# MARCO AMATO

Postdoctoral Researcher - Solid & Structural Mechanics

## CONTACT


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## RESEARCH INTERESTS

My research interests are primarily situated within the field of solid and structural mechanics with a focus on the complexities that arise when nonlinearity is involved. Within this area, I have concentrated my efforts on exploring configurational forces and the interactions between magnetic and elastic phenomena commonly referred to as magnetoelasticity. My work involves both the development of analytical models and the application of numerical simulations to verify these models, aiming to deepen the understanding of material behaviors under nonlinear conditions and complex loadings.

## EDUCATION

**Ph.D. - Solid & Structural Mechanics** — **Nov 20 - May 24**
**University of Trento (Trento, Italy)**

Thesis: *Elastic solids under frictionless rigid contact and configurational force*
Supervisors: Prof. Francesco Dal Corso, Prof. Davide Bigoni and Prof. Andrea Piccolroaz

**M.Sc. - Civil Engineering** — **Sep 16 - Jul 20**
**University of Bologna (Bologna, Italy)**

Thesis: *The Galerkin method for vibrational problem on stepped structures*
Supervisors: Prof. Alessandro Marzani and Prof. Isaac Elishakoff

**B.Sc. - Civil Engineering** — **Sep 12 - Oct 16**
**University of Bologna (Bologna, Italy)**

Thesis: *Experimental shear test on masonry samples: investigation on the role of prestress* (in Italian)
Supervisors: Prof. Cristina Gentilini, Prof. Stefano de Miranda and Dr. Antonio Maria D'Altri

## PROFESSIONAL EXPERIENCE

**Postdoctoral Researcher** — **Feb 24 - Present**
**Faculty of Civil Engineering**
**Czech Technical University in Prague (Prague, Czech Republic)**

Project: **SOFFA ERC CZ**

I focus on *magnetorheological elastomers* (MREs), a class of smart materials that combine elastomers with magnetic particles, allowing their mechanical properties to be tuned by an external magnetic field. My work involves developing variationally consistent models to describe the behavior of these materials under various mechanical and magnetic conditions, including large deformations and instability phenomena. These models are then implemented into OOFEM an open-source finite element software, written in C++ and developed within the department, enabling more accurate simulations of MREs in practical applications.

# SKILLS

- **ABAQUS** 3+ yrs
- **AutoCAD** 10+ yrs
- **LaTeX** 6+ yrs
- **Mathematica** 5+ yrs
- **MATLAB** 6+ yrs
- **Microsoft Office (Word, Excel, etc.)** 10+ yrs
- **Teaching** 4+ yrs

**Doctoral Researcher** — **Oct 20 - May 24**
**Department of Civil, Environmental and Mechanical Engineering**
**University of Trento (Trento, Italy)**

Project: **Beyond ERC-AdG**

My research focused on *configurational forces* in solids. I developed a theoretical model to describe these forces within static and dynamic regimes compared its predictions with the solution obtained from ABAQUS software.

**Visiting Scholar** — **Aug 19 - Mar 20**
**Deparment of Ocean & Mechanical Engineering**
**Florida Atlantic University (Boca Raton, Florida, US)**

Host & Supervisor: Prof. Isaac Elishakoff

Research internship for Master's thesis devoted to the development of the Galerkin method for stepped structures. I compared standard and generalized functions approaches by applying them to various structural elements like bars, beams and plates.

**Lab Intern** — **Jun 16 - Feb 17**
**Department of Civil, Chemical, Environmental and Materials Engineering**
**University of Bologna (Bologna, Italy)**

Experimental research for Bachelor's thesis. Experiments involved the assessment of the elastic modulus of mortar and brick materials, measurement of the flexural strength of mortar specimens, the development of pull-out tests on steel helical bars and the evaluation of the shear strength of masonry specimens.

# TEACHING

**Teaching Assistant**

- **Scienza delle Costruzioni** (Solid Mechanics)
  **University of Trento (Trento, Italy)**
  AY 2021/22, 2022/23, 2023/24 | First semester | Undergraduate course
- **Meccanica Computazionale delle Strutture 2** (Computational Mechanics 2)
  **University of Trento (Trento, Italy)**
  AY 2021/22 | Second semester | Graduate course
- **Teoria e Dinamica delle Strutture** (Theory and Dynamics of Structures)
  **University of Trento (Trento, Italy)**
  AY 2020/21, 2021/22, 2022/23 | First semester | Graduate course

**Guest Lecturer**

- **Mechanical Vibrations**
  **Florida Atlantic University (Boca Raton, Florida, US)**
  AY 2019/20 | First semester | Graduate course
- **Statics**
  **Florida Atlantic University (Boca Raton, Florida, US)**
  AY 2019/20 | First semester | Undergraduate course

**Additional Teaching Experience**

- Individual tutoring to high school students in Mathematics and Physics to improve their understanding and prepare them for the tests.

# AWARDS

**Scholarship for Final Thesis Research Abroad** — **Jun 19**
**University of Bologna (Bologna, Italy)**

Amount: 2 237.53 €

Awarded the scholarship under the *Scholarships for Final Thesis Research Abroad in Second-Cycle or Single-Cycle Degrees* program to support international research for a final thesis.

# PUBLICATIONS

### Peer-reviewed articles

[5] Dal Corso, F., Amato, M., & Bigoni, D. (2024). Elastic solids under frictionless rigid contact and configurational force. *Journal of the Mechanics and Physics of Solids*, 188, 105673.
DOI: https://doi.org/10.1016/j.jmps.2024.105673

[4] Amato, M., Elishakoff, I., & Reddy, J. N. (2021). Flutter of a Multicomponent Beam in a Supersonic Flow. *AIAA Journal*, 59(11), 4342-4353.
DOI: https://doi.org/10.2514/1.J060631

[3] Elishakoff, I., & Amato, M. (2021). Flutter of a beam in supersonic flow: truncated version of Timoshenko-Ehrenfest equation is sufficient. *International Journal of Mechanics and Materials in Design*, 1-17.
DOI: https://doi.org/10.1007/s10999-021-09537-x

[2] Elishakoff, I., Amato, M., & Marzani, A. (2021). Galerkin's method revisited and corrected in the problem of Jaworski and Dowell. *Mechanical Systems and Signal Processing*, 155, 107604.
DOI: https://doi.org/10.1016/j.ymssp.2020.107604

[1] Elishakoff, I., Amato, M., Ankitha, A. P., & Marzani, A. (2020). Rigorous implementation of the Galerkin method for stepped structures needs generalized functions. *Journal of Sound and Vibration*, 115708.
DOI: https://doi.org/10.1016/j.jsv.2020.115708

### Book chapters

[1] Bigoni, D., Amato, M., & Dal Corso, F. (2022). Configurational Forces in Penetration Processes. *In Solid (Bio) mechanics: Challenges of the Next Decade: A Book Dedicated to Professor Gerhard A. Holzapfel* (pp. 429-437). Cham: Springer International Publishing.
DOI: https://doi.org/10.1007/978-3-030-92339-6_19

### Conference papers

[1] Gentilini, C., D'Altri, A. M., Amato, M., Zanotti, P., Favaro, F., & de Miranda, S. (2017). Salt attack effects on the shear behavior of masonry: preliminary results of an experimental campaign. *In Key Engineering Materials* (Vol. 747, pp. 512-517). Trans Tech Publications Ltd.
DOI: https://doi.org/10.4028/www.scientific.net/KEM.747.512

# CONFERENCES

### Presentations

**NMM2024 - Conference on Nano and Macro Mechanics** — **Sep 12, 2024**
**Prague, Czech Republic**

Hard-magnetic soft materials: theory and implementation.

**ICNEM - 26th International Conference on Nonlinear Elasticity in Materials** — **Jun 9 - 14, 2024**
**Prague, Czech Republic**

Efficient numerical approach to modeling of hard magnetic soft beams.

**Mathematics and Mechanics of Solids and Structures - Scientific challenges and methodologies for future societal development** — **Jun 7 - 9, 2023**
**Aberystwyth, Wales, UK**

Elastic solids moving along frictionless constraints via configurational forces.

**EUROMECH - Mechanics of high-contrast elastic composites** **Sep 6 - 8, 2021**
**Virtual Conference, Online**

Free vibration and flutter of a multi-component beam in a supersonic flow.

**ASME - International Mechanical Engineering Congress & Exposition** **Nov 16 - 19, 2020**
**Virtual Conference, Online**

Flutter of a beam in a supersonic flow: no need in full Timoshenko-Ehrenfest equations.

*Last Update: January 3, 2025*