UNIVERSITA' DEGLI STUDI DI NAPOLI FEDERICO II

DIPARTIMENTO DI STRUTTURE PER L'INGEGNERIA E L'ARCHITETTURA
CORSO DI DOTTORATO DI RICERCA IN
INGEGNERIA STRUTTURALE GEOTECNICA E RISCHIO SISMICO

XXXIX CICLO

Il sottoscritto prof. Marco Di Ludovico

(PO □ PA X RU □ RTD □) afferente al Dipartimento di Strutture per l'Ingegneria e l'Architettura

S.S.D. ICAR/09 Tecnica delle Costruzioni

CHIEDE

di essere inserito tra i possibili tutor di studenti di dottorato per il XXXIX ciclo.

1. Curriculum sintetico del proponente (max 500 parole)

Prof. Marco Di Ludovico is currently Associate Professor at Department of Structures for Engineering and Architecture, University of Napoli Federico II. He hold the PhD in Civil Engineering in the 2007 at the same department. His research activities focus on theoretical and experimental work in the field of: non-linear behavior of structures, behavior of RC members under biaxial actions, strengthening of PC girders, RC and masonry structures with composite materials (Fiber-Reinforced Polymers, FRP, Cementitious Composite, FRC, Fabric Reinforced Cementitious Matrix, FRCM, Composite Reinforced Mortar, CRM, and Fibre Reinforced Mortar, FRM) , pseudo static, pseudo dynamic and dynamic tests on full scale structural members, in – situ testing, health monitoring systems, fragility curves on existing structures, post-earthquake damage and performance loss, reparability of existing structures, expected seismic losses, innovative methodologies and technologies for knowledge, management restoration and protection of Cultural Heritage. He had the scientific responsibility of the following research projects: ReLUIS 2014-2016 RS13, DPC - ReLUIS 2016-2018- RS 4, DPC - ReLUIS 2019-2021 – Research Line - WP 2, WP 4; WP 7; WP 8 , INCASS. He participated to several research projects: MACE, MAMAS, SIMURAI, SIT-MEW, DABACOM N, PROVACI, INNOVANCE, STRIT, METROPOLIS, METRICS; H2020 LIQUEFACT. Scientific coordinator of the scientific consultancy for the Saint Gobain PPC Italia S.p.A. "Characterization and Qualification of FRCM systems for strengthening masonry structures. His scientific activity is documented more than 95 ISI papers on national and internationals journals and 150 conference papers, h-index 24/26 and 1344/2158 citations (Scopus/Google scholar). S Supervisor of 6 concluded PhD and 75 MSc theses, Supervisor of 3 concluded Postdoc projects, Member of: fib bulletin TG 5.1, CNR DT 200, CNR-DT 215/2018, Technical committee for developing Commentary to Italian Building Code NTC 2018, EAEE (European Association for Earthquake Engineering), Working Group 1 (EC8) Future Directions for Eurocode 8. Co-founder of the spin-off SEISMART srl, Sustainable Engineering, Innovative Solutions & Materials for Antiseismic Reliable Techniques (www.seismart.it).

2. Dottorandi dei quali il proponente è stato tutor nell'ultimo triennio

n.1	*Alessandro Lubrano Lobianco (Phd program in Structural and Geotechnical Engineering and Seismic risk, XXXV cicle, ongoing) grant: Ateneo*
n.2	*Natale Andrea (Structural and Geotechnical Engineering and Seismic risk, XXXIV cicle, ongoing) grant: POR*
n.3	*Autiero Francesca (PhD program in Industrial Product and Process Engineering, XXXIIV cicle) grant: Ateneo*

3. Titolo della ricerca proposta

Damage detection and quantification from Structural Health Monitoring data

4. Area tematica

Ingegneria Geotecnica □

Ingegneria Strutturale ☒

Rischio Sismico □

5. Tipologia di borsa per la quale si propone il progetto

Ateneo ☒

DM 117 (Investimento 3.3) □

(in questo caso indicare l'azienda co-finanziatrice)

DM 118 (Investimento 4.1 P.A.) □

DM 118 (Investimento 4.1 generici) ☒
DM 118 (Investimento 4.1 Patrimonio culturale) □

6. Sintesi del progetto di ricerca (max 500 parole. Stato dell'arte, obiettivi e breve programma previsto per le attività e)

Ageing of transportation infrastructure is a key challenge of many countries, where roadway bridges represent the most critical assets to maintain for keeping network's functionality. Structural Health Monitoring (SHM), the process of automated structural diagnosis and prognosis based on data continuously acquired by sensor networks, is widely recognized as the most efficient solution for an effective optimization of maintenance activities, but its implementations are still limited due to technological and theoretical shortcomings. In the Italian context, ANAS manages about 11000 bridges and viaducts. The main structural issues affecting roadway bridges made of reinforced or prestressed concrete are related to rebars/cables/tendons corrosion/fatigue and to concrete degradation. Furthermore, piers and foundations suffer from corrosion, as well as from damages caused by landslides, scour and earthquakes. SHM is acknowledged as the best solution for prioritizing structural interventions on a large number of bridges and for optimally allocating the budgets available for maintenance activities. In this framework, the objectives of the PhD project are:

- Defining physically-meaning damage-sensitive features and related monitoring thresholdslinking the most critical damaging mechanisms of the investigated classes of roadway bridges to measurable quantities, also using digital twins/surrogate models;

- Achieving high level of damage identification in bridge monitoring through transfer learning and a clear definition of target performance metrics based on damage identification errors;

- Validating the developed methods in application to relevant literature benchmark problems, simulation case studies, as well as in the field.

7. Eventuali pubblicazioni del tutor sul tema di ricerca (max 10)

Lobianco, A. L., Del Zoppo, M., & Di Ludovico, M. (2021, August). Seismic Damage Quantification for the SHM of Existing RC Structures. In Civil Structural Health Monitoring: Proceedings of CSHM-8 Workshop (Vol. 156, p. 177). Springer Nature.

Nanni, A., Ludovico, M. D., & Parretti, R. (2004). Shear strengthening of a PC bridge girder with NSM CFRP rectangular bars. Advances in Structural Engineering, 7(4), 297-309.

Cuzzilla, R., Di Ludovico, M., Prota, A., & Manfredi, G. (2011). Seismic rehabilitation of RC bridges by using FRP and SRP: case study of a bridge in the south of Italy. Special Publication, 277, 1-20.

Del Zoppo, M., Menna, C., Di Ludovico, M., Asprone, D., & Prota, A. (2021). Opportunities of light jacketing with Fibre Reinforced Cementitious Composites for seismic retrofitting of existing RC columns. Composite Structures, 263, 113717.

Polese, M., Di Ludovico, M., Prota, A., & Manfredi, G. (2013). Damage-dependent vulnerability curves for existing buildings. Earthquake engineering & structural dynamics, 42(6), 853-870.

Sisti, R., Di Ludovico, M., Borri, A., & Prota, A. (2019). Damage assessment and the effectiveness of prevention: the response of ordinary unreinforced masonry buildings in Norcia during the Central Italy 2016–2017 seismic sequence. Bulletin of Earthquake Engineering, 17(10), 5609-5629.

Di Ludovico, M., Digrisolo, A., Moroni, C., Graziotti, F., Manfredi, V., Prota, A., ... & Manfredi, G. (2019). Remarks on damage and response of school buildings after the Central Italy earthquake sequence. Bulletin of earthquake engineering, 17(10), 5679-5700.

Di Ludovico, M., De Martino, G., Santoro, A., Prota, A., Manfredi, G., Calderini, C., ... & Sorrentino, L. (2019). Usability and damage assessment of public buildings and churches after the 2016 Central Italy earthquake: The ReLUIS experience. In Earthquake Geotechnical Engineering for Protection and Development of Environment and Constructions (pp. 915-924). CRC Press.

Di Ludovico, M., Santoro, A., De Martino, G., Moroni, C., Prota, A., Dolce, M., & Manfredi, G. (2019). Cumulative damage to school buildings following the 2016 central Italy earthquake sequence. Bollettino di Geofisica Teorica ed Applicata, 60(2).

8. Eventuali progetti di ricerca finanziati in cui l'attività si inserisce

Research Project of National Relevance PRIN 2017 "Life-long optimized structural assessment and proactive maintenance with pervasive sensing techniques", Prot. 20172LHSEA.

CSLLPP_ReLUIS Attuazione DM578/2020, Sperimentazione delle linee guida per la classificazione e gestione del rischio, la valutazione della sicurezza ed il monitoraggio dei ponti esistenti

DPC-ReLUIS 2022-2024, WP 4 "Risk maps and seismic damage scenario (MARS-2)" PNRR, Sustainable Mobility Center (Centro Nazionale per la mobilità sostenibile – CNMS)

9. Eventuali fondi disponibili a supporto dell'attività del dottorando (escluso finanziamento borse)

CSLLPP_ReLUIS Attuazione DM578/2020, Sperimentazione delle linee guida per la classificazione e gestione del rischio, la valutazione della sicurezza ed il monitoraggio dei ponti esistenti

DPC-ReLUIS 2022-2024, WP 4 "Risk maps and seismic damage scenario (MARS-2)"

PNRR, Sustainable Mobility Center (Centro Nazionale per la mobilità sostenibile – CNMS)

10. Informazioni relative ad un periodo di ricerca all'estero (minimo tre mesi) previsto per il dottorando (*indicare Università/ente di ricerca e docente/ricercatore di riferimento* con indirizzo mail) (max 300 parole)

Rice University, Houston (TX), Prof. Jamie Padgett, jamie.padgett@rice.edu

11. Eventuali collaborazioni con imprese/aziende sul tema di ricerca (max 300 parole)

Tecne – Autostrade per l'Italia

Almaviva

SAT - SAT Società Autostrada Tirrenica p.A.

SAM - Autostrade Meridionali S.p.A/ SIS S.c.p.a

Tangenziale di Napoli

RINA

Napoli, 30/06/2023

Il presente modulo va compilato in ogni sua parte ed inviato all'indirizzo di posta elettronica phd.dist@unina.it entro e non oltre **il 30/06/2023.**