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

XXXVI CICLO

I sottoscritti prof. Francesco Silvestri (PO ■ PA □ RU □ RTD □), afferente al Dipartimento di Ingegneria Civile, Edile ed Ambientale S.S.D. ICAR/07 Geotecnica, e prof. Fulvio Parisi (PO □ PA □ RU □ RTD ■), afferente al Dipartimento di Strutture per l'Ingegneria e l'Architettura S.S.D. ICAR/09 Tecnica delle Costruzioni,

CHIEDONO

di essere inseriti tra i possibili tutor di studenti di dottorato per il XXXVI ciclo.

1. Curriculum sintetico dei proponenti (max 500 parole)

Francesco Silvestri

Career

1986: M.Sc. in Civil Engineering at the University of Napoli Federico II, where he took the degree of Ph.D. in Geotechnical Engineering in 1991.
1990: Research engineer - Scientist assistant at the University of Texas at Austin (USA).
1990 to 1998: Research Assistant at the 'Department of Geotechnical Engineering' of the University of Napoli Federico II.
1998 to 2003: Associate Professor at the 'Department of Soil Defense' of the University of Calabria. 2003 to 2007: Full Professor at the 'Department of Soil Defense' of the University of Calabria.
2007 to date: Full Professor at the University of Napoli Federico II, currently at the 'Department of Civil, Architectural and Environmental Engineering'.

Research

Experimental and analytical research on characterisation and analysis of mechanical behaviour of soils under time-variable loads, relevant to working and seismic conditions of buildings and infrastructures.
Specific research topics:

- advanced experimental techniques for measurement of soil mechanical properties;
- constitutive modelling of cyclic/dynamic soil behaviour in pre-failure conditions and at liquefaction;
- embankments, levees, earth dams, coastal and underground structures under

working and seismic loading;
- geotechnical characterisation, seismic response analysis and microzonation of small to large urban centers;
- ground deformations, soil liquefaction, instability of slopes and cavities induced by earthquakes and other natural events;
- soil-foundation-structure interaction for buildings and bridges with shallow or deep foundations;
- propagation, effects and attenuation measures of man-made vibrations;
- ground improvement and early warning technologies for seismic risk reduction.

On the above mentioned research topics, he published more than 300 papers with a h-index = 17.
Appointed as general or panel session reporter, chairman and discussion leader at national and international conferences.

Organizing activities
Guest editor and reviewer of technical papers for National and International Journals and Conferences.
Member of national/international Technical Committees on geotechnical testing, design codes and earthquake geotechnical engineering.
Italian delegate to the International Technical Committee of ISSMGE on 'Earthquake Geotechnical Engineering' since 2006.
Co-chairman of WG6 (Geotechnical Earthquake Engineering) of EAEE (European Association of Earthquake Engineering) since 2015 to 2019.
Member of Organising Committees and Editor of the Proceedings of national/international conferences.
Chairman of the VII International Conference on Earthquake Geotechnical Engineering (Roma, 2019).
Principal Investigator of the institutional Research Units in the national Research Projects on soil dynamics and earthquake engineering.
Coordinator of the supporting activity of the Italian Geotechnical Society to the Department of Civil Protection in the emergency after l'Aquila earthquake in 2009.
Task coordinator in the national research project ReLUIS since 2010 to date.
Principal Investigator of international research projects.
Participation in investigation projects with private financing.

Teaching
Course on 'Soil Dynamics and Earthquake Geotechnical Engineering' - M.Sc. Degrees in 'Structural and Geotechnical Engineering' and 'Environmental Engineering' - University of Napoli Federico II (Italy).

Short Course on 'Soil dynamics and non-linear site response analysis' - International Master Erasmus Mundus Courses on 'Geomechanics, Civil Engineering and Risks (MGCER)' and on 'Earthquake Engineering and Engineering Seismology (MEEES)' - Laboratoire 3SR - University of Grenoble Joseph Fourier (France).
Short Course on 'Soil Behaviour and Soil-Structure Interaction in Seismic Conditions' (lectures on Fundamentals of Soil Dynamics and Seismic response analysis) - PhD Program in Civil, Chemical and Environmental Engineering - University of Genova (Italy).
Coordinator of international agreements with the Aristotle University of Thessaloniki (Greece) and the University of Cuyo at Mendoza (Argentina) with Erasmus + .
Supervisor of 13 PhD theses in Geotechnical Engineering or Seismic Risk.

Fulvio Parisi
Assistant Professor in Structural Engineering at University of Naples Federico II, Italy, and Associate Researcher at the Institute for Complex Systems of the National Research Council of Italy (CNR).
In 2017, he received the Italian national scientific qualification as Associate Professor in Structural Engineering.
He teaches the courses entitled "Design and Retrofit of Masonry Structures" and "Diagnosis and Therapy of Structural Failures", giving several invited lectures in different universities and research centres across Europe and USA. He is also a Scientific Board Member and teacher of "Failures and Collapses" in the post-graduate MSc Programme in Forensic Engineering. Since 2018, he is expert reviewer of the Italian Ministry for Education, University and Research.
Dr. Parisi is an Associate Editor of the ASCE Journal of Performance of Constructed Facilities, Frontiers in Earth Science (Geohazards and Georisks) and Advances in Civil Engineering, as well as Editorial Board Member of two other peer-reviewed international journals. He is reviewer for more than 40 journals and many international conferences. Besides, he was scientific committee member or mini-symposium organizer for more than 15 international conferences.
He was involved in 11 research projects and currently works on 6 projects, carrying out both theoretical and experimental research in the following fields: seismic design, assessment and retrofit of masonry structures; smart structural health monitoring (SHM) and digital technologies for condition-based structural assessment; structural robustness; multi-hazard risk and resilience assessment of civil infrastructure.
He authored over 130 papers published in peer-reviewed international journals and conference proceedings, as well as a book, three book chapters, many scientific reports, and three computer tools for seismic analysis of masonry buildings and experimental data selection of masonry properties. He was editor of a book and two journals special

issues. His research outcomes were awarded or recognized by several institutions and journals, including the Macedonian Association for Earthquake Engineering, Journal of Performance of Constructed Facilities (ASCE), Engineering Failure Analysis (Elsevier), and Engineering Structures (Elsevier). Some of his research studies were implemented or cited in three guidelines published by the American Concrete Institute and CNR. In this respect, he is a Task Group Convener for the Fédération Internationale du Béton (fib), a Working Group Member for the European Association for Earthquake Engineering (EAEE), CNR and Comité Européen de Normalisation (CEN), Vice-Coordinator of working group UNI/CT021/GL06 – Robustness for Ente Nazionale di Normazione (UNI), and a member of the Board of Directors and Regional Coordinator of the Complex Systems Society – Italy Chapter.

2. Dottorandi dei quali il proponente è stato tutor nell'ultimo triennio	
Silvestri	Annachiara Piro (33rd cycle, no grant), Giorgio Andrea Alleanza (34th cycle, ministerial grant), Francesco Gargiulo (35th cycle, ministerial grant)
Parisi	Annachiara Piro (33rd cycle, no grant), Martina Scalvenzi (34th cycle, ministerial grant), Giacomo Miluccio (35th cycle, grant funded by research project)

3. Titolo della ricerca proposta
Seismic vulnerability models for historical urban centres considering site-city interaction

4. Area tematica
Ingegneria Geotecnica □
Ingegneria Strutturale □
Rischio Sismico ■ (ma include anche le due precedenti…)

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

Heavy damage to old masonry constructions after moderate-to-strong earthquakes continuously highlight the high seismic risk of historical urban centres, which are often subjected to significant local amplification of ground motion due to soil deformability. Even though site effects can be considered in current methodologies for seismic risk assessment, a few studies have investigated the effects of soil-structure interaction (SSI) on seismic performance and risk of historical masonry buildings, which frequently include underground storeys and are characterised by a variety of foundation systems. In this respect, recent studies have been carried out to investigate the nonlinear seismic response of case-study historical buildings through nonlinear dynamic analysis of soil-foundation-structure (SFS) capacity models. Those numerical simulations focused on building sub-structures prone to suffer out-of-plane collapse mechanisms, which are usually detected in historical masonry constructions. The importance of SSI effects in seismic performance of a real school building collapsed under the 2017 Central Italy earthquakes has been evaluated, allowing a comprehensive understanding of observed damage. Nonetheless, vulnerability models for historical masonry buildings including SSI effects are still missing.

The scope of this research programme is to develop seismic fragility models for historical masonry building aggregates, considering site-city interaction (SCI) effects. The latter type of interaction includes both SSI at the scale of single buildings and the interaction among densely distributed buildings and the site. Such a complex interaction is frequently neglected in regional seismic risk assessment studies, although SCI effects can play an important role in seismic damage and disaster risk reduction of historical urban centres. Indeed, SCI effects can generate a further variability in regional simulations, in addition to that related to the earthquake shaking, soil amplification and building configuration.

The research programme involves the following primary tasks:

1. To perform nonlinear dynamic analysis of three-dimensional SFS capacity models representative of single masonry buildings (asset type A) or masonry building aggregates (asset type B), making use of advanced software packages.
2. To develop computationally efficient capacity models of selected assets, accounting for variability in site characteristics and foundation systems.
3. To run fragility analysis of selected assets, considering (i) record-to-record variability, (ii) uncertainty in soil, foundation and structural systems (intra-building variability), and (iii) uncertainty associated with building variability within the city system (inter-building variability).

4. To perform seismic damage simulation at urban scale for selected historical centres located in regions with moderate-to-high hazard.

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

Alterio L., Russo G., Silvestri F. (2017). Seismic vulnerability reduction for historical buildings with non-invasive subsoil treatments: the case study of the Mosaics Palace at Herculaneum. International Journal of Architectural Heritage, 11(3):382–398, doi:10.1080/15583058.2016.1238969

de Silva F., Pitilakis D., Ceroni F., Sica S., Silvestri F. (2018). Experimental and numerical dynamic identification of a historic masonry bell tower accounting for different types of interaction, Soil Dynamics and Earthquake Engineering 109 (2018) 235–250, doi:10.1016/j.soildyn.2018.03.012

de Silva F., Ceroni F., Sica S., Silvestri F. (2018). Non-linear analysis of the Carmine bell tower under seismic actions accounting for the soil-foundation-structure Interaction. Bulletin of Earthquake Engineering 16(7):2775–2808 doi:10.1007/s10518-017-0298-0

Piro A., de Silva F., Parisi F., Scotto di Santolo A., Silvestri F. (2019). Effects of soil-foundation-structure interaction on fundamental frequency and radiation damping ratio of historical masonry building sub-structures. Bulletin of Earthquake Engineering, DOI: 10.1007/s10518-019-00748-4.

de Silva F., Piro A., Brunelli A., Cattari S., Parisi F., Sica S., Silvestri F. (2019). On the soil-structure interaction in the seismic response of a monitored masonry school building struck by the 2016-2017 Central Italy earthquake. In: M. Papadrakakis, M. Fragiadakis (editors). Proceedings of COMPDYN 2019 – 7th ECCOMAS Thematic Conference on Computational Methods in Structural Dynamics and Earthquake Engineering, Crete, Greece, 24-26 June 2019.

Piro A., de Silva F., Martinelli G., Meccariello M., Parisi F., Silvestri F., Scotto di Santolo A. (2019). Effects of the underground urban development on the seismic response of a historical centre in Italy. In: Silvestri F., Moraci N. (editors). Earthquake Geotechnical Engineering for Protection and Development of Environment and Constructions – Proceedings of the 7th International Conference on Earthquake Geotechnical Engineering, Rome, 17-20 June 2019, CRC Press/Balkema, Taylor & Francis Group, London, UK, pp. 4498-4506, ISBN: 978-0-367-14328-2.

Cattari S., Sivori D., Brunelli A., Sica S., Piro A., de Silva F., Parisi F., Silvestri F. (2019). Soil-structure interaction effects on the dynamic behaviour of a masonry school damaged by the 2016-2017 Central Italy earthquake sequence. In: Silvestri F., Moraci N. (editors). Earthquake Geotechnical Engineering for Protection and Development of Environment and Constructions – Proceedings of the 7th International Conference on Earthquake Geotechnical Engineering, Rome, 17-20 June 2019, CRC

Press/Balkema, Taylor & Francis Group, London, UK, pp. 1655-1663, ISBN: 978-0-367-14328-2.

Piro A., de Silva F., Scotto di Santolo A., Parisi F., Silvestri F. (2018). Sensitivity analysis of seismic soil-foundation-structure interaction in masonry buildings founded on cavities. Proceedings of the 16th European Conference on Earthquake Engineering, Thessaloniki, 18-21 June 2018.

Vuoto A., Piro A., de Silva F., Scotto di Santolo A., Parisi F., Silvestri F. (2018). Seismic soil-structure interaction: Two case studies in Sant'Agata de' Goti, Italy. Proceedings of the 16th European Conference on Earthquake Engineering, Thessaloniki, 18-21 June 2018.

7. 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 ReLUIS-DPC 2019–2021 research project.

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

The research activity will mainly consist of numerical research, which is supported by the abovementioned research project and additional funding for research mobility both inside and outside Europe.

9. 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 6 months at University College London (UK) and/or Aristotle University of Thessaloniki (Greece) in cooperation with Prof. Dina D'Ayala (d.dayala@ucl.ac.uk) and Prof. Dimitris Pitilakis (DPitilakis@civil.auth.gr), as per current agreements.

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

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The research activity might stimulate cooperation with several engineering and construction companies interested in seismic assessment and retrofit of historical constructions, such as EdilCam.

Napoli, 14/02/2020

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 **venerdì 14/02/2020**.