POLITECNICO DI MILANO

PhD in MODELLI E METODI MATEMATICI PER L'INGEGNERIA / MATHEMATICAL MODELS AND METHODS IN ENGINEERING - 41st cycle

THEMATIC Research Field: SPATIAL AND HIGH-DIMENSIONAL STATISTICAL TECHNIQUES FOR GROUND DISPLACEMENT MONITORING IN CRITICAL CIVIL INFRASTRUCTURES

Monthly net income of PhDscholarship (max 36 months)
1400.0 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	The PhD candidate will participate in research activities related to two projects: the 2022 PRIN Project FORERUN (*Near-source ground shaking scenarios for enhancing seismic resilience of critical infrastructure networks*) (covering the first year of the program), and the project *Development of models and algorithms for satellite monitoring of distribution infrastructures*, funded by SNAM S.p.A. in collaboration with the Department of Civil and Industrial Engineering. The PhD research program will focus on developing models and algorithms for monitoring natural hazards using both in situ measurements and remote sensing data on ground motion, with the potential integration of synthetic data generated from numerical simulations of the phenomena under study.
Methods and techniques that will be developed and used to carry out the research	The project focuses on developing models and algorithms in functional data analysis, object-oriented data analysis, spatial statistics, and non-parametric forecasting. These methods will be applied to data from in-situ monitoring networks and remote sensing, incorporating synthetic data to reflect the physics of natural phenomena. The research aims to model, predict, monitor, and simulate ground motion scenarios, ultimately supporting the monitoring of critical infrastructure against natural hazards. Prior experience with the analysis of natural

	hazards. Prior experience with the analysis of natural hazard data or the relevant methodological fields is appreciated but not required.As the project spans multiple disciplines, the PhD candidate will work closely within a multidisciplinary research team.
Educational objectives	From a training perspective, the research project is designed to foster the professional growth of the researcher, who, upon completion of the PhD, will possess a unique and highly sought-after set of transversal skills—both theoretical and applied—in advanced mathematical and statistical modeling for complex data with spatial and temporal dependence, as well as the ability to effectively collaborate with researchers from other disciplines in both academia and industry.
Job opportunities	At the conclusion of the PhD program, the candidate will be well-prepared for positions in leading national and international research centers—both in academia (within research groups focused on mathematical modeling, statistics, and machine learning) and in industry (not only in companies directly related to the PhD's specific field of application, but also in industrial, financial, and marketing sectors where big data analytics plays a central role).
Composition of the research group	3 Full Professors 3 Associated Professors 0 Assistant Professors 2 PhD Students
Name of the research directors	Proff. A. Menafoglio e S. Vantini

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Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents	--

Scholarship Increase for a period abroad	
Amount monthly	700.0 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
Educational activities (purchase of study books and material, funding for participation to courses, summer schools, workshops and conferences): financial aid per PhD student per year 1st year: max 1.902,40 euros 2nd year: max 1.902,40 euros 3rd year: max 1.902,40 euros The PhD students are encouraged to take part in activities related to teaching, within the limits allowed by the regulations.1 individual PC per student +several shared PC. Access to one cluster with 32 processors and 384 GB RAM, and to several multi-processor servers.