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

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

e

Il sottoscritto ing. Carlo Del Gaudio (PO □ PA □ RU □ RTD X) afferente al Dipartimento di Strutture per l'Ingegneria e l'Architettura

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

CHIEDONO

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

1. Curriculum sintetico del proponente (max 500 parole)

Gerardo Mario Verderame is Associate Professor of Structural Engineering at DIST, University of Naples Federico II. He has a Master's degree in Civil Engineering cum laude in 1996. He is PhD in Structural Engineering (XII cycle) at University of Naples Federico II defending a thesis on "Analisi sismica di edifici in cemento armato progettati per soli carichi gravitazionali" in 1999. In 2002 he attained the position of Researcher in Structural Engineering (ICAR/09) at University of Naples Federico II. In 2014 he attained the position of Associate Professor in Structural Engineering (ICAR/09) at University of Naples Federico II. He got the National Scientific Qualification (ASN) for the position of Full Professor on 2017.

Teaching activity
Since 1998 he supported the activities of Prof C. Greco for the course of Structural engineering (1998-2000), of Prof E. Cosenza for the course of Structural engineering (2000-2002), of Prof. R. Realfonzo for the course of Experimentation, Testing and Control of Constructions (2000-2001), of Prof G. Manfredi for the course of Structural Rehabilitation (2006-2014). He is actually lecturer of Structural engineering (Corso di laurea triennale in Ingegneria per l'Ambiente e il Territorio, equivalent to Bachelor of

Science) and of Structural Rehabilotation (Corso di laurea specialistica in Ingegneria Strutturale e Geotecnica, equivalent to Master's degree).
He has provided (as substitute in quality of researcher, or as regular lecturer after he became associate professor in 2014) a total of 78 official courses, during the academic years between 2003-2023.
He has been tutor of 10 phd studend and 23 post-doctoral fellowship.

Research activity
The research activities deal with experimental and numerical analysis of reinforced concrete (RC) elements, the modeling and non-linear analysis of RC structures, the influence of infill elements on the response of RC buildings, with respect to the inplane and out-of-plane conditions, the evaluation of seismic vulnerability of RC buildings via simplified mechanical analysis, seismic vulnerability and risk assessment for large stock of buildings via empirical approaches, structural intervention and retrofit techniques of RC buildings.
The results of the researches are presented in several national and international congresses and summarized in several indexed-journals, for a total number of documents equal to 306 and a total number of citation equal to 5729. He participated in several Research Projects as: SIMURAI (MIUR), STRIT (PON), METROPOLIS (PON), PLANNER (POR), STRASICURE (PON), BEWARE (PRIN), RELUIS (Department of Civil Protection), the Extended Partnership RETURN.

Carlo Del Gaudio is Assistant Professor (RTD-A) of Structural Engineering at DIST, University of Naples Federico II. He has a Bachelor in Civil Engineering (2008), a Master's degree in Structural and Geotechnical Engineering cum laude in 2011. He is PhD in Seismic Risk (XXVII cycle) at University of Naples Federico II defending a thesis on " Seismic fragility assessment of rc buildings at large scale" in 2015. He got the National Scientific Qualification (ASN) for the position of Associate Professor on 13th February 2023.

Teaching activity
Since 2012 he supported the activities of Prof Verderame of Structural engineering (Corso di laurea triennale in Ingegneria per l'Ambiente e il Territorio, equivalent to Bachelor of Science), and Rehabilitation of existing structures (Corso di laurea magistrale in Ingegneria Strutturale e Geotecnica, equivalent to Master of Science). Since 2022 he is co-lecturer of Structural engineering (Corso di laurea triennale in Ingegneria per l'Ambiente e il Territorio, equivalent to Bachelor of Science).
He is lecturer of the course "Insights in seismic fragility assessment: state of the art and future challenges" (duration 8 hours) in Ph.D. Schools in Industrial And Civil

Engineering And Territory Innovation And Sustainability of Università degli Studi Niccolò Cusano.
He is lecturer of the course "Insight into the derivation of empirical fragility approaches: a contribution towards the updated Italian seismic risk assessment" (duration 8 hours) in Ph.D. School of Structural Engineering, Geotechnics and Seismic Risk of University of Napoli Federico II.

Research activity
The research activities deal with experimental and numerical analysis of reinforced concrete (RC) elements, the modeling and non-linear analysis of RC structures, the influence of infill elements on the response of RC buildings, the evaluation of seismic vulnerability of RC buildings via simplified mechanical analysis, seismic vulnerability and risk assessment for large stock of buildings via empirical approaches, structural intervention and retrofit techniques of RC buildings.
The results of the researches are presented in several national and international congresses and summarized in several indexed-journals. He participated in several Research Projects as: METROPOLIS (PON), PLANNER (POR), RELUIS (Department of Civil Protection), the Extended Partnership RETURN.

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

n. ___1___	*Santa Anna Scala*

3. Titolo della ricerca proposta

Towards a novel fragility model for a problem-solving and integrated disaster risk governance

4. Area tematica

Ingegneria Geotecnica □

Ingegneria Strutturale □

Rischio Sismico X

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) X
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)

Over the past twenty years, there has been a significant increase in the number of natural hazard-related disasters recorded globally, resulting in economic losses that have approximately doubled compared to the preceding two decades (UNDRR, 2020: The human cost of disasters: an overview of the last 20 years - 2000-2019). This escalation can largely be attributed to the growing exposure of people and assets in all countries, which has outpaced the reduction in vulnerability (as outlined in the Sendai Framework for Disaster Risk Reduction 2015–2030). All this yields a steady increase in impacts on the economic, social, health, cultural and environmental sectors.

Given this context, there are growing interests for reliable and comprehensive methodologies that advocate for a deeper comprehension of dynamics behind natural disasters and enhance predictive models for quantifying risk. The National Research Program (PNR) strongly reccomended the enhancement of understanding of natural risks, as well as their interrelation with the effect of climate change effects, and improve risk prevision and methodologies for prevention, adaptation and mitigation.

The objective of this project is to firstly conduct a comprehensive examination of seismic fragility and vulnerability approaches, which stem from various methods such as empirical analysis adopting post-earthquake data, analytical or mechanical models employing simplified or exhaustive techniques, as well as heuristic or hybrid procedures that combine engineering judgments. The project aims to thoroughly discuss the advantages and disadvantages of these approaches, their applicability, and the results they yield.
The project will focus on conducting fragility assessments for residential buildings, addressing the primary open challenges in the field. These challenges include a throughly quantification of uncertainty in risk assessment, encompassing all the potential sources such as geometry, material characteristics, capacity model, uncertainty in intensity measure estimation, and its spatial correlation, record-to-record uncertainty. Moreover, the project will explore the utilization of different intensity measures to evaluate their relative effectiveness in seismic behaviour of building and their loss estimation.
Furthermore, the project aims to explore potential outcomes related to the implementation of various mitigation strategies for existing residential buildings. One of the primary objectives is to conduct a pairwise comparison of fragility curves, considering both the presence of retrofit interventions and the absence of such interventions. This comparative analysis seeks to evaluate the effectiveness of retrofit measures in reducing seismic risk and assess their economic viability.

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

1. Del Gaudio, C., Ricci, P., Verderame, G. M., & Manfredi, G. (2015). Development and urban-scale application of a simplified method for seismic fragility assessment of RC buildings. Engineering Structures, 91, 40-57.
2. Del Gaudio, C., De Martino, G., Di Ludovico, M., Manfredi, G., Prota, A., Ricci, P., & Verderame, G. M. (2017). Empirical fragility curves from damage data on RC buildings after the 2009 L'Aquila earthquake. Bulletin of Earthquake Engineering, 15, 1425-1450.
3. Del Gaudio, C., Ricci, P., & Verderame, G. M. (2018). A class-oriented mechanical approach for seismic damage assessment of RC buildings subjected to the 2009 L'Aquila earthquake. Bulletin of Earthquake Engineering, 16, 4581-4605.
4. Del Gaudio, C., De Martino, G., Di Ludovico, M., Manfredi, G., Prota, A., Ricci, P., & Verderame, G. M. (2019). Empirical fragility curves for masonry buildings after the 2009 L'Aquila, Italy, earthquake. Bulletin of earthquake engineering, 17, 6301-6330.
5. Del Gaudio, C., Di Ludovico, M., Polese, M., Manfredi, G., Prota, A., Ricci, P., & Verderame, G. M. (2020). Seismic fragility for Italian RC buildings based on damage data of the last 50 years. Bulletin of earthquake engineering, 18, 2023-2059.

6. Scala, S. A., Del Gaudio, C., & Verderame, G. M. (2022). Influence of construction age on seismic vulnerability of masonry buildings damaged after 2009 L'Aquila earthquake. Soil Dynamics and Earthquake Engineering, 157, 107199.
7. Di Ludovico, M., Cattari, S., Verderame, G., Del Vecchio, C., Ottonelli, D., Del Gaudio, C., ... & Lagomarsino, S. (2023). Fragility curves of Italian school buildings: derivation from L'Aquila 2009 earthquake damage via observational and heuristic approaches. Bulletin of Earthquake Engineering, 21(1), 397-432.

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

The research activity is associated with seismic risk assessment studies performed in the framework of the DPC-ReLUIS 2022–2024 project (https://www.reluis.it), the RETURN (Multi-Risk sciEnce for resilienT commUnities undeR a changiNg climate, https://www.fondazionereturn.it/).

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

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)

The PhD student is expected to spend at least 6 months in a major university or research centre,
such as:

Eng. **Ioanna Ioannou** (Research Associate) at the Department of Civil Engineering and Industrial Design of University of Liverpool (Ioanna.Ioannou@liverpool.ac.uk)

Professor **PAULO B. LOURENÇO** and Ing. **Nicola Chieffo** at the Department of Civil Engineering, University of Minho, Portugal. (pbl@civil.uminho.pt; nicola.chieffo@civil.uminho.pt;)

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

Napoli, 30/06/2023 FIRMA

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.**