Curriculum Vitae

Filippo Masi

Updated on: January 2023

Email:	filippo.masi@sydney.edu.au
Secondary email:	flp.masi@gmail.com
Internet website:	filippo-masi.github.io
Profiles:	Google Scholar – ResearchGate – OrcidID
Channels:	LinkedIn – Twitter – YouTube

1 Career summary

Since late 2022, I joined the Sydney Centre in Geomechanics and Mining Materials (SciGEM) at The University of Sydney, School of Civil Engineering (Australia).
I studied at the School of Mechanical Engineering of the University of Florence (Italy) and did my thesis jointly at Ecole des Ponts ParisTech and Ecole Centrale de Nantes (France), in collaboration with the University of Versailles and St-Quentin and the enterprise Ingerop. My research concerns the development of data-driven and machine learning approaches for the constitutive modeling of materials, the structural and fast-dynamic behavior of masonry structures, geomechanics, and hydrodynamics.

Scientific interest and research axes

Thermodynamics-based machine learning approaches for material constitutive modeling – Computational mechanics – Multiscale modeling – Structural Mechanics – Masonry – Granular materials – Fast Dynamics – Blast loads – Rocking systems.

2 Employment

01/12/2022 – present	**Postdoctoral research associate**, Sydney Centre in Geomechanics and Mining Materials, School of Civil Engineering, The University of Sydney, Australia.
01/01/2021 – 30/11/2022	**Post-doctoral researcher** under the ERC-StG CoQuake (Controlling Earthquakes) project, Ecole Centrale de Nantes, GeM Laboratory, France.
02/11/2020 – 31/12/2020	**Research Engineer** at Ecole Centrale de Nantes – Centrale Innovation, France.
18/09/2017 – 31/10/2020	**Engineer**, Ingérop Conseil et Ingénierie, France.
24/06/2016 – 24/10/2016	**Research Engineer**, Ecole des Ponts ParisTech, France.

3 Academic degrees

01/10/2017 – 14/12/2020	**PhD**, Mechanics – Ecole Centrale de Nantes, Ecole des Ponts ParisTech, in collaboration with University of Versailles and St-Quentin and Ingerop, France. "Fast-dynamic response and failure of masonry structures subjected to blast loads". Supervisors: Prof I Stefanou, Prof P Vannucci.
01/01/2016 – 17/07/2017	**Master**, Mechanical Engineering, University of Florence, Italy (solemn commendation of the committee – outstanding).
01/10/2013 – 03/12/2015	**Bachelor**, Mechanical Engineering, University of Florence, Italy.

4 Honors and Awards

2022 Early Career Researcher **Award** by EUROMECH (European Mechanics Society), on the occasion of the 18th European Mechanics of Materials Conference, Oxford, UK.

2021 **Award** for the best PhD thesis bringing technological and conceptual breakthroughs in the industry by Centrale Innovation (Ecoles Centrales Group).

2021 **Award** for the best PhD by CSMA (Computational Structural Mechanics Association).

2021 Finalist in the selection for ECCOMAS PhD award, Robert J Melosh Medal by Duke University, I Vardoulakis prize by ALERT Geomaterials.

2017 **Award** for the best Master thesis by the Order of Engineers of Florence, Italy.

5 Scientific production

Author of **10 articles** in major multi-disciplinary scientific journals and leading peer-reviewed international journals. More than **20 communications** in prestigious international conferences.

Citations: 285 (google scholar) – h-index: 9 – i10-index: 9.

Pre-prints

– **F Masi**, I Stefanou (2022). Evolution TANN and the discovery of the internal variables and evolution equations in solid mechanics. arXiv preprint. doi: 10.48550/arXiv.2209.13269.

Refereed journal articles

A1 **F Masi**, I Stefanou (2022). Multiscale modeling of inelastic materials with Thermodynamics-based Artificial Neural Networks (TANN), *Computer Methods in Applied Mechanics and Engineering*, 398, 115190. doi: 10.1016/j.cma.2022.115190.

A2 **F Masi**, I Stefanou, V Maffi-Berthier (2021). Scaling Laws for Rigid-Body Response of Masonry Structures under Blast Loads. *Journal of Engineering Mechanics* (Invited Special Issue), 147(10), 04021078. doi: 10.1061/(ASCE)EM.1943-7889.0001986. Featured in the Editor's Choice section.

A3 **F Masi**, I Stefanou, P Vannucci, V Maffi-Berthier (2021). Thermodynamics-based Artificial Neural Networks for constitutive modeling. *Journal of the Mechanics and Physics of Solids*, 147, 104277. doi: 10.1016/j.jmps.2020.104277.

A4 **F Masi**, I Stefanou, V Maffi-Berthier, P Vannucci (2020). A Discrete Element Method based-approach for arched masonry structures under blast loads. *Engineering Structures*, 216, 110721. doi: 10.1016/j.engstruct.2020.110721.

A5 **F Masi**, I Stefanou, P Vannucci, V Maffi-Berthier (2020). Resistance of museum artefacts against blast loading. *Journal of Cultural Heritage*, 44, 163-173. doi: 10.1016/j.culher.2020.01.015.

A6 **F Masi**, I Stefanou, P Vannucci, V Maffi-Berthier (2019). Rocking response of inverted pendulum structures under blast loading. *International Journal of Mechanical Sciences*, 157, 833-848. doi: 10.1016/j.ijmecsci.2019.05.024.

A7 P Vannucci, **F Masi**, I Stefanou (2019). A nonlinear approach to the wind strength of Gothic Cathedrals: the case of Notre Dame of Paris. *Engineering Structures*, 183, 860-873. doi: 10.1016/j.engstruct.2019.01.030.

A8 **F Masi**, PM Mariano, P Vannucci (2018). Blast actions in aircrafts: An integrated methodology for designing protection devices. *Engineering Structures*, 175, 895-911. doi: 10.1016/j.engstruct.2018.08.082.

A9 **F Masi**, I Stefanou, P Vannucci (2018). On the origin of the cracks in the dome of the Pantheon in Rome. Engineering Failure Analysis, 92, 587-596. doi: 10.1016/j.engfailanal.2018.06.013.

A10 **F Masi**, I Stefanou, P Vannucci (2018). A study on the effects of an explosion in the Pantheon of Rome. *Engineering structures*, 164, 259-273. doi: 10.1016/j.engstruct.2018.02.082.

Refereed conference proceedings

c1 **F Masi**, I Stefanou (2022). Thermodynamics-based Artificial Neural Networks for multiscale computational mechanics, *25eme Congrès Français de Mécanique*. Nantes, France, 29 August - 2 September.

c2 **F Masi**, I Stefanou, A Morsel, P Kotronis (2022). Reduced-scaled experiments of masonry structures under blast loads, *25eme Congrès Français de Mécanique*. Nantes, France, 29 August - 2 September.

c3 G Piunno, **F Masi**, I Stefanou, C Jommi (2022). Multi-scale modelling of natural composites via Thermodynamics-based Artificial Neural Networks, *25eme Congrès Français de Mécanique*. Nantes, France, 29 August - 2 September.

c4 **F Masi**, I Stefanou, P Vannucci, V Maffi-Berthier (2021) Material Modeling via Thermodynamics-based Artificial Neural Networks. In: Barbaresco F., Nielsen F. (eds) *Geometric Structures of Statistical Physics, Information Geometry, and Learning*. Springer Proceedings in Mathematics & Statistics, vol 361. Springer, Cham. doi: 10.1007/978-3-030-77957-3_16.

c5 **F Masi**, I Stefanou, P Vannucci, V Maffi-Berthier (2019). Rocking response and overturning of museum artefacts due to explosions (**invited keynote speaker**), *Proceedings of the 7th International Conference on Computational Methods in Structural Dynamics and Earthquake Engineering*. Crete, Greece, 24-26 June. doi: 10.7712/120119.7119.19577

c6 **F Masi**, I Stefanou, P Vannucci, V Maffi-Berthier (2019). Response of monumental buildings to internal explosions, *Proceedings of the 7th International Conference on Computational Methods in Structural Dynamics and Earthquake Engineering*. Crete, Greece, 24-26 June.
doi: 10.7712/120119.6958.19630

Conference communications

c6 **F Masi**, I Stefanou (2022). Data- and thermodynamics-driven discovery of state variables and evolution equations, *41st International Workshop on Bayesian Inference and Maximum Entropy Methods in Science and Engineering (MaxEnt'22)*. Paris, France, 18-22 July.

c7 **F Masi**, I Stefanou (2022). Understanding the behavior of masonry structures subjected to blast loads, *International Conference on Nonlinear Solid Mechanics*. Alghero, Italy, 13-16 June.

c8 **F Masi** (2022). Deep learning, simulation temps réel et réduction de modèles (**invited speaker**), *5^{e} Workshop CSMA Junior*. Giens, France, 14-16 May.

c9 **F Masi**, I Stefanou (2022). Multiscale modeling of inelastic microstructured materials with TANN, *18th European Mechanics of Materials Conference (EMMC18)*. Oxford, UK, April 4-6.

c10 **F Masi**, I Stefanou (2021). Thermodynamics-based Neural Networks: a general framework for modeling microstructured materials displaying path-dependency, *ALERT Geomaterials*. Aussois, France, 27-29 September.

c11 F Rabie, **F Masi**, I Stefanou (2021). Thermodynamics-based Artificial Neural Networks for Nonlinear Seismic Analysis of High-rise Buildings, *ALERT Geomaterials*. Aussois, France, 27-29 September.

c12 **F Masi**, I Stefanou (2021). Thermodynamics-based Artificial Neural Networks (TANN) and constitutive modeling, *Mechanistic Machine Learning and Digital Twins for Computational Science, Engineering & Technology*. San Diego, CA, USA, 26-29 September. Lecture

c13 **F Masi** (2021). Mechanics and Deep Learning for protecting cultural heritage against explosions (**invited speaker**), *6th ECCOMAS Young Investigators Conference*. Valencia, Spain, 7-9 July.

c14 **F Masi**, I Stefanou (2021). Thermodynamics-based Artificial Neural Networks for the constitutive modeling of inelastic materials, *14th World Congress on Computational Mechanics*. Paris, France, 11-15 January.

c15 **F Masi**, I Stefanou, P Vannucci, V Maffi-Berthier (2021). Micro-modelling of masonry structures under blast loads via a Discrete Element Method approach, *14th World Congress on Computational Mechanics*. Paris, France, 11-15 January. Lecture

c16 **F Masi**, I Stefanou, P Vannucci, V Maffi-Berthier (2020). Material modeling via Thermodynamics-based Artificial Neural Networks (invited speaker), École de Physique des Houches, *Joint Structures and Common Foundations of Statistical Physics, Information Geometry and Inference for Learning*. Les Houches, 26-31 July.

c17 **F Masi**, I Stefanou, P Vannucci, V Maffi-Berthier (2019). Michelangelos David or Aphrodite of Milos: who is more resistant to blast loads? *12th HSTAM International Congress on Mechanics*. Thessaloniki, Greece, 22-25 September.

c18 **F Masi**, I Stefanou, P Vannucci, V Maffi-Berthier (2019). A Discrete Element Method approach for the preservation of the architectural heritage against explosions, *12th HSTAM International Congress on Mechanics*. Thessaloniki, Greece, 22-25 September.

c19 **F Masi**, I Stefanou, P Vannucci, V Maffi-Berthier (2019). Masonry vaults under explosive loads, *7th International Conference on Computational Methods in Structural Dynamics and Earthquake Engineering*. Crete, Greece, 24-26 June.

c20 **F Masi**, I Stefanou, P Vannucci, V Maffi-Berthier (2018). Simulations of blast effects in monumental structures, *13th World Congress on Computational Mechanics*. NY, USA, 22-27 July.

c21 **F Masi**, I Stefanou, P Vannucci, V Maffi-Berthier (2018). Étude de la réponse structurale de structures à géométrie complexe aux explosions: le cas du Panthéon de Rome, *2^{e} Édition des Jounées Nationales Maçonnerie*. Marne-la-Vallée, France, 22-23 March.

c22 **F Masi**, I Stefanou, P Vannucci (2018). Une approche non-linéaire pour l'étude de la résistance au vent d'une cathédrale gothique: Notre Dame de Paris, *2^{e} Édition des Journées Nationales Maçonnerie*. Marne-la-Vallée, France, 22-23 March.

Technical reports

τ1 P Vannucci, **F Masi**, I Stefanou, V Maffi-Berthier (2019). Structural integrity of Notre Dame Cathedral after the fire of April 15th, 2019. Techincal report. CNRS, Paris, France. hal-02105786v2

T2 P Vannucci, **F Masi**, I Stefanou (2017). A study on the simulation of blast actions on a monument structure. Techincal report. CNRS, Paris, France. hal-01447783v3
T3 P Vannucci, I Stefanou, **F Masi** (2017). Report of the project "Cathédrales Durables". Classified: *Confidentiel Défense*. CNRS, Paris, France.

Lectures

L1 Invited lecture, "ISSMGE TC309 Technical Forum of Young Scholars on Data-driven Modelling of Soil Behaviours with Geotechnical Applications", Hong Kong Polytechnic University, 25 November 2022.
L2 Invited lecture, "How Machine Learning can help in earthquake control and fault mechanics?", Crunch Machine Learning + X Seminars, Brown University, Division of Applied Mathematics, 12 November 2021. lecture
L3 Invited lecture, "Can we tame earthquakes?" Data-centric engineering, University of Sydney, 27 October 2021. Slides – lecture
L4 Plenary Lecture, "Comportement des structures maçonnées à l'explosion" (Behavior of masonry structures to explosions), Ingérop, 29 October, 2020. lecture (in French)

Data, software, algorithms

D1 **F Masi**, I Stefanou (2022). Multiscale modeling of inelastic materials with Thermodynamics-based Artificial Neural Networks (TANN) (*under construction*).
D2 **F Masi**, I Stefanou (2021). Thermodynamics-based Artificial Neural Networks. doi: 10.5281/zenodo.4482668
D3 Metadata available at blastructures.eu and YouTube channel BLAST.

6 Supervising and teaching

Supervision and mentoring

PhD students supervision

- A Morsel (01/2021-present). *Experimental testing of masonry structures subjected to extreme loads*, PhD Thesis, Ecole Centrale de Nantes.

Master students supervision

- F Rabie (02/2021 – 08/2021). *Thermodynamics-based Artificial Neural Networks for nonlinear seismic analysis of high-rise buildings*, Ecole Centrale de Nantes.
- B Abougaye (02/2020 – 08/2020). *Design of reduced-scale experiments of masonry structures subjected to explosions*, Ecole Centrale de Nantes.

Courses taught

- Continuum mechanics, Lecturer – Bachelor's degree, ECN (2021-2022)
- Experimental imaging analysis for Engineers, Course coordinator – Master's degree, ECN (2020-present)
- Advanced computational mechanics – Master's degree, École des Ponts ParisTech (2018-2019)
- Computational mechanics – Bachelor's degree, École des Ponts ParisTech (2018-2019)

7 Service

- Invited reviewer

  Computer Methods in Applied Mechanics and Engineering
  Computational Mechanics
  International Journal of Mechanical Sciences
  European Journal of Mechanics, A/Solids
  Géotechnique
  International Journal for Numerical and Analytical Methods in Geomechanics
  Strain
  Defence Technology
  Journal of Cultural Heritage

- Ambassador of the French Declics Association by cerclefser: '*Dialogues Entre Chercheurs et Lycéens pour les Intéresser à la Construction des Savoirs*' (Dialogues between researchers and high school students to interest them in the construction of knowledge).
- Member of the Direction Board of GeM laboratory (03/2022 – 11/2022).
- Member of the Computational Structural Mechanics Association (CSMA), Paris, France.
- Member of the Association Française du génie Parasismique (AFPS), Paris, France.

8 Collaborations and projects

- Prof I Einav (USYD, hydrodynamics, geomechanics), Prof I Stefanou (ECN, TANN, multiscale computations, testing of masonry structures to blast loading), Prof P Kotronis (ECN, testing of masonry structures to blast loading), Prof P Vannucci (USVQ, masonry, blast loading, rocking, and structural engineering), A/Prof V Maffi-Berthier (ESTP, masonry, blast loading, rocking, and structural engineering), Prof PM Mariano (University of Florence, blast loading of fuselage structures).
- Collaborator in ERC-StG CoQuake: Controlling Earthquakes, (PI: I Stefanou, 2020 – present).
- Collaborator in Connect Talent project: CEEV, Controlling Extreme Events (PI: I Stefanou, 2020 – present).
- Collaborator in *Cathédrales Durables* CNRS project – *Attentats-Recherche* (PI: P Vannucci and I Stefanou, 2016).