POLITECNICO DI MILANO

PhD in INGEGNERIA DELL'INFORMAZIONE / INFORMATION TECHNOLOGY - 40th cycle

Research Area n. 1 - Computer Science and Engineering

PNRR 630 Research Field: PRIVACY-PRESERVING PRECISION MEDICINE FOR GENOMIC DATA ANALYSIS

Monthly net income of PhDscholarship (max 36 months)
€ 1500.0
In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity	
Motivation and objectives of the research in this field	1. The development of State of the Art genomic data analysis solutions in the field of personalized medicine based on ML and DL techniques. The study will focus on addressing emerging genomics challenges, such as disease risk assessment and treatment response prediction, advancing precision in medical interventions. 2. The design of novel architectures for the models mentioned in (1) capable of operating on encrypted data. This will involve integrating the mathematical foundations of Homomorphic Encryption with the internal structures of ML and DL networks, while addressing the complexities of genomics. 3. The implementation of learning algorithms able to train the models proposed in (2) directly on encrypted data. This represents an open research topic, as it involves overcoming significant challenges related to computational efficiency and accuracy while ensuring data remains encrypted throughout the process.
Methods and techniques that will be developed and used to carry out the research	The objectives of the research will be achieved by advancing the state-of-the-art in the field of privacy-preserving computation (e.g., based on Homomorphic Encryption and Differential Privacy) as well as in the field of machine and deep learning operating in a "as-a-service" manner.

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Educational objectives	The Ph.D. will gain high-quality and integrated competences in the field of machine and deep learning as-a-service aswell as privacy-preserving computation.
Job opportunities	The novel and heterogeneous background (strong competences on both theory and application) of the Ph.D.candidate will pave the way to positions in the academia, in research centers and in all the companies designing and developing machine and deep learning solutions for Cloud Computing.
Composition of the research group	1 Full Professors 0 Associated Professors 2 Assistant Professors 4 PhD Students
Name of the research directors	Manuel Roveri

Contacts
manuel.roveri@polimi.it

Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--

Scholarship Increase for a period abroad	
Amount monthly	750.0 €
By number of months	6

National Operational Program for Research and Innovation	
Company where the candidate will attend the stage (name and brief description)	Dhiria S.r.l (Milano)
By number of months at the company	6
Institution or company where the candidate will spend the period abroad (name and brief description)	Università della Svizzera Italiana (Lugano)
By number of months abroad	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
EDUCATIONAL ACTIVITIES (purchase of study books and material, including computers, funding for participation in courses, summer schools, workshops and conferences): financial aid per PhD student.

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TEACHING ASSISTANTSHIP: availability of funding in recognition of supporting teaching activities by the PhD student. There are various forms of financial aid for activities of support to the teaching practice.
 The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.

COMPUTER AVAILABILITY:
 1st year: Yes
 2nd year: Yes
 3rd year: Yes