Dr. Andrea Meoni

ACADEMIC COLLABORATIONS

March 2022 – Present

Research fellow

Research project: Innovative methodologies for safety assessment and instrumental monitoring of bridges.
"Multi-level security analysis and monitoring of existing bridges" (Fabre-Anas 2021 contract)

Place of work: University of Perugia, Department of Civil and Environmental Engineering (DICA), Via G. Duranti, 93, 06125, Perugia.

Main research activities:

- Development of innovative methodologies for risk assessment and management of existing bridges;
- Development of innovative methodologies for monitoring the structural performance of existing bridges.

January 2021 – March 2022

Research fellow

Research project: Development of innovative methodologies for structural health monitoring of masonry structures based on the use of smart strain-sensing clay bricks (DETECT-AGING, PRIN 2017, 201747Y73L).

Place of work: University of Perugia, Department of Civil and Environmental Engineering (DICA), Via G. Duranti, 93, 06125, Perugia.

Main research activities:

- Development of innovative methodologies for structural health monitoring of reinforced concrete and masonry constructions based on strain measurements acquired using smart sensors made with nano- and micro-composite cement- or clay-based materials;
- Development of innovative methodologies for traditional structural health monitoring of reinforced concrete and masonry constructions based on vibration measurements acquired from accelerometers;
- Numerical modeling of masonry structures, based on mechanical models discretized according to the finite element method, aimed at the creation of digital twins for supporting data analysis in permanent structural health monitoring systems.

November 2017 – December 2020

PhD Student

International Doctorate in Civil and Environmental Engineering, XXXIII Cycle.

Place of work: University of Perugia, Department of Civil and Environmental Engineering (DICA), Via G. Duranti, 93, 06125, Perugia.

Administrative office: University of Florence, Department of Civil and Environmental Engineering (DICEA), Via di S. Marta, 3, 50139, Florence.

Main research activities:

- Experimentation on smart sensors made with nano- and micro-composite cement- or clay-based materials for structural health monitoring of reinforced concrete and masonry buildings (measurement of static/dynamic structural response);
- Experimentation on traditional sensors, such as LVDT, strain gauges, and accelerometers for structural health monitoring of reinforced concrete and masonry buildings (measurement of static/dynamic structural response);
- Numerical modeling of masonry structures/structural elements by means of mechanical models discretized according to the finite element method.

April 2017 – November 2017

Research Associate

Postgraduate scholarship for research activities: Structural health monitoring of historical and monumental heritage.

Place of work: University of Perugia, Department of Civil and Environmental Engineering (DICA), Via G. Duranti, 93, 06125, Perugia.

Main research activities:

- Analysis of typological and structural characteristics of a sample of residential buildings in Umbria for their quick seismic risk classification;
- Experimentation on smart sensors made with nano- and micro-composite cement- or clay-based materials for structural health monitoring of reinforced concrete and masonry buildings (measurement of static/dynamic structural response).

Other Academic Assignments:

Winner of the call for tenders for tutoring activities included in the Course of Technique of Constructions (Degree in Civil Engineering (L-7)) at the Department of Civil and Environmental Engineering (DICA) of the University of Perugia, for the Academic Year 2020/2021 and 2018/2019.

Scientific Collaborations with Foreign Residence Period:

Research activities at the Institute of Applied Mechanics, Technische Universität Braunschweig (Pockelsstraße, 3, 38106, Braunschweig, Germany), from October 2019 to March 2020, from May 2019 to June 2019, and from April 2018 to June 2018.

EDUCATION

2017 – 2021	**Doctor of Philosophy, PhD: International Doctorate in Civil and Environmental Engineering XXIII Cycle, Constructions Design, Verification and Control (Doctor Europaeus)** University of Florence, Piazza S. Marco, 4, 50121, Firenze. PhD Thesis: Smart Brick for Post-Earthquake Assessment of Masonry Buildings. Italian Supervisor: Prof. Filippo Ubertini, Dr. Antonella D'Alessandro. German Supervisor: Prof. Laura De Lorenzis.
2013 – 2017	**Master's Degree in Civil Engineering (LM-23, 110/110 cum laude)** University of Perugia, Department of Civil and Environmental Engineering (DICA), Via G. Duranti, 93, 06125, Perugia. Graduate Thesis: Carbon nanotube cement-based sensors embedded in RC structural elements: Characterization and first results. Relator: Prof. Filippo Ubertini; Correlator: Dr. Antonella D'Alessandro.
2009 – 2013	**Bachelor's Degree in Civil Engineering (L-7, 99/110)** University of Perugia, Department of Civil and Environmental Engineering (DICA), Via G. Duranti, 93, 06125, Perugia.

Additional Courses:

- **Lavoratori addetti alla conduzione di piattaforme di Lavoro Mobili Elevabili – PLE con e senza stabilizzatori (art. 73 c.5 del D.LGS. 81/08)**, in Italian, Integra srl, 26/05/2021;
- **Dispositivi di protezione di III categoria (D.LGS. 81/2008 art. 77 c.4 lett. H)**, in Italian, SEA Gruppo srl, 31/05/2021;
- **Operatori laboratorio meccanico (Macro Categorie di rischio ATECO 2002 L-M, 2007 O-P**), in Italian, University of Perugia, 25/02/2021;
- **LabVIEW Core 2**, National Instruments, 19/10/2020 – 21/10/2020;
- **Developing test programs using TestStand**, National Instruments, 14/09/2020 – 17/09/2020;
- **LabVIEW Core 1**, National Instruments, 31/08/2020 – 03/09/2020;
- **12th Asia-Pacific-Euro Summer School on Smart Structures Technology**, Sapienza Università di Roma, 15/07/2019 – 03/08/2019.

SKILLS

Personal Skills: Perseverance, dedication, responsibility, aptitude for innovation, time management, autonomy, communication, problem-solving.

Technical Skills:

Experience in using traditional/innovative sensors for structural health monitoring (LVDT, strain gauges, accelerometers, cement- or clay-based piezoresistive smart sensors).

Experience in evaluating the dynamic response of structures via Operational modal analysis (OMA) performed by using frequency- (FDD, EFDD) and time-domain (SSI-COV) methods.

Experience in evaluating vibration-induced structural damage according to the prescriptions provided by the Italian Technical Standard UNI 9916-2014.
Experience in evaluating vibration annoyance for buildings' occupants according to the prescriptions provided by the Italian Technical Standard UNI 9614-2017.
Experience in site inspections for the detection of defects in steel, reinforced/precast concrete, and masonry structures.
Experience in the application of the Guidelines for risk classification, safety assessment, and monitoring of existing bridges issued by the Italian Ministry of Infrastructure and Transport.
Experience in mechanical/electromechanical laboratory tests for materials characterization.
Experience in data analysis; knowledge of the main statistical methods and machine learning algorithms such as regressions, principal component analysis (PCA), Kriging.
Experience in constructing mechanical models discretized with the finite element method according to the main techniques of micro/macro modeling; model updating.
Experience in programming in Python environment for the development of codes for data analysis, graphical interfaces, and stand-alone software.

Computer Skills:
Operating systems: Windows (Microsoft), Ubuntu (Linux), iOS (Apple).
Programming: Python, MatLab, LabVIEW.
Parallel computing systems: Beowulf Cluster.
Additional software: Excel, Word, Power Point, Outlook, Latex, Revit Autodesk, AutoCAD 2D/3D Autodesk, SAP2000, Abaqus CAE, FEAP, Spyder, ARTeMIS Modal, TestStand, Inkscape, QGIS, Google Colab, Adobe Photoshop Cs.

Language Skills: Italian (mother tongue), English (EFSET - C2 Proficient).

CERTIFICATIONS

- **EFSET English Certificate,** Final Score 71/100 (C2 Proficient), September 2020;
- **Qualified as Professional Engineer in the Sector of Civil and Environmental Engineering,** Licensed State Examination Sec. A., June 2017 session, University of Perugia.

PROJECTS

- Participation in the research activities of the Consortium FABRE (Research consortium for evaluation and monitoring of bridges, viaducts and other structures) as a member of the Research Unit of the University of Perugia;
- Participation in the GEOFIT project funded by the Horizon 2020 research and innovation program of the European Union (No. 792210);
- Participation in the project "Terre proiettate per una industria delle construzioni eco-sostenibile a misura d'uomo", 2021 (FISR2019_00245), Fondo Integrativo Speciale per la Ricerca (FISR);
- Participation in the project LIVESTOCK SMART FARMING - Focus Area 2 A, PSR Regione Umbria 2014-2020: "Il benessere animale nei sistemi di allevamento per rispondere alle nuove sfide di mercato per i prodotti di origine animale";
- Research fellow in the project DETECT-AGING, PRIN 2017 (201747Y73L): Degradation Effects on sTructural safEty of Cultural heriTAGe constructions through simulation and health monitoring;

- Winner of the Project, RESEARCH GRANTS - SHORT-TERM GRANTS, 2019 (57442045), German Academic Exchange Service (DAAD): As part of the PhD program, this Project helped to co-fund my research activity at the Institute of Applied Mechanics, Technische Universität Braunschweig (Pockelsstraße, 3, 38106, Braunschweig) for a period of six months, from October 2019 to March 2020;
- Participation in the project SMART - BRICK, PRIN 2015 (2015MS5L27): Novel strain-sensing nano-composite clay brick enabling self-monitoring masonry structures;
- Research associate in the Convention between Azienda Territoriale per l'Edilizia Residenziale della Regione Umbria (ATER-Umbria) and the Department of Civil and Environmental Engineering (DICA) of the University of Perugia: “Analisi a campione delle caratteristiche strutturali inerenti la vulnerabilità sismica degli immobili di proprietà dell'ATER-Umbria ed ampliamento della base dati esistente”.

OTHER ACTIVITIES

- Member of the Coordination Group of the Consortium FABRE (Research consortium for evaluation and monitoring of bridges, viaducts and other structures)

OTHER PROFESSIONAL TITLES

- **Registered as Professional Engineer,** Ordine degli Ingegneri della Provincia di Arezzo, n. 1829, 2017 to Present.

ATTACHMENTS

- **Scientific Publications**

Andrea Meoni

SCIENTIFIC PUBLICATIONS

International Journals

1. **Meoni, A.**, D'Alessandro, A., Mancinelli, M. and Ubertini, F., 2021. A Multichannel Strain Measurement Technique for Nanomodified Smart Cement-Based Sensors in Reinforced Concrete Structures. *Sensors* 2021, 21(16), 5633; https://doi.org/10.3390/s21165633.

2. **Meoni, A.**, D'Alessandro, A., Kruse, R., De Lorenzis, L. and Ubertini, F., 2021. Strain field reconstruction and damage identification in masonry walls under in-plane loading using dense sensor networks of smart bricks: Experiments and simulations. *Engineering Structures* 2021, 239, 112199, doi: https://doi.org/10.1016/j.engstruct.2021.112199.

3. D'Alessandro, A., Coffetti, D., Crotti, E., Coppola, L., **Meoni, A.** and Ubertini, F., 2020. Self-Sensing Properties of Green Alkali-Activated Binders with Carbon-Based Nanoinclusions. *Sustainability*, 12(23), 2020, 9916, https://doi.org/10.3390/su12239916.

4. D'Alessandro, A., Tiecco, M., **Meoni, A.** and Ubertini, F., 2020. Improved strain sensing properties of cement-based sensors through enhanced carbon nanotube dispersion. *Cement and Concrete Composites*, 115, 2020, 103842, https://doi.org/10.1016/j.cemconcomp.2020.103842.

5. **Meoni, A.**, D'Alessandro, A. and Ubertini, F., 2020. Characterization of the strain-sensing behavior of smart bricks: A new theoretical model and its application for monitoring of masonry structural elements. *Construction and Building Materials*, 250, 2020, 118907, https://doi.org/10.1016/j.conbuildmat.2020.118907.

6. **Meoni, A.**, D'Alessandro, A., Cavalagli, N., Gioffré, M. and Ubertini, F., 2019. Shaking table tests on a masonry building monitored using smart bricks: damage detection and localization. *Earthquake Engineering and Structural Dynamics*, 48: 910-928, https://doi.org/10.1002/eqe.3166.

7. D'Alessandro, A., **Meoni, A.** and Ubertini, F., 2018. Stainless Steel Microfibers for Strain-Sensing Smart Clay Bricks. *Journal of Sensors*, DOI: 10.1155/2018/7431823.

8. **Meoni, A.**, D'Alessandro, A., Downey, A., García-Macías, E., Rallini, M., Materazzi, A.L., Torre, L., Laflamme, S., Castro-Triguero, R. and Ubertini, F., 2018. An experimental study on static and dynamic strain sensitivity of embeddable smart concrete sensors doped with carbon nanotubes for SHM of large structures. *Sensors*, 18(3), p.831, https://doi.org/10.3390/s18030831.

9. D'Alessandro, A., **Meoni, A.** and Ubertini, F., 2018. Innovative Composites with Carbon Nanofillers for Self-Sensing Structural RC Beams. In *Nano Hybrids and Composites* (Vol. 19, pp. 12-22). Trans Tech Publications, https://doi.org/10.4028/www.scientific.net/NHC.19.12.

10. D'Alessandro, A., Ubertini, F., García-Macías, E., Castro-Triguero, R., Downey, A., Laflamme, S., **Meoni, A.** and Materazzi, A.L., 2017. Static and dynamic strain monitoring of reinforced concrete components through embedded carbon nanotube cement-based sensors. *Shock and Vibration*, 2017, https://doi.org/10.1155/2017/3648403.

International and National Conferences

1. D'Alessandro, A., Birgin, H.B., **Meoni, A.** and Ubertini, F., 2021. Smart graphite cementitious composites for weigh-in-motion and monitoring of bridges. *Proceedings of Italian Concrete Days 2020, in press (accepted for publication: 22 Mar 2021).*

2. D'Alessandro, A., **Meoni, A.** and Ubertini, F., 2019. Recent results on the use of smart bricks for earthquake-induced damage detection in masonry structures. *XVIII ANIDIS Conference, Seismic Engineering in Italy*, Ascoli Piceno, Italy.

3. D'Alessandro, A., **Meoni, A.**, Cavalagli, N., Gioffré, M. and Ubertini, F., 2019. Applications of Smart Bricks for Strain Field Reconstruction in Masonry Walls: Numerical Analysis and Shaking Table Tests. *COMPDYN 2019, 7th International Conference on Computational Methods in Structural Dynamics and Earthquake Engineering*, https://doi.org/10.7712/120119.6931.20032.

4. D'Alessandro, A., **Meoni, A.**, García-Macías, E., Gioffrè, M., Cavalagli, N. and Ubertini, F., 2018. Full-scale testing of a masonry building monitored with smart brick sensors. *In Proceedings, 5th International Electronic Conference on Sensors and Applications ECSA-5*, DOI: 10.3390/ecsa-5-05764.

5. D'Alessandro, A., **Meoni, A.**, Ubertini, F. and Materazzi, A.L., 2018. Strain measurement in a reinforced concrete beam using embedded smart concrete sensors. *In: by Prisco M., Menegotto M. (eds) Proceedings of Italian Concrete Days 2018. ICD 2018. Lecture Notes in Civil Engineering, vol 42. Springer, Cham*, https://doi.org/10.1007/978-3-030-23748-6_22.

6. **Meoni, A.**, D'Alessandro, A., Downey, A., Laflamme, S. and Ubertini, F., 2018, March. Strain monitoring in masonry structures using smart bricks. *In Sensors and Smart Structures Technologies for Civil, Mechanical, and Aerospace Systems 2018* (Vol. 10598, p. 105981T). International Society for Optics and Photonics, DOI: 10.1117/12.2297526.

7. D'Alessandro, A., Ubertini, F., Comanducci, G., **Meoni, A.** and Almadori, A., 2017. A critical investigation on typological and structural characteristics of residential buildings in Umbria for their quick seismic risk classification. *XVII ANIDIS Conference, Seismic Engineering in Italy*, Pistoia, Italy (pp. 561-567).

8. D'Alessandro, A., Ubertini, F., **Meoni, A.**, Downey, A. and Laflamme, S., 2017. Nanocomposite Clay Bricks for Smart Masonry Structure. *Annual International Conference on Composites and Nano Engineering*, ICCE-25, Rome, Italy.

Book Chapter

1. **Meoni, A.**, D'Alessandro, A. and Ubertini, F., 2021. Recent Advances and Open Issues on the Use of Smart Bricks for Seismic Monitoring of Masonry Buildings: Experimental Tests and Numerical Simulations. In Rizzo P., Milazzo A. (eds), *European Workshop on Structural Health Monitoring*, EWSHM 2020, Lecture Notes in Civil Engineering, vol 127. Springer, Cham. https://doi.org/10.1007/978-3-030-64594-6_82.

2. **Meoni, A.**, D'Alessandro, A., Ubertini, F. and Materazzi, A.L., 2019. Use of Carbon-Based Sensors for Dynamic Monitoring of Structures. In D'Alessandro, A., Materazzi, A.L. and Ubertini, F., *Nanotechnology in Cement-Based Construction*, Jenny Stanford Publishing, Chapter 9: 215-245, ISBN: 9789814800761, DOI: 10.1201/9780429328497-10.