



MULTI-ANNUAL WORK-PROGRAMME IN GENOMICS AND BIOINFORMATICS

One PhD position in “Applications of artificial intelligence to study the interaction between genetic and environmental factors underlying human diseases”

[PhD selected are enrolled in the PhD course in Computer Science](#). The University of Milan will award a PhD degree at the end of the PhD programme.

The University of Milan UNIMI (Department of Computer Science) and the Joint Research Centre JRC of the European Commission are inviting applications for one PhD position through the Collaborative Doctoral Partnership (CDP) scheme.

Project background

The CDP scheme intends to enhance the science-policy link through strategic collaborations with higher education institutions characterized by research excellence and international reputation, in order to:

- Train a new generation of doctoral graduates in science and technology with a focus on the science-policy interface, able to understand the research needs at different stages of the policy cycle, capable of providing scientific support to policy and of using transferable skills in science communication and knowledge management.
- Co-develop, co-host and co-supervise doctoral studies between higher education institutions and the JRC.
- Strengthen collaboration between the JRC and higher education institutions by promoting mutual enhancement of related skills and competences, combining existing knowledge and capacities, and enhancing networking in key scientific areas.

Project objectives and description

The overall aim of the doctoral work-programme is to train PhD students with a solid background in Artificial Intelligence (AI), particularly in the area of Machine Learning (ML), in the application of AI and ML approaches to (Gen-)omics and Bioinformatics, in order to both perform original research in these multidisciplinary fields of Biology, and provide scientific support to the European Union policy focussing on human health and care, and citizen well-being.

More precisely, the objective of this specific PhD program is to support the development of AI-based computational models for the quantitative analysis of the complex network of relationships among genetic components and environmental factors in the onset and development of human diseases. The models developed during the PhD are expected to improve our understanding of the genetic mechanisms underlying human genetic disorders, and should shed light on the environmental factors that trigger them, as well as on the specific interaction of the overall genetic profile of individuals with the environmental factors underlying the onset of human diseases. The results of the AI-based models should also be used to provide scientific evidence that can support EU policies for implementing these novel approaches in the context of the EU One Health actions.

During the three years of studies of the PhD program, the PhD candidate is expected to:

- Establish a general framework of existing ML-based methods for the prediction of deleterious and pathogenic genetic variants associated with genetic, mental health and cancer diseases.
- Apply Natural Language Processing tools (NLP) to critically compare recent literature about AI-based approaches developed to analyse the interaction among genetic components and environmental factors in the onset and development of human diseases.
- Assess high-throughput and bio-monitoring biotechnologies, and their application to Genomics and Environmental Sciences.
- Design and develop AI-based methods for the prediction of the genetic and environmental factors underlying specific diseases.
- Evaluate how mining of digital biomarkers by AI tools (for smartphones, tablets, and wearables) can predict diseases like neuro-degenerative ones.
- Establish criteria for assessing the reproducibility of analyses made by AI-based tools that explore the complex network of relationships among genetic components and environmental factors linked to human diseases.

Duration of the doctoral project, doctoral scholarships and salary

We offer a three-year PhD position in collaboration with the Joint Research Centre (JRC) of the European Commission.

The PhD research will be realized at the Joint Research Centre (JRC) in Ispra, Italy, for a period of up to 24 months. While at the JRC in Ispra, the PhD candidate will get a contract as a Grant Holder 20*, while at UNIMI he will be funded through the PRIN project “Multi-criteria optimized data structures: from compressed indexes to learned indexes and beyond”, according to the Scholarship regimen of the University of Milan **.

The PhD student will spend the first year at the Computer Science Department of the University of Milan, and the next two years at the JRC of Ispra. The starting date of the doctoral programme will be April 1st, 2020.

Profile of the PhD candidate

- Master in Computer Science, Bioinformatics, Biotechnology, Molecular Biology (or a related field).
- A strong interest in Genomics, Artificial Intelligence, Biotechnology, and experience in at least one of these fields.
- Experience with applications of Machine Learning methods to Computational Biology is a major asset.

- Experience with R, Matlab, Python, or other programming languages is an advantage.
- Working proactively and independently and having good communication skills.
- Very good knowledge of English, both spoken and written.
- Relevant publications in peer review journals would be an asset and should be highlighted.
- Highly motivated, ambitious and result-oriented.

Candidates should have the nationality of a Member State of the EU or a country associated with the Research Framework Programs (Horizon2020) at the start of the employment contract with JRC.

Candidates from other countries may also apply, providing they have a residence and work permit in Italy. They will have to go through a security clearance before they can be granted the GH contract.

University of Milan

Università degli Studi di Milano is a public teaching and research university, founded in 1924, which is distinguished by its wide variety of disciplinary fields. It is the largest university in the Lombardy region (60,000 enrolled students) and is characterized by the marked multidisciplinary nature of its teaching and research programs, developed in 4 main academic areas: the economic, legal, political, and social area; the healthcare area; the area of science and scientific technology; and the area of the humanities. The University of Milan is one of the 24 members of the League of European Research Universities.

One of the Dept. of Computer Science's missions is to support the cooperative research in the field of Genomics and Bioinformatics. The coordinator of the Collaborative Doctoral Partnership in Genomics and Bioinformatics for the University of Milan, Prof. Giorgio Valentini, leads [AnacletoLab](#), the Computational Biology and Bioinformatics laboratory of the Department of Computer Science of the University of Milan.

Application procedure

List of documents to provide:

- Short CV including publication list (if any)
- Letter of motivations (max 1 page)
- Copy of master degree
- Summary of Master's thesis (max 2 pages)
- Identity card or passport copy
- English proficiency certificate (at least B2 level)

The pdf files have to be sent in a single e-mail, within 21 February 2020 to Prof. Giorgio Valentini, at the following address: valentini@di.unimi.it.

Questions regarding the position should be directed by email to Prof. Giorgio Valentini, valentini@di.unimi.it or to Prof. Alex Patak, Alex.patak@ec.europa.eu (no applications).

Selection is intended to ascertain the qualification, capacity and aptitudes of candidates for scientific research and their personal motivations. The selection procedure is public and includes both the evaluation of the CV and an interview of the candidate. It is composed of two phases, that is, a first selection is made by UNIMI resulting in a short list of candidates and then a second selection is made by JRC. After the selection process, the candidate will enroll in the [PhD programme in Computer Science](#) at [University of Milan](#), hosted by the [Computer Science Dept.](#)

* www.ec.europa.eu/jrc/sites/jrcsh/files/jrc_granholder_rules.pdf

* www.ec.europa.eu/jrc/en/working-with-us/jobs/temporary-positions/granholders/contract-and-working-conditions.

** <https://www.unimi.it/en/study/postgraduate-study/doctoral-research-phd-programmes/doctoral-scholarships-and-fees/doctoral>