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. _____ANTONIO BILOTTA_____

(PO □   PA ■   RU □   RTD □) afferente al Dipartimento di _____

_____Structures for Engineering and Architecture_____

S.S.D. (ICAR09 – Structural Engineering)

CHIEDE

di essere inserito nell'elenco dei tutor per il XXXVIII ciclo.

1. Curriculum del proponente (max 500 parole)
Antonio Bilotta, PhD, is Assistant Professor of Structural Engineering at the University of Naples Federico II, Italy. His research interests include: • Strengthening of existing reinforced concrete structures by application of fiber-reinforced composite materials: on this issue an extensive experimental programme was personally carried out and the contribution for a statistical procedure for the calibration of capacity models from experimental data was implemented, in accordance with the suggestions provided by Eurocode 0. The application of the procedure allowed formulating a proposal for updating the design formulas of the Instructions CNR-DT200/2004. The proposal was now in the updated standard CNR-DT200-R1/2013. Moreover, with reference to the adhesion of FRP bars applied according to the technique NSM (near surface mounted) an extensive experimental programme of bond tests has been performed in the framework of the research project EN-CORE (Marie Curie research training network) - fib TG 9.3 (international federation for structural concrete - task group 9.3). • Effects of fire on concrete structures reinforced with FRP bars: on this issue the writer collaborated for an activity concerning the effects of high temperatures on the performance of concrete members reinforced with FRP bars continued in cooperation with the Research Institute for Infrastructure and Environment of the University of Edinburgh (BRE - Centre for Fire Safety Engineering) where the writer has been Visiting Researcher. • Behaviour of intumescent paints for fire protection of steel structures: on this issue, he is performing theoretical and experimental activities to assess thermal properties of intumescent coatings, which are necessary for calculations with advanced methods. • Composite steel and concrete structures: on this issue the writer is secretary of the Task Group 2.6 of the fib (fédération internationale du béton / the International Federation for Structural Concrete), which is aimed to contribute to an unified approach for the design of steel, concrete and composite members.

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• Effects of earthquake on structures: this theme the writer carried out reconnaissance activities following the recent earthquakes in Italy since 2009, and numerical analyses for the assessment of vulnerability and the design of the strengthening of existing structures.

The writer is author of more than 100 publication (about 30 on international peer reviewed journal) The writer participated to several national (more than 10) and international (more than 20) conferences, generally as speaker.

The writer participated to several national (more than 20) and international research projects, among which: RELUIS DPC 2005-2008, SIMURAI, RELUIS DPC 2010-2013, RELUIS DPC 2014-2018, RELUIS DPC 2019-2021, METRICS, METROPOLIS, GRISIS, RiqualiFire, CoIn, CERN, RELUIS DPC 2022-2024.

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

n. _3___	*specificare tipologia di borsa: ateneo, pon, por, ecc.* 1. **Dr. Alberto Compagnone** Research topic: Fire resistant structures (from 2016 to 2019 - Thesis dissertation in March 2020) in co-tutoring with Prof. Emidio Nigro – university funds Thesis title: Probabilistic approach for simplified verification methods of resistance of steel frames in fire. 2. **Eng. Giusiana Testa** Research topic: Safety assessment of existing bridges (from 2019 to date - Thesis dissertation expected in 2023) in co-tutoring with Prof. Iunio Iervolino – university funds 3. **Arch. Ugo Carmando** Research topic: Application of artificial intelligence (AI) for structural monitoring systems for infrastructure (from 2020 to date - Thesis dissertation expected in 2024) funded by PON R&I 2014-2020 4. **Eng. Rosa Anna Nero** Research topic: Capacity of reinforced concrete joints (from 2022 to date - Thesis dissertation expected in 2026) funded by PNRR

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3. Titolo della ricerca proposta
Modeling and monitoring of an underground infrastructure for prognostics of induced structural effects in operational conditions

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)
The development of structural monitoring techniques and technologies (SHM) are increasingly at the center of the demands of administrations that, on a local and national scale, have to manage the existing built.   In particular, infrastructure management requires constant assessment of the safety and functional conditions of structural works, in order to optimize routine and extraordinary

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maintenance interventions and to be able to take into account events whose effects are not easily detected by traditional inspection and survey methods.

The proposed research is marked by a balanced distribution of activities of: (i) study of existing literature, (ii) data analysis of case studies at research facility abroad, (iii) in-house numerical modeling, (iv) validation at research facilities in Italy, and (v) dissemination of the developed technology.

Bibliographic study (i) will be conducted at the University of Naples Federico II, where the research is incardinated, which has a rich collection of scientific journals, accessible online from the University network. There will also be access to the bibliographic resources held at CERN, a partner in the project, which is promoting the development of artificial intelligence (AI) systems in different fields of study.

Real-world data analysis will be possible through access to CERN's repositories of monitoring data related mainly to underground structures. The monitoring data are obtained from both traditional high-precision and low-cost next-generation sensors.
Subsurface-structure interaction will be the subject of numerical modeling (iii) at Smart-G, which specializes in modeling and innovation in civil and infrastructure engineering. The objective of the numerical model will be to provide an interpretive benchmark for monitoring data.

The validation of the numerical models involves the use of artificial intelligence (iv) and will be carried out in academia, but will also be the subject of specific work at the foreign partner, CERN, which has recent but well-established experience on AI systems, suitably trained, capable of reconstructing the tracks of particle collisions faster than possible with untrained measurement instruments.

Finally, dissemination (v) will be carried out by the researchers of the proposing party (Federico II) with the necessary logistical and technological support provided by the industrial partner (Smart G) on facilities identified from among those that are frequently the subject of structural evaluation as part of ordering activities conducted by the Department of Structures at Federico II.

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

Bilotta A., Tomeo R., Nigro E., Manfredi G. (2018). Evaluation of the seismic demand of an existing tall building, International Journal of Earthquake Engineering, ISSN:0393-1420, 35(1), pp. 67-87

Tomeo R., Pitilakis D., Bilotta A., Nigro E. (2018) SSI effects on seismic demand of reinforced concrete moment resisting frames. ENGINEERING STRUCTURES ISSN: 0141-0296, vol.173, pages 559–572 DOI: 10.1016/j.engstruct.2018.06.104

Andrea Pollastro, Giusiana Testa, Roberto Prevete, Antonio Bilotta (2022). Variational Autoencoder and One-Class Support Vector Machine for unsupervised damage detection. Proc. of the 14th fib International PhD Symposium in Civil Engineering Sep. 5 - 7, Rome, Italy.

Andrea Pollastro, Giusiana Testa, Antonio Bilotta, Roberto Prevete (submitted to IEEE TRANSACTIONS and JOURNALS) Semi-supervised detection of structural damage using Variational Autoencoder and a One-Class Support Vector Machine.

Alessandra De Angelis, Antonio Bilotta, Maria Rosaria Pecce, Andrea Pollastro, Roberto Prevete (submitted to Journal of Civil Structural Health Monitoring) Dynamic identification methods and artificial intelligence algorithms for damage detection of masonry infills.

U. Carmando, A. Mubarak, A. Bilotta, E. Bilotta, J. Knappett, S. La Mendola, M. Gastal, P. Mattelaer, L. Sironi, D. Merlini, M. Falanesca, G. Bella, F. Gianelli, M. Andreini (2023) Preliminary study for seismic assessment of the underground facilities at point 5 of the large hadron collider (LHC) at CERN. COMPDYN 2023 9th ECCOMAS Thematic Conference on Computational Methods in Structural Dynamics and Earthquake Engineering M. Papadrakakis, M. Fragiadakis (eds.) Athens, Greece, 12-14 June 2023

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

-    CERN Agreement

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

Possibility of economic support for tests and training from incoming research project on the topic.

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 research leader has good research collaboration outside Italy, most notably for this topic:

University of Davis (California), University of Thessaloniki (Greece).

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

The research activity will be partially carried out at the Smart-G consultancy enterprise. Engineering societies (e.g. Pini Group) are strongly interested on the topic.

Napoli, 26/06/2023   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.**