CIVIL AND ENVIRONMENTAL ENGINEERING

Ateneo - Structural robustness, health monitoring, and failure analysis with applications to civil infrastructures

Funded By	Politecnico di TORINO [P.iva/CF:00518460019]
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Context of the research activity	The research activities of this PhD project are intended to cover three closely related topics: (i) Structural Health Monitoring; (ii) Structural Robustness analysis; and (iii) Structural Failure analysis.
Objectives	The research activity will cover some of the following aspects: - static, dynamic (vibration-based), topographic, environmental, and/or operational monitoring for structural assessment; - Collapse resistance assessment, also through the implementation of progressive damage scenarios; - data-based semi-automated decision-making for asset management; - Estimations of resilience indices for structural integrity, either for the single infrastructure or at the network level; - potentially other related aspects. The research activities will also develop the PhD student's ability to read the potential failure modes of a civil infrastructure of interest, identify its structural critical issues; and select the best technologies for structural control and monitoring, leveraging interdisciplinary approaches and state-of-the-art methodologies to address critical challenges in civil infrastructure engineering. The key objectives of this PhD project will be to propose novel approaches and technologies for the three related fields of Structural Health Monitoring, Structural Robustness, and Structural Failure and Collapse. In more detail, this will require highlighting the critical issues of a civil structure and understanding how a structure would most likely collapse. Following this diagnosis, monitoring, inspection/survey, and control interventions and safety strategies can be planned and implemented to avoid structural defaults. This will also require a propensity for innovation and the development of cutting-edge technical-scientific topics, with applications to all kinds of civil infrastructures, either above or below ground, ranging from bridges and viaducts to tunnels and others. Non-destructive testing techniques will also be of great interest, to identify, localize, and assess damage occurrence in structural and non-structural

	elements such as e.g. tunnel linings.

Skills and competencies for the development of the activity	-M.Sc. in Civil Engineering with a specific focus on Structural Engineering. -Experience in coding with MATLAB and potentially Python as well. -Very good knowledge of Dynamics of Structures and Structural Mechanics -Very good knowledge of data-driven Machine Learning approaches and algorithms -Previous knowledge of dynamic and static Structural Health Monitoring -Potentially previous knowledge in Finite Element software including SAP 2000, ANSYS, etc. -Strong problem-solving attitude