POLITECNICO DI MILANO

PhD in INGEGNERIA MECCANICA / MECHANICAL ENGINEERING - 41st cycle

THEMATIC Research Field: BIG DATA AND AI TOOLS FOR TRANSPORTATION PLANNING

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	In recent years, the availability of big data and the exponential growth of computing power have opened new horizons for transportation and mobility planning. On one hand, the increasing volume of data from diverse sources—such as sensors, mobile devices, connected vehicles, and digital platforms—helps overcome one of the sector's long-standing challenges: the scarcity of reliable and up-to-date information for analyzing mobility patterns. On the other hand, enhanced computational capabilities enable the development of advanced simulation models that can represent both supply (networks, services, infrastructure) and demand (behaviors, preferences, user segmentation) in a more detailed and disaggregated manner. The overall objective of the project is to develop advanced artificial intelligence tools that support transportation planning through a learning process based on the integration of simulation models with real-world big data.
Methods and techniques that will be developed and used to carry out the research	The proposed approach is structured as an iterative framework divided into three main phases: 1. Model design: The model generates an optimal solution—such as a network or service configuration—considered efficient based on the defined simulation parameters. 2. Validation: The proposed solution is compared with real-world data to assess its consistency, measuring

	the alignment between simulated results and observed outcomes. 3. Learning: The artificial intelligence system learns from the discrepancies between model outputs and actual observations, progressively enhancing its ability to propose solutions that better reflect real mobility needs. Following an initial testing phase on small-scale networks, the approach will be scaled up and validated on real-world use cases to assess its effectiveness in complex contexts.The main stages of the research will include: •Identifying the most appropriate AI techniques to implement the proposed learning process (e.g., machine learning, deep learning, or reinforcement learning methods); •Developing a taxonomy of use cases most suitable for the methodological framework; •Designing and training the model on controlled test networks; •Implementing the model on real networks to evaluate its scalability, efficiency, and transferability to other contexts.
Educational objectives	The project will provide candidate with: -knowledge of the transportation sector, particularly advanced techniques for data collection, dynamic simulation models and transportation network design models -methodological competences at both the theoretical and applied level -problem setting and solving capabilities -capabilities to interact with people of diverse background
Job opportunities	Our last survey on MeccPhD Doctorates highlighted a 100% employment rate within the first year and a 35% higher salary, compared Master of Science holders in the same field. The research will be jointly developed within framework of the National Research centre on sustainable Mobility

	(MOST), led by the Politecnico di Milano and including 25 Italian Universities.
Composition of the research group	2 Full Professors 2 Associated Professors 3 Assistant Professors 8 PhD Students
Name of the research directors	Prof. Pierluigi Coppola

Contacts
Phone +39 02 2399 8376 Email: pierluigi.coppola@polimi.it For questions about scholarship/support: phd-dmec@polimi.it

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	750.0 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
Financial aid is available for all PhD candidates (purchase of study books and materials, fundingfor participation in courses, summer schools, workshops and conferences) for a total amount of € 6.114,50. Our candidates are strongly encouraged to spend a research period abroad, joining high-level research groups in the specific PhD research topic, selected in agreement with the Supervisor. An increase in the scholarship will be applied for periods up to 6 months (approx. 750 euro/month- net amount). Additionally, PhD candidates who spend at least 3 months abroad are eligible for an extra reimbursement of €3,000 to cover travel expenses. Teaching assistantship: availability of funding in recognition of supporting teaching activitiesby the PhD candidate. There are various forms of financial aid for activities of support to theteaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.