heat pump generators and solar technologies. The objective consists of an optimal synergy operation between all the multi-technology components, maximizing energy efficiency, environmental sustainability, and reducing climate-changing emissions. Dynamic simulation techniques will be coupled with experimental campaigns, also thanks to the support of the partner company that provides laboratories and resources for tests in controlled environments.

# Research activity:

Specific areas of Applied Thermodynamics and Heat Transfer, related to the energy performance of components and systems, with particular reference to methods and tools for the design and advanced thermal control of air conditioning systems integrated with renewable sources for energy-sustainable buildings.

The expected scientific activity involves participation to research projects funded by public or private entities, writing of scientific papers to be published either in domestic and international frameworks, on scientific journals or congresses. Possible deposit of industrial patents. The scientific productivity must be consistent with the reference of ING-IND/10 sector.

# Places of activities:

Dipartimento di Ingegneria dell'Energia, dei Sistemi, del Territorio e delle Costruzioni per 30 mesi e Immergas S.p.A. (Brescello, RE) per 6 mesi

#### Didactic commitment:

The total annual commitment for the conduct of didactic activities, integrative teaching, and service to students is 350 hours for the full-time regime and 200 hours of part-time regime. The researcher with junior contract is required to perform 60 hours, waived up to 10% more or less, of classroom teaching per academic year, as a task assigned educational institution within the teaching program of degree courses, single-cycle degree, degree, specialization courses, and PhD. Only to avoid excessive fragmentation of the teaching modules / lessons can provide an additional exemption of 10% more, up to a maximum of 72 hours total. The researcher with junior contract may not be awarded additional teaching assignments free of charge or paid in the context of the above courses.

In agreement with the didactic plans of the degree programmes, the teaching activity will concern courses based on the themes of the admission examination sector 09/C2, with a particular focus on energy efficiency and energy saving in buildings, heating, ventilation, and air conditioning systems, and renewable energy sources. Courses examples are: "Methods for Energy Sustainability", First Cycle (Bachelor), Degree Programme in Energy Engineering; "Energy Saving in Buildings", Second Cycle (Master), Degree Programme in Energy Engineering.

#### Internship in Private Companies:

Impresa: Immergas S.p.A. (Brescello, RE)

Numero di mesi: 6

#### Date e time of the interview:

mercoledì 1° dicembre 2021, ore 15:30, in modalità telematica

# The interview will include a test of language skills for: English

Cod. RIC2021PON\_A30

Dipartimento di Ingegneria dell'Energia, dei Sistemi, del Territorio e delle Costruzioni Settore Concorsuale 09/C1 SSD ING-IND/08 – Macchine a Fluido

n. 1 posto

Commitment regime: Full time

Principal Investigator: Prof. Umberto Desideri

Thematic Area: Green

# Motivation consistency and compliance with the restricted thematic areas of Innovation or Green:

The topic of this research is fully integrated in Mission 2 of Italian PNRR with particular reference to Missions M2C2 and M2C3 and also in more general terms to Mission 3. The topic is also coherent with the objectives of the Italian Integrated Plan of Energy and Climate concerning decarbonization the development of renewable energy and energy efficiency. Finally, the topic is in line with the objectives of the EU Green New Deal and in particular with points 2.1.2 and partially with points 2.1.3, 2.1.5 and the EU SET Plan

# Research title:

Innovative Solutions and Technologies for power generation and fluid machinery for the green transition.

#### **Research topic:**

Development of novel scientific, theoretical and technical solutions for the optimization, reduction of losses and improvement of efficiency of energy conversion processes based on the use of fluid machinery. Systems and machines will be studied for decarbonized plants and with totally new concepts.

Particular attention will be given to fluid machinery the activities will be focused on the development of models and control strategies to optimize the operation and miminize the environmental impact of the processes that use them and to contribute to a higher plant flexibility which is necessary to improve the integration with renewable power plants and reduce greenhouse gas emissions. In addition the operational characteristics required in grids with high penetration of renewables and with the use of new energy vectors with low environmental impact.

#### Specific research activity:

Thermodynamic, fluiddynamic, energy, environmental, technological problems of fluid machinery both at component and system levels. Design, management, diagnostic, control, environmental impact, experimental and testing aspects of fluid machinery either for power generation (steam turbines, gas turbines, hydro turbines, expander, internal combustion engines) or operating machines (pumps, fans, compressors) or combustion components (combustors, gasifiers, reactors) or heat exchangers (evaporators, condensers, recuperators, etc.). Finally the insertion of machines in stationary power generation systems, in propulsion systems for terrestrial, marine and aircrafts, in industrial processes and in tertiary and residential applications.

# Scientific productivity goals:

The objectives of scientific productivity will be finalized to the production of scientific papers to be submitted to international journals (1-3 articles per year on high impact publications), to participation at national and international congresses and conferences, and to participation in international and national projects and technology transfer initiatives. Improvement of knowledge in the field of fluid machinery with the aim of technical and engineering development.

## Places of activities:

Dipartimento di Ingegneria dell'Energia, dei Sistemi, del Territorio e delle Costruzioni

Baker Hughes s.p.a., C.S.T. Compression Service Technology Srl

# Specific didactic activity foreseen:

Didactic activities for classes and modules of the sector 09/C1 "Macchine a Fluido e Sistemi per l'Energia e l'Ambiente" for bachelor and master programs. Tutoring of master and PhD thesis.

# Internship in Private Companies:

Impresa: Baker Hughes - Nuovo Pignone Tecnologie s.p.a.

Numero di mesi: 6 mesi in totale divisi tra le due imprese

#### Research period abroad

mesi: 6

Date e time of the interview:

30 Novembre 2021 - ore 14:30 (telematica)

# The interview will include a test of language skills for: English

Cod. RIC2021PON\_A31

Dipartimento di Ingegneria dell'Informazione Settore Concorsuale 09/G1 SSD ING/INF 04

n. 1 posto

Commitment regime: Full time

Principal Investigator: Antonio Bicchi

Thematic Area: Green

#### Motivation and agreement with the Green Innovation Area:

The "Programma Operativo Nazionale Ricerca e Innovazione 2014-2020" lists among the objectives within the "green" theme the preservation of ecosystems and biodiversity.

The objective of proposed RTD-A contract is to employ robotics to support and empower the methodologies with which environmental monitoring is currently carried out. This will allow to improve the effectiveness and the efficiency with which the healthy status of a habitat is assessed.

# Research title:

Robotics for Environmental Monitoring

## Research topic:

Today, one of the main challenges for the research community is posed by the global warming that is threatening the survival of thousands of species on Heart. In fact, the biodiversity preservation is one of the most prominent goals among the European policies include in the Green Deal to fight climate crisis. To this aim, the Natura 2000 network - a network of protected areas instituted in 1992 by the Habitat Directive that today includes more than 27000 sites - will be enlarged to cover the 30% of the European land.

The main tool for biodiversity preservation is environmental monitoring of such a network. Environmental monitoring aims at evaluating the healthy status of a habitat via the sociological analysis of the quality and quantity of the habitat vegetation. Currently the only option to execute such an activity is the employment of highly qualified human operators. This causes high costs and, de facto, make not sustainable an effective monitoring of the sites of Natura 2000 network.

Robotics is a promising solution to improve effectiveness and efficiency of current environmental monitoring techniques. Robotic environmental monitoring poses two main technical challenges: to improve the level of robot autonomy in data acquisition, analysis, and interpretation; to improve robot mobility in environments that are not structured, not know, and characterized by extremely variable geometrical and physical features.

University of Pisa is already at the forefront of the research on this subject. It is the coordinator of the European research project "Natural Intelligence" (GA Id: 101016970) within the H2020 Programme. The "Natural Intelligence" consortium includes ETH Zurich, Imperial College London, Kingston University, TU Delft, Istituto Superiore per la Protezione e la Ricerca Ambientale (ISPRA), together with the Universities of Milano, Perugia, Sassari e Siena, that are currently actively contributing to monitor the Natura 2000 network.

#### Specific research activities:

To tackle the challenges posed by robotic environmental monitoring the researcher will perform activities aiming at obtaining a step-change of the state-of-the-art robots. Such activities will complement and overcome the expected objectives of on-going research projects. Potentially useful methodologies and tools, that the researcher could profitably adopt, can include: soft-robotics, model-based and model-free control techniques for Lagrangian under-actuated systems, optimization-based motion-planning techniques, impedance planning, machine learning.

# Scientific targets:

"Advancements in the state of the art within the fields of Automation, Robotics, and Control proved by high-quality scientific publications; fund-raising at local, national, and international level"

# Places of activities:

Dipartimento Ingegneria dell'Informazione

# Teaching:

6 CFU course on Automatic Control

# Internship in Private Companies:

Impresa: qbrobotics s.r.l. Numero di mesi: 6

# Date e time of the interview:

24 Novembre 2021 ore 14:00 (remote)

# The interview will include a test of language skills for: English

Cod. RIC2021PON\_A32

Dipartimento di Ingegneria dell'Informazione Settore concorsuale 09/F2 "TELECOMUNICAZIONI" SSD ING-INF/03 "TELECOMUNICAZIONI"

n. 1 posto

Commitment regime: Full time

Principal Investigator: Prof. Giovanni Corsini

Thematic Area: Green

#### Motivation and agreement with the Green Innovation Area:

Remote Sensing plays an important role in the development of innovative services to support the green transition and to assess the effectiveness of the actions by means of multiplatform image processing at different scales (global, regional). The processing and analysis of remote sensing data is useful for addressing environmental challenges in many application areas ranging from the use of renewable energy sources with low environmental impact to sustainable agriculture.

#### Research title:

Remote sensing for the assessment of green transition actions on the environment. Tema della ricerca:

#### Research topic:

Research activity will be focused on the study and the identification of data fusion methods applied to hyper-dimensional, multi-sensors and multiplatform images. Particular attention will be given to the methodologies for the analysis of changes and the development of decision support services in the context of the actions concerning the green transition and the evaluation of the results and the impact of the actions taken.

Research activity is included in the general theme of remote sensing and is therefore consistent with the main topics of the SSD ING-ING/03 Telecomunicazioni

#### Scientific targets:

"Advances in the state of the art on the topics within area 09/F2 "TELECOMUNICAZIONI", SSD ING-INF/03 "TELECOMUNICAZIONI, documented by high quality publications in peer reviewed journals; capability of acquiring funds for scientific and technological research and development at the local, national, and international level."

## Places of activities:

- Dipartimento di Ingegneria dell'Informazione Università di Pisa
- FlySight Srl Via A. Lampredi 45, Livorno 57122, Italy

#### Teaching:

Advanced courses within area 09/F2 "TELECOMUNICAZIONI", SSD ING-INF/03 "TELECOMUNICAZIONI with specific reference to the course of Methods e Technologies for Remote Sensing - Master degree in Telecommunication Engineering (6 CFU).

#### Internship in Private Companies:

- Impresa: FlySight Srl Via A. Lampredi 45, Livorno - 57122, Italy

Numero di mesi: 12

# Date e time of the interview:

giovedì 2 Dicembre a partire dalle ore 15:00, prosecuzione venerdì 3 Dicembre a partire dalle ore 15:00.

# The interview will include a test of language skills for: English

#### Dipartimento di Ingegneria dell'Informazione Settore Concorsuale 09/F1 SSD ING-INF/02

n. 1 posto

Commitment regime: Full time

Principal Investigator: Prof. Agostino Monorchio

Thematic Area: Green

#### Motivation and agreement with the Green Innovation Area:

The research activity is focused on the design of innovative methods for the development of sustainable and environmentally friendly technologies, with particular reference to increasing the efficiency of energy transfer systems employing the propagation of electromagnetic waves in free space.

#### Research title:

Sustainable energy technologies based on reconfigurable metamaterials and metasurfaces for Wireless Power Transfer (WPT) and energy harvesting on-the-move

#### Research topic:

The program will be focused on the design and development of cutting-edge research technologies to face the huge issue of creating a more sustainable and greener society. In this sense, our ubiquitously connected society requires energy effective and environmentally less expensive tools, to reach a compromise between a limited energy cost and the typical needs of a 4.0 society. In addition, the powering of electronic tools and the huge development of electric vehicles push the research to increase the energy efficiency and the harvesting capabilities of WPT devices. Thus, the urgency is to conduct specific research activities to come up with affordable and reliable solutions to make these technologies greener and more respectful of the environment. To address this aim, metamaterials and metasurfaces can be exploited. They consist in artificial materials, opportunely engineered, showing unconventional and unnatural electromagnetic properties, both in terms of permeability and permittivity. This extraordinary feature allows the possibility to break some traditional limits in terms of energy transfer efficiency, allowing at the same time the possibility of connecting and interface multiple sensors with a single structure. One specific aim of the program is to develop models and tools for the designing of innovative metamaterials, able to be easily integrated within the existing technological environment; bendable and conformal metasurfaces can have a disruptive impact in terms of viable and not-invasive solutions. Smart and reconfigurable metamaterials can be envisioned, paving the path towards tools able to adapt themselves to the specific environmental conditions, maximizing efficiency and making sustainable some of our actual technologies. Moreover, reconfigurability of metamaterials is foreseen as a candidate solution that would allow to focus the direct link also for moving vehicles. The activity will be firstly directed to analyze and identify the most promising and effective solutions appeared so far within the broad field of metamaterials and metasurfaces. Next, novel methods to expand and overcome the state-of-the-art, especially considering bendable and conformal structures, will be developed in order to design proof-of-concepts prototypes ready to be exploited in the industrial setting. Indeed, the close relationship between the academic path and the industrial environment will be at the center of the proposed program that aims to merge these two entities in order to have a radical impact on the society.

The proposed activity is based on the study of electromagnetic waves through Maxwell's equations. This model, still very modern, offers continuous opportunities for deductive analysis and formal insights, constituting a broad working basis for scholars and scientists on the theory of electromagnetism. The initial developments aimed at telecommunications gave rise to studies on free and guided propagation and on antenna design methods, together with the analysis of diffusion problems. The most recent developments in propagation studies have been directed towards the characterization of the channel for mobile communications and towards the topic of energy harvesting and wireless power transfer. At the same time, an important advancement occurred in the design of very high frequency passive circuits, able to analyzing increasingly complex situations, with a variety of novel components and elements, including active ones: it is the area of microwave and millimeter wave circuits, in which interesting solutions based on metamaterials and metasurfaces are increasingly growing. Other areas of application concern the sectors of remote sensing, fundamental for the diagnostics of the environment, in particular through modern radars, and that of the biological effects of electromagnetic fields, essential to evaluate human exposure to radio systems. Biomedical applications, both diagnostic and therapeutic, based on the use of electromagnetic fields are paving the way to unveiled possibilities for human health. The activity will also have to consider and not neglect electromagnetic compatibility issues, typically present in industrial applications, with particular reference to materials treatments and sensors development.

# Scientific targets:

Advancement of the state of the art in the scientific disciplinary sector "ING-INF/02 - Electromagnetic Fields", documented through high-level scientific publications in international journals with review; participation in qualified international conferences; ability to acquire funding for scientific and technological development at local, national and international level.

## Places of activities:

Dipartimento di Ingegneria dell'Informazione

#### Teaching:

Basic and advanced courses within the scientific disciplinary sector "ING-INF/02 - Electromagnetic Fields". Management of teaching activities and projects on the research theme.

#### Internship in Private Companies:

Impresa: Free Space s.r.l., via Antonio Cocchi 7, 56121 Pisa Numero di mesi: 12

# Date e time of the interview:

1° dicembre 2021 ore 11:00 (remote)

# The interview will include a test of language skills for: English

Dipartimento di Ingegneria dell'Informazione Settore Concorsuale 09/E3 SSD ING-INF01

n. 1 posto

Commitment regime: Full time

Principal Investigator: Prof. Giovanni Pennelli

Thematic Area: Green

# Motivazione coerenza e rispondenza con le aree tematiche vincolate dell'Innovazione o Green:

La ricerca consiste nello sviluppo di dispositivi e sistemi termoelettrici per la trasformazione diretta del calore in energia elettrica, e rientra quindi nelle tematiche del green energy harvesting. Per maggiori dettagli, vedere il "Tema della ricerca" di cui sotto.

# Research title:

Nanostructured devices and thermoelectric systems for the recovery of thermal energy and its conversion into electrical energy

# Research topic:

Advanced processes for the nanostructuration of silicon will be developed, and thermoelectric devices, which can be used for the direct conversion of heat into electrical power, will be fabricated. Thanks to the nanostructuration, these devices will have a low thermal conductivity still maintaining a high the electrical conductivity; this will allow high thermal-to electrical conversion efficiencies. Starting from these silicon-based devices, systems, complete of heat exchangers and electrical circuits for the management of the output power, will be designed and tested. A key point of the project will be the transfer of the nanotechnological processes and of the design criteria of the thermoelectric conversion systems to the industrial level.

Due to their compactness and reliability, thermoelectric devices offer a large range of applications in the fields of **green energy harvesting** (macroharvesign) and of **energy scavenging** (microharvesting). These devices can also be used for cooling, with interesting applications in microcooling and microconditioning systems.

In particular, these devices will allow: 1) the **recovery** of the large amount of heat produced by many productive processes, which cannot be converted with conventional techniques, and hence need to be dissipated; **heat is energy, and wasted heat is wasted energy**; 2) the exploitation of many low temperature heat sources, such as geothermal sources; 3) energy production from concentration solar plants, in combination with techniques for storage energy; the compactness and low cost of thermoelectric devices will allow the fabrication of small solar thermal plant on domestic scale; 4) recovery of the large amount of heat of servers for information processing, simultaneoulsy giving an important contribution for their cooling.

# Specific research activities:

The research will consist in the development of innovative micro- and nanotechnologies, and in the design, fabrication, caracterization and optimization of nanodevices. The design of electronic systems for the optimization of the electrical power is also planned.
Scientific publications on high impact factor international reviews, presentation to international conferences, and patentes also in collaboration with the industrial partner GemaTEG.

## Places of activities:

Dipartimento di Ingegneria dell'Informazione, Universita' di Pisa, Via Caruso 16, 56122 PISA GemaTEG Italia Srl, Via G.B. Pontani, 47 - 06128 Perugua

## Teaching:

Insegnamenti nell'ambito del settore scientifico-disciplinare ING-INF01: dispositivi e tecnologie elettroniche, elettronica di base ed avanzata.

Internship in Private Companies: Impresa: GemaTEG Italia Srl Via G.B. Pontani, 47 - 06128 Perugia

Numero di mesi: 6

## Date e time of the interview:

3 dicembre 2021 ore 11:00 (remote)

## The interview will include a test of language skills for: English

Dipartimento di Ingegneria dell'Informazione Settore Concorsuale: 09/H1 - sistemi di elaborazione delle informazioni SSD: ING-INF/05 - sistemi di elaborazione delle informazioni

n. 1 posto

Commitment regime: Full time

Principal Investigator: Prof. Francesco Marcelloni

Ambito tematico: INNOVAZIONE

## Motivazione coerenza e rispondenza con le aree tematiche vincolate dell'Innovazione o Green:

La ricerca si concentrerà sullo sviluppo e sperimentazione di algoritmi di federated learning per data stream mining che rappresentano una tecnologia abilitante e innovativa per l'analisi di flussi di dati prodotti da sorgenti diverse, preservando la privacy. L'estrazione di conoscenza da flussi di dati è un problema che deve essere affrontato in molte applicazioni industriali e che richiede specifici algoritmi. Il federated learning consente di preservare la privacy dei dati, permettendo di applicare algoritmi di data mining senza trasferire i dati. L'applicazione del federated learning per estrarre conoscenza da flussi di dati non è stata particolarmente studiata nella letteratura sebbene rappresenti un approccio con possibili interessanti ricadute sia sulla ricerca di base che su quella applicata.

## Research title:

Design and testing of federated learning algorithms for data stream mining

## Tema della ricerca:

Molti degli algoritmi di apprendimento automatico che sono stati proposti nella letteratura negli ultimi anni si sono basati sull'ipotesi che l'intero insieme di dati fosse staticamente disponibile. In realtà, i dati vengono tipicamente prodotti in flusso e quindi l'apprendimento dovrebbe essere effettuato in maniera incrementale nel tempo all'arrivo dei dati. Questo richiede degli algoritmi di apprendimento appropriati che siano in grado di gestire due specificità dei flussi di dati: i) la sequenza di dati può essere illimitata, così ponendo il problema della loro memorizzazione, e ii) le proprietà statistiche dei dati possono cambiare nel tempo, a causa di modifiche spesso imprevedibili del sottostante processo non stazionario di generazione (fenomeno identificato come concept drift nella letteratura).

In scenari applicativi diverse sorgenti di dati sono normalmente utilizzate e ogni sorgente genera un flusso di dati. Ovviamente più è ampia la disponibilità dei dati maggiore sarà l'accuratezza e l'affidabilità del modello appreso. Infatti, dati provenienti da sorgenti diverse, in genere riflettono fenomeni diversi che potrebbero verificarsi nel tempo in contesti in cui in precedenza non erano stati riscontrati. Tuttavia, a tutela della privacy e\o del segreto industriale, i dati non possono in genere essere condivisi, così impedendo in pratica di poter sfruttare tutti i dati a disposizione nell'apprendere i modelli. Per superare le limitazioni relative alla condivisione dei dati, generando in ogni caso modelli per data mining accurati, negli ultimi anni è stato proposto il Federated Learning (FL). FL è un recente paradigma che preserva la privacy in un contesto di apprendimento collaborativo dei modelli: in FL i proprietari dei dati condividono solo informazioni aggregate (come per esempio modelli locali) e contribuiscono all'apprendimento di un modello globale. Il modello globale integra al suo interno "la conoscenza" relativa a tutti i fenomeni caratteristici dei singoli contesti in cui sono stati prodotti i dati, senza che questi siano stati resi pubblici.

L'attività di ricerca riguarderà la progettazione e la sperimentazione di algoritmi di FL per l'apprendimento di modelli per data mining da flussi di dati. Sebbene esista ormai una cospicua letteratura su FL, molto limitata è stata finora l'attività di ricerca su FL per data stream mining, malgrado i dati nelle applicazioni reali siano disponibili tipicamente in forma di flussi. Durante i tre anni verranno trattati vari problemi di data mining, proponendo soluzioni basate su FL e sperimentando tali soluzioni in contesti applicativi, anche legati all'azienda che ospiterà il ricercatore.

## Specific research activities:

Research activities related to the scientific sector "09/H1 - Information processing systems", with reference to Artificial Intelligence for data stream analysis.

## Scientific targets:

Publication of papers on qualified international scientific journals; participation to international conferences; involvement in national and international research projects.

## Places of activities:

Dipartimento di Ingegneria dell'Informazione e LogObject AG con sede in Ambassador Haus Thurgauerstrasse 101 A, CH-8152 Opfikon - Switzerland e con sede operativa a Ponsacco (PI).

## Teaching:

Teaching activity in courses of the scientific sector "09/H1 - Information processing systems". Management of teaching activities and projects.

## Internship in Private Companies:

Impresa: LogObject AG (P.IVA: CHE-104.997.055) con sede in Ambassador Haus Thurgauerstrasse 101 A, CH-8152 Opfikon - Switzerland e con sede operativa a Ponsacco (PI). Numero di mesi: 6

# **Date e time of the interview:** 29 novembre alle ore 9 (remote)

## The interview will include a test of language skills for: English

Dipartimento di Matematica Settore Concorsuale 01/A3 "Analisi matematica, probabilità e statistica matematica" SSD MAT/05 "Analisi matematica"

n. 1 posto

Commitment regime: Full time

Principal Investigator: prof. Stefano Galatolo

Thematic Area: Green

## Motivation and agreement with the Green Innovation Area:

Mathematics plays an important role in understanding the behaviour of a complex system such as the one that determines the climate on our planet. The following areas of Mathematics are particularly involved: dynamic systems, statistical mechanics, fluid mechanics and data science. Research in this direction may help in understanding important issues concerning phenomena related to climate change.

## Research title:

Mathematical methods for climate science

## Research topic:

Applications of Mathematical Analysis to the study of dynamical systems and to the modeling of atmospheric and climate phenomena.

#### Specific research activities:

Mathematical Analysis in all its aspects (harmonic, convex, functional, stochastic, linear and nonlinear), Calculus of Variations, Function Theory (real and complex), and Analytic Number Theory.

#### Scientific targets:

Publishing papers of interest in the realm of mathematical analysis in generalist or specialized journals at a national or international level. Seminars in Universities, Research Institutes and international or national Conferences.

## Places of activities:

Principalmente Pisa, salvo i viaggi di studio per i quali sarà dato incarico da parte del dipartimento.

## Teaching:

Teaching of courses having as a topic the basics of mathematics, in any degree program of the university, and of advanced courses of mathematical analysis in the bachelor's degree, master's degree and PhD program in mathematics, among which courses of interest for climate science, such as: deterministic and stochastic dynamical systems, data science, modeling and computational methods.

# Internship in Private Companies:

Impresa: Miningful Studio (http://www.miningfulstudio.eu/)

Numero di mesi: 6

# Date e time of the interview:

3 dicembre ore 9 (remote)

## The interview will include a test of language skills for: English

Dipartimento di Scienze Agrarie Alimentari ed Agro-ambientali Settore concorsuale 07/A - Economia agraria ed estimo SSD AGR/01 - Economia ed estimo rurale

n. posti 1

Commitment regime: Full time

Principal Investigator: Gianluca Brunori

Thematic Area: Green

#### Motivation and agreement with the Green Innovation Area:

Livestock production is one of the main sources of greenhouse gas emissions and soil pollution among the agricultural activities. Although the intensity of environmental pressures in Europe is lower than in many other regions of the world, there are large European areas the production systems of which will require a radical redesign to meet the sustainable development goals and Green Deal targets. Some solutions are already available, but have not become common practices, and the paths of transition of livestock farms towards sustainable food systems are not yet well studied. In addition, the likelihood of further climate change occurring, and the increasing scale of potential climate impacts require attention on the agricultural adaptation strategies of the livestock sector.

#### Titolo della ricerca:

Analisi socio-ecologica della transizione dei sistemi zootecnici

#### Research topic:

Research will assess practices and innovations that enable a reduction in net greenhouse gas emissions from terrestrial livestock, while working to ensure farm profitability and the resilience of production systems, including adaptation to climate change, and taking into account the impact on the environment and biodiversity. A systemic approach will study how different actors can cooperate to improve the greenhouse gas balance of livestock production, optimizing the use of resources, including feed (e.g. production and origin), improving circularity, analyzing the potential socio-economic impact of proposed practices and innovations, and exploring options to facilitate their adoption.

#### Specific research activities:

Scientific activity in the fields of economic, political, management and estimation aspects of production, processing, distribution, market and consumption of products in the primary sector (agriculture, forestry and fisheries), the agri-food economy and agro-biotechnology, their relations with the other components of the socio-economic and environmental system, and the problems of technical assistance.

#### Obiettivi di produttività scientifica:

Un articolo / anno su riviste ad alto impact factor

## Places of activities:

Pisa

## Teaching:

The candidate will carry out teaching activities in the Green-related fields such as: Rural and environmental assessment, agri-food policy, farm management, rural planning and management, interactions between agricultural systems and sustainable development.

## Internship in Private Companies:

Impresa: Consorzio Tutela del Pecorino Toscano

Numero di mesi: 6

## Date e time of the interview:

30 Novembre ore 14:00

## The interview will include a test of language skills for: English

Dipartimento di Scienze Agrarie, Alimentari e Agro-ambientali Settore Concorsuale 07/D1 SSD AGR/11

n. 1 posto

Commitment regime: Full time

## Principal Investigator: Prof. Andrea Lucchi

Thematic Area: Green

## Motivation and agreement with the Green Innovation Area:

The present research is part of the Green thematic area, being focused on the development, validation and optimization of new tools for the eco-friendly management of grapevine pests, with a major focus on biological control and Integrated Pest Management.

#### Research title:

Behavioral ecology and sustainable management of insects of agricultural importance, with special reference to the biological control of grapevine pests.

#### Research topic:

The researcher's activity will focus on the development of new tools for the environmentally sustainable management of grapevine arthropod pests, with special reference to biological control and Integrated Pest Management with entomophagous organisms (predators and parasitoids) and eco-friendly pheromone formulations. The researcher's activity will be focused on three points of high practical interest, to be developed in close collaboration with the Company: (i) Insights on the behavioral ecology of grapevine pests and their natural enemies, since this basic knowledge is of key importance to develop GREEN tools for pest management; (ii) Development of novel methods for monitoring harmful grapevine pests, including "smart" approaches in the context of "precision agriculture"; (iii) Development of new tools for the effective and eco-friendly control of grapevine pests, with special reference to the use of entomophagous predators and parasitoids, mating disruption, and green insecticides with multiple mechanism of action and limited non-target effects, including nanoformulated natural products.

## Specific research activities:

Morphology, physiology, ecology, ethology, systematic and biodiversity of arthropods and nematodes of agricultural, forestry, zootechnical, urban and commodity interest; general and applied entomology, agricultural entomology, forestry entomology, urban entomology, food and veterinary medicine entomology, apidology, sericulture, general agricultural and applied zoology, biocenotic interactions, biological and integrated control, agricultural parasitology, biotechnology applied to arthropods, control strategies and management of harmful species, protection and enhancement of beneficial species.

## Scientific targets:

As part of the proposed activity, the obtained results will be published in international journals with impact factor in the field of general and applied entomology. Special attention will be devoted to make the results readily available on a large scale through open-access publications. In addition to the publications of original papers reporting results of experiments conducted in the field and in the laboratory, careful analysis of the literature regarding the research lines (i)-(iii) mentioned above will be done, as well as articles contributing to the technology transfer of the innovation.

## Places of activities:

Dipartimento di Scienze Agrarie, Alimentari e Agro-ambientali Department of Agriculture, Food & Environment

## Teaching:

The fixed term researcher (RTD-a) will conduct teaching activity related to the biology, ecology and sustainable management of the main grapevine pests within the framework of the master degree "Sustainable Innovation in Viticulture and Enology", and supplementary teaching within the course of Biological and Integrated Control in the master degree "Agrifood Production and Agroecosystem Management".

## Internship in Private Companies:

Impresa: CBC (Europe) srl, Biogard Division, Grassobbio (BG). Numero di mesi: 9 Months: 9

#### Research period abroad:

Istituzione: Université Côte d'Azur, INRAE, CNRS, UMR-ISA, 06000, Nice, France Numero di mesi: 6 Months: 6

#### Date e time of the interview:

2 dicembre ore 10:00 (telematica)

## The interview will include a test of language skills for: English

#### Dipartimento di Scienze Agrarie Alimentari e Agro-Alimentari Settore Concorsuale 07/E1 "Chimica Agraria, Genetica e Pedologia" SSD AGR/13 "Chimica Agraria"

n. 1 posto

Commitment regime: Full time

Principal Investigator: Prof.ssa Annamaria Ranieri

Thematic Area: Green

#### Motivation and agreement with the Green Innovation Area:

According with the objectives for sustainable development of the 2030 Agenda aimed at promoting responsible production, reducing waste and enhancing the health and well-being of the consumers, the research will be aimed at identifying and optimizing some eco-sustainable approaches, to be adopted in pre- or post-harvest, capable of improving the productivity and organoleptic / commercial quality of the fruit and vegetable products, of increasing the content of compounds beneficial to human health and in prolonging the shelf life of the product itself.

#### Research title:

Eco-sustainable approaches in pre- and post-harvest to increase production, improve nutritionalnutraceutical quality and reduce waste of fruit and vegetables

#### Research topic:

Among the green technologies that can be used in order to achieve the above objectives, the research will use LEDs lamps, either monochromatic or built with different combinations of visible and ultraviolet (UV-A and UV-B) wavelengths, that have the potential to customize the lighting environment (in pre or post-harvest) according to the needs of the different species / varieties, and depending on the type of desired response (higher yield, more intense coloring of leaves, flowers or fruits, increased concentration of bioprotective compounds for both the plant and the consumers, greater resistance to the attack of pathogens and harmful insects, etc.).

Another eco-friendly and very promising approach to prolong the shelf life of fresh food products and preserve their nutritional-nutraceutical properties will be the use of edible coatings, that is, coatings based on biopolymers, whose use, both pure or enriched with bioactive substances, may limit gaseous exchanges with the external environment, reduce attacks by pathogens and slow down the inevitable reduction in organoleptic and nutraceutical quality that occurs during shelf life. The production of these polymers from by-products and / or waste materials of the agri-food chain (chitosan, for example, is produced from the crustaceans shells but can also be extracted from the exoskeleton of insects bred using fruit and vegetable waste) and their use to reduce food waste is an excellent example of a sustainable and circular production system

#### Specific research activities:

The sector brings together the research topics concerning the chemical, biochemical, physiological and ecological aspects of the soil-water-plant-atmosphere system, with particular attention to the biotechnological approach aimed at identifying innovative technical means for the regulation of processes aimed at improving the yield and quality of production, preserving, improving and restoring soil fertility. The training skills are related to the chemistry, biochemistry and fertility of the soil, the biochemistry and physiology of cultivated plants and their products also in post-harvest.

## Scientific targets:

Publications in national and international journals; participation in national and international congresses and workshops; participation in national and international competitive research project

## Places of activities:

Dipartimento di Scienze Agrarie, Alimentari e Agro-Ambientali (DiSAAA-a UNIPI)

## Teaching:

#### Activity in the SSD AGR/13.

The activity will consist of lectures and exercises for the course "Bioactive and Nutraceutical Compounds", Master's Degree in Biosafety and Food Quality. Supervision activities for undergraduates, PhD students and seminar activities are also planned, consistent with issues concerning eco-sustainable approaches to the production and conservation of products of plant origin.

## Internship in Private Companies:

Impresa: C-LED srl (Imola - BO) Numero di mesi: 6

## Date e time of the interview:

24 novembre 2021, ore 9.30 (telematica)

## The interview will include a test of language skills for: English

Dipartimento di Scienze della Terra Settore Concorsuale 04/A2 - Geologia strutturale, geologia stratigrafica, sedimentologia paleontologia SSD GEO/02 - Geologia stratigrafica e sedimentologica

Numero posti: 1

Commitment regime: Full time

Principal Investigator: Prof. Caterina Morigi

Thematic Area: Green

## Motivation and agreement with the Green Innovation Area:

Relevance of research activities in relation to the ability to create high added value, through the enhancement of human capital, in terms of scientific repercussions on the national territory with reference to the issues of biodiversity and the reduction of climate change impacts.

## Research title:

Reconstruction of the oceanographic dynamics during the geological past through the analysis of the biodiversity in the microfossil assemblages: clue for the modeling of the future climate

#### Research topic:

The aim of this research is to investigate the planktic microfossil assemblages in marine sediments, collected in geographic areas particularly sensitive to recent and past climatic changes (Arctic, Antarctica, and East Equatorial Pacific, EEP). The study of the temporal variation of the assemblages' biodiversity gives fundamental information on the evolution of the sea-ice (Arctic and Antarctica), and on the shallowing of the thermocline (EEP). The behavior of these two parameters is not only a consequence of the climate change itself but can be the cause of it. In fact, the sea-ice contributes positively to the terrestrial albedo, reducing the absorption of heat by the Earth; its reduction due to global warming therefore increases global warming itself. Similarly, the shift of the thermocline in the EEP, which is a phenomenon whose periodicity has been also recognized in the geological past, is the cause of a natural periodic terrestrial warming. This variation is exacerbated by the recent rise of global temperatures, caused by anthropogenic factors, and it enhances the frequency and intensity of the climatic phenomenon ENSO (El Niño Southern Oscillation). This phenomenon causes variations in the circulation of the Humboldt current coming from Antarctica and directly influences floods and reduction of fish stocks along the Pacific coasts of the South America, as well as droughts in the hinterland areas of western South America, with dramatic consequences for the economies of the Latin countries. Study of the planktic microfossil associations is one of the most powerful tools for palaeoclimatic reconstructions, because it provides essential data to feed models that describe the future climatic evolution of our planet. In particular, the analysis of laminated sediments provides information on the annual dynamics of ocean warming processes; data that would be difficult to obtain with other proxies. The study of these biological-sedimentary structures will be deepened by the Researcher during secondment at the School of Earth and Environmental Sciences (Cardiff University) and methodologically, with the use of scanning electron microscope systems, during the months spent at the company NanoVision S.r.l. (Brugherio, MB).

## Specific research activities:

The scientific activity will focus on geochronological reconstruction of the physical and biological events occurred during the Earth geological history; analyses of the recent and fossil stratigraphic successions, their spatial and temporal description and correlation; paleoenvironmental, paleoclimatic and paleogeographical reconstructions; study of the recent marine sedimentary environments and their dynamics.

## Obiettivi di produttività scientifica:

Publication of scientific papers in high-rank international scientific journals. Participation to national and international congresses. Outreach activities. Set up and management of analytical laboratories, including scanning electron microscope.

## Places of activities:

Dipartimento di Scienze della Terra

## Teaching:

Didactic activities within the SSD GEO/02 Stratigraphical and sedimentological geology, in the framework of the undergraduate and master courses.

## Internship in Private Companies:

Impresa: Nanovision S.r.l., via S. Margherita 115, 20861 Brugherio (MB)

Numero di mesi: 6

#### Research period abroad:

Istituzione: School of Earth and Environmental Sciences (Cardiff University) Numero di mesi: 6

#### Date e time of the interview:

24 novembre 2021 ore 10,00 (remote)

## The interview will include a test of language skills for: English

Dipartimento di Scienze della Terra Settore Concorsuale 04/A2 Geologia strutturale, Geologia stratigrafica, Sedimentologia Paleontologia SSD GEO/03 Geologia strutturale

Numero posti: 1

Commitment regime: Full time

Principal Investigator: Prof. Michele Marroni

Thematic Area: Green

Motivazione coerenza e rispondenza con le aree tematiche vincolate del Green in inglese:

the research activity is relevant being able to create a high added value, through the enhancement of human capital, in terms of scientific, social and economic impacts on the national territory, in relationships to the theme of reducing the impact of climate change and capability to prevent hydrogeological risk.

## Research title:

Geological and thematic mapping as tool for the hydrogeological risk prevention: an application to the Arezzo area

#### Research topic:

Italy has historically suffering the occurrence of hydrogeological catastrophic events, such as landslides, floods and intensive erosion, which have occurred and continue to occur in response to the intrinsic fragility of our country. Recently, climate change produces strong impact on the frequency and intensity of extreme rainfall events, resulting in a progressive increase in risks for the population. The damages produced by the extreme rainfall are increased in the high urban density that characterizes our country, resulting from a wide anthropization of the territories, some even very fragile. It should be noted that the economic damage associated with an extreme event is much greater than the financial resources necessary for its prevention. Prevention therefore means saving money and human lives.

Unfortunately, the geological knowledge of the Italian territory is still poorly developed, mainly concerning the geological cartography. The CARG (Geologic CARtography) project has not been completed and therefore a widespread geological knowledge of the Italian territory is still lacking. Even less available are the thematic geological maps, which are crucial tools for the prevention of hydrogeological risks.

This research, which is supported by the funding provided by ISPRA for the realization of the CARG sheet "Arezzo" at a scale of 1: 50,000, is devoted to produce a detailed geological map of the area around the city of Arezzo from which thematic maps aimed at prevention of hydrogeological risks can be derived.

The selected area is characterized by coexistence of strongly anthropized flat areas and mountains sectors, where human activities are reduced. In addition to the geological survey, special attention will be paid to the mapping of all the instabilities that characterize the study area and to the reconstruction of the subsoil of the Arezzo plain by analyzing the data provided by the drillings carried out for civil and industrial purposes. The results of this study will be used to produce valuable risk indicators for landslides and floods in order to preserve population, businesses and cultural heritage. The goal is therefore to produce an effective tool for the prevention of hydrogeological risk to be made available to civil society and public managers for a more correct use of our country.

## Specific research activities:

Topics included in the SSD GEO/03 Structural Geology mainly focused on the study of deformative lithospheric processes in surface and deep geological units by the geological survey and three-dimensional reconstruction of complex geological structures at different scales and their evolution, also by the integration with data provided by other fields of Earth Sciences. The research area will also refer to the analysis, with different methods, of the deformation processes and numerical and analogue modeling for the representation, also at map scale, and interpretation of deformation processes on different scales and at different depths. Tha topics include also the contributions to geological applications in the environmental and impact assessment fields, in the mitigation of natural risks, in the finding of georesources and in the management of natural assets.

## Scientific targets:

Publication of peer-reviewed papers in international journals with Impact Factor

## **Places of activities:** Dipartimento di Scienze della Terra

## Teaching:

Teachings of Basic Knowledge of Geology, Geology and Geological Survey inside Undergraduate and Master courses.

#### Internship in Private Companies:

Impresa: Tegeia S.r.l., Via Ippolito Nievo, 27/B - 56021 Cascina (PI) Numero di mesi: 6

**Date e time of the interview:** 25 novembre ore 10 (remote)

## The interview will include a test of language skills for: English

Dipartimento di Scienze Politiche Settore Concorsuale 12E/4 SSD IUS/14

n. 1 posto

Commitment regime: Full time

Principal Investigator: Prof.ssa Sara Poli

Thematic Area: Green

#### Motivazione coerenza e rispondenza con le aree tematiche vincolate dell'Innovazione o Green:

Il PNR 2021-2027, in part. la sez.3.4.2, evidenzia le connessioni con il Green Deal e richiama esplicitamente l'ob.5 di quest'ultimo, "Accelerare la transizione verso una mobilità sostenibile e intelligente".

#### Titolo della ricerca:

Diritto UE, transizione verde e mobilità sostenibile tra teoria e prassi

#### Tema della ricerca:

I trasporti e la riduzione del loro impatto ambientale

#### Specifica attività di ricerca:

La ricerca analizzerà gli sviluppi normativi a livello dell'Unione e nazionale relativi alla transizione verde e alla mobilità sostenibile. In particolare saranno indagate in modo organico 3 dinamiche distinte ma strettamente connesse: l'evoluzione dell'approccio dell'UE e dei suoi Stati membri verso la transizione verde con particolare riferimento al contesto nazionale; lo sviluppo di discipline e orientamenti innovativi promossi dall'UE nel settore della mobilità sostenibile con attenzione alle evoluzioni della COP26 e dell'attuazione dell'Accordo di Parigi; la loro attuazione nell'ordinamento italiano con specifica attenzione alle ricadute economiche e sociali sul territorio nazionale.

#### Obiettivi di produttività scientifica:

3 articoli su riviste di fascia A italiane o straniere

#### Places of activities:

Dipartimento di scienze politiche e Piaggio

#### Attività didattica specifica prevista:

Corso monografico sul diritto UE e internazionale dell'ambiente svolto nell'ambito del tema di ricerca 'green'. Laboratori pratici con coinvolgimento di esperti, aziende rilevanti e altri stakeholders

#### Periodo di ricerca in impresa:

Impresa: Piaggio Numero di mesi: 9 mesi

Data e orario di svolgimento della discussione dei titoli e delle pubblicazioni (telematica):

#### 22 novembre 2021 ore 9.00

La prova orale accerterà la conoscenza della lingua: inglese (verrà accertata in sede di discussione dei titoli e delle pubblicazioni)

Le pubblicazioni in lingue diverse dall'inglese o dal francese devono essere accompagnate da una traduzione certificata e da una dichiarazione sostitutiva dell'atto di notorietà di conformità, ai sensi del D.P.R. 445/2000, con la quale si attesti la conformità all'originale del testo tradotto.

I candidati potranno presentare un numero massimo di 12 pubblicazioni scientifiche ivi compresa la tesi di dottorato, se presentata.

Dipartimento di scienze veterinarie Settore concorsuale 07/H5 - Cliniche chirurgica e ostetrica veterinaria SSD VET/10 - Clinica ostetrica e ginecologia veterinaria

n. 1 posto

Commitment regime: Full time

Principal Investigator: Prof.ssa Alessandra Rota

Thematic Area: Green

TITOLO DELLA RICERCA in inglese: Contribution to animal biodiversity conservation through the study of protocols for gamete (spermatozoa) and embryos cryoconservation.

TEMA DELLA RICERCA in inglese: The (EC) 870/2004 regulation promoted the conservation of animal biodiversity threatened of extinction, including donkey germplasm. Artificial insemination and semen and embryos cryoconservation are well developed in farm animals and in horses, but not in donkeys.

The project aims to improve the knowledge on donkey's spermatozoa and embryos cryoconservation, to contribute to biodiversity preservation in this species.

Concerning the semen, new extenders, based on a donkey milk composition, will be evaluated for in vitro semen quality and in vivo fertility, after 24 and 48 hours of cooling and after the freezing-thawing process. Concerning the embryos, 7 days old donkey embryos will be recovered and submitted to slow freezing, according to a protocol already tested in vitro. After at least one month of preservation in liquid nitrogen, embryos will be thawed and non-surgically transferred in suitable recipients with the aim of evaluating the capacity of embryos to develop in vivo.

In case of positive results, the protocols studied will be employed for implementing the bank of animal germplasm conservation, with the aim of animal biodiversity preservation and green development of animal breeding.

## SPECIFICA ATTIVITÀ DI RICERCA in inglese:

"In addition to the previous reported topics, gamete and embryo cryopreservation and biotechnologies applied to the animal reproduction, the researcher will focus on physiopathology of reproduction of females and males of the different animal species, diagnostic and clinic of lesions and anomalies of reproductive tract, pregnancy and parturition, hypo-fertility, estrus cycles control, in accordance to the national and international regulations. The training skill will include andrology and andrology clinic, gynaecology and obstetrics clinic, hygiene and physiopathology of animal reproduction and artificial insemination, biotechnologies, reproductive pathology and methods of reproduction in the different animal species". Obiettivi di produttività scientifica:

"Nell'arco del triennio, si aspetta la produzione di 5lavori scientifici pubblicatisu riviste internazionali dotate di impact factor e recensite su Scopus e/o Wos"

Obiettivi di produttività scientifica in inglese:

"In the three years, the publication of 5manuscript in scientific journals with impact factor and reviewed on Scopuse/o Wos is expected"

#### Places of activities:

-Dipartimento di Scienze Veterinarie, Università di Pisa

-Complesso Agricolo Forestale Regionale Bandite di Scarlino. Via Martiri d'Istria, 1 -8020 Scarlino (GR)

Attività didattica specifica prevista in inglese:

Teaching activity will be developed on the course of Andrology and Technology of Reproduction, according to the current regulation and limitations, and it will be specifically focused on the techniques for gamete and embryos cryoconservation for animal biodiversity conservation through the preservation of endangered local breeds in the contest of a green evolution of domestic animal breeding. La prova orale accerterà la conoscenza della lingua: Inglese

Periodo di ricerca in impresa:

Complesso Agricolo Forestale Regionale Bandite di Scarlino. Via Martiri d'Istria, 1-8020 Scarlino (GR) Numero di mesi: 6

Research period abroad: 6 mesi

Data e orario di svolgimento della discussione dei titoli e delle pubblicazioni: 26 novembre 2021 ore 9:00 (Telematica)

La prova orale accerterà la conoscenza della lingua: Inglese

I candidati possono presentare un numero massimo di 14 pubblicazioni scientifiche (non inferiore a 12), ivi compresa la tesi di dottorato se presentata.