

# Maria Rosaria Marulli

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## CURRENT POSITION

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**Post Doctoral Fellow** 01/06/2021 - Ongoing  
in **Computational mechanics for extra fast and accurate simulation of complex structural systems**  
IMT School for Advanced Studies Lucca  
Research unit: MUSAM Multi-scale Analysis of Materials - Director: Prof. Marco Paggi

## RESEARCH INTERESTS

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Finite Element Method for Solid mechanics;  
Fracture and contact mechanics;  
Phase-field approach for fracture mechanics;  
Cohesive zone model for complex interface modelling;  
Surface roughness characterization;  
Microstructured bio-mimetic surfaces.

## EDUCATION

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**Ph.D. in Systems Science - Computer Science and Systems Engineering** 02/11/2017 - 27/11/2021  
IMT School for Advanced Studies Lucca  
Thesis: "New methods to assess the performance of structural joints with microstructures"  
Advisors: Prof. Marco Paggi - IMT School for Advanced Studies Lucca;  
Prof. José Reinoso - University of Seville

**Master in Civil Engineering** 31/10/2014 - 19/04/2017  
Università del Salento, Lecce, Italy  
Final Mark: 110/110 Cum Laude  
Thesis in Computational Mechanics: "Numerical and Structural Analysis of the Particle Detector Mu2e Calorimeter"  
Advisor: Prof. Giorgio Zavarise

**Bachelor in Civil Engineering** 24/09/2010 - 08/04/2014  
Università del Salento, Lecce, Italy  
Final Mark: 110/110 Cum Laude  
Thesis in Science of Materials: "Development and mechanical characterization of new composite materials with natural fibres" - Advisor: Prof. Antonio Greco

## PUBLICATIONS

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- M. R. Marulli, A. Valverde-González, A. Quintanas-Corominas, M. Paggi, J. Reinoso  
**A combined phase-field and cohesive zone model approach for crack propagation in layered structures made of nonlinear rubber-like materials,**  
Comput. Methods Appl. Mech. Engrg., in press.
- H. Zarei, M. R. Marulli, M. Paggi, R. Pietrogrande, C. Üffing, and P. Weißgraeber,  
**Adherend surface roughness effect on the mechanical response of silicone-based adhesive joints,**  
Eng. Fract. Mech., vol. 240, p. 107353, Dec. 2020.
- H. Zarei, M. R. Marulli, M. Paggi, R. Pietrogrande, C. Üffing, and P. Weißgraeber,  
**Mechanical characterization and failure modes in the peeling of adhesively bonded strips from a plastic substrate,**  
Mech. Adv. Mater. Struct., pp. 1–6, Oct. 2020.
- J. Bonari, M. R. Marulli, N. Hagemeyer, M. Mayr, A. Popp, and M. Paggi  
**A multi-scale FEM-BEM formulation for contact mechanics between rough surfaces,**  
Comput. Mech., 2019.
- M. R. Marulli, L. Heepe, S. Gorb, M. Paggi  
**A finite element framework for the simulation of bio-inspired adhesives with mushroom-shaped microstructures,**  
Submitted for publication

## CONFERENCES

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- M. R. Marulli, M. Paggi and J. Reinoso,  
"Phase-field and Cohesive Zone Approach for modeling the competition between adhesive and cohesive failure"  
**ICTAM - 25th International Congress of Theoretical and Applied Mechanics**  
23-28 August 2021, Milan, Italy  
**Speaker**
- M. R. Marulli, J. Bonari, N. Hagemeyer, M. Mayr, A. Popp, and M. Paggi,  
"A two-scale FEM-BEM formulation for contact mechanics between rough surfaces"  
**ICCCM 2019 - VI International Conference on Computational Contact Mechanics**  
3-5 July 2019, Leibnizhaus Hannover, Germany  
**Speaker**
- M. R. Marulli, J. Bonari, N. Hagemeyer, M. Mayr, A. Popp, and M. Paggi,  
"Mechanical contact problems with roughness: introduction to a new multi-scale approach"  
**3rd IMT Research Symposium**  
6-7 June 2019, IMT School for Advanced Studies Lucca  
**Organiser and Speaker**
- M. R. Marulli,  
"Caratterizzazione di materiali eterogenei su scala microscopica"  
**JoTTo Fair 2019**  
9-10 May 2019, IMT School for Advanced Studies Lucca  
**Pitch talk**
- J. Bonari, M. R. Marulli,  
"Morphological characterization of surfaces from nature and technology"  
**2nd IMT Research Symposium**  
19-20 November 2018, IMT School for Advanced Studies Lucca,  
**Poster**

## INVITED SEMINARS AND LECTURES

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- M. R. Marulli  
"An efficient computational approach for indentation-induced fracture"  
**Northwestern University - Mechanical Engineering Seminar series**  
21 October 2022  
**Invited speaker**
- M. R. Marulli  
"Fracture Mechanics of Joints"  
**NEWFRAC PRO Winter School - NEWFRAC Marie Curie Innovative Training Network**  
7-11 February 2022  
**Lecturer**

## VISITING PERIODS

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| <b>Modelling of adhesive/cohesive failure of structural adhesives</b>        | January 2020 - April 2020                         |
| Host Institution: University of Seville, Seville (Spain)                     |   |
| Tutor: Prof. José Reinoso Cuevas   |   |
| Granted by Erasmus+/traineeship program of the European Union                |   |
| <b>Multi-Scale Modeling of Friction for Large-Scale Engineering Problems</b> | January 2019 and<br>September 2018 - October 2018 |
| Host Institution: University of the Bundeswehr Munich, Munich (Germany)      |   |
| Tutor: Prof. Alexander Popp  |   |
| Granted by MIUR-DAAD Joint Mobility Program                                  |   |

## WORK EXPERIENCE AND OTHER ACTIVITIES

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**Course: Introduction to Machine Learning**

November - December 2021, 20 hours

IMT School for Advanced Studies Lucca

**Bright Night – European Researchers Night**

2018 - 2019 - 2020

IMT School for Advanced Studies Lucca

Organised laboratories and activities:

- "Energia pulita: un futuro verde nelle nostre mani?" (2020)
- "Le bolle di sapone: dal gioco alla scienza" (2019)
- "Origami: from the art of paper folding to geometry and beyond" (2018)

**Course: Modelling and Simulations of Tribological Problems in Technology**

28/05/18 - 02/06/18

CISM (Udine, Italy)

**Internship at EnginSoft SpA**

December 2016 - March 2017

Mesagne (Brindisi), Italy

Structural analysis for the development of the master thesis using Ansys Workbench.

**University Tutor**

November 2015 - May 2016

Department of Engineering for Innovation, Università del Salento (Lecce, Italy)

## TECHNICAL SKILLS

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**Languages:** Fortran, Python, Matlab, Latex, HTML

**Programs:** FEAP (Programmer Level), Abaqus (Programmer Level), FreeFEM++ (User level), Ansys (User level), AutoCAD (Expert User), Sap2000, Adobe Photoshop

**Laboratory skill:** Leica DCM 3D confocal profilometer

## LANGUAGES

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- **Italian** - Mother tongue
- **English** - Level C2
- **Spanish** - Level A1