

1 Contacts

- **Name and Surname:** Marianna Puccia
- **Date of birth:** 19/09/1994

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2 Studies and career

2.1 Graduate studies

- *May 15 13, 2023 - on going*: **Postdoctoral research fellow** at the Department of Engineering at the **University of Palermo**. Title of the fellow: "LAttice STructures for Energy aBSorption: advanced numerical analysis and optimal design (LASTEB)". Scientific advisor: Prof. Giuseppe Giambanco.
- *January 13, 2023*: Ph.D. Doctor Europaeus in Civil, Environmental and Materials Engineering, with the thesis: "*Strain localization and fracture in isotropic damaging materials: a novel augmented-finite element strategy*". Tutor: Prof. G. Giambanco.
- *February 2019 - August 2022*: **PhD student in Civil, Environmental and Materials Engineering**, at the Department of Engineering, University of Palermo, with a full regional scholarship through the "Fondo Sociale Europeo Sicilia 2020".
- *October 2020 - December 2020*: **Research visiting scholar** at the Department of Mechanics, **Czech Technical University of Prague**, under the supervision of Prof. Milan Jirásek and Ing. Martin Horák.
- *October 2019*: Italian engineering professional license.

2.2 Undergraduate studies

- *October 2013 - 16/10/2018*: **Laurea** (5-yrs degree) in **Civil and Architectural Engineering** at University of Palermo with the grade of **110/110 summa cum laude**. Laurea thesis: "*Modellazione della risposta meccanica della muratura con strumenti numerici avanzati*". Tutor: Prof. Giuseppe Giambanco, Co-tutor: Ing. Emma La Malfa Ribolla.
- *September 2008 - July 2013*: High School degree at the Liceo Scientifico "Luigi Failla Tedaldi" in Castelbuono (PA) with the grade of **100/100**.

2.3 Main attended courses/seminar during PhD studies or before

COURSES

- *May 6-9, 2024*: **Minicourse and Seminar on "Automation of Computational Modeling in Solid Mechanics"**, **Dr. Mohsen Rezaee Hajidehi** (IPPTR PAN Warsaw, Poland) at the Department of Engineering, University of Palermo;
- *May 16-17, 2022*: **Minicourse and Seminar on "Contact and interface modelling"**, **Prof. Frederik Lebon** (Aix-Marseille University, France) at the Department of Engineering, University of Palermo;
- *May 2-6, 2022*: **Short course on "Advanced analysis of structures"**, **Ph.D. Martin Horák** (ČVUT - Department of Mechanics, Czech Technical University, Prague) at the Department of Engineering, University of Palermo;
- *July 19-22, 2021*: **Summer school on "Seismic analysis of Structures using OpenSees"** at the Department of Engineering, University of Palermo;
- *March-May, 2021*: **Short course on "Scientific Writing and Publishing in English"**, Online course in Czech Technical University (Prague);
- *December, 2020*: **Online course on "Numerical methods for the solution of Partial Differential Equations"**, **Prof. Marco Paggi** (Scuola IMT Alti Studi di Lucca);
- *September 15-19, 2019*: **Short OOFEM training course**, by the **OOFEM group** in the Department of Mechanics, Czech Technical University (Prague);
- *July-September, 2019*: **Short course on ABAQUS**, **Ph.D. Marco Ferrotto**, at the Department of Engineering, University of Palermo;
- *June-July, 2019*: **Short course on Wolfram Mathematica**, **Ph.D. Gioacchino Alotta**, at the Department of Engineering, University of Palermo;
- *April 16-19, 2019*: **Short course on "Modeling of strain localization"**, **Prof. Milan Jirásek**, at the Department of Engineering, University of Palermo;
- *April-May, 2019*: **Short course on Python & FEM**, **Ph.D. Emma La Malfa Ribolla**, at the Department of Engineering, University of Palermo;

- March, 2019: **Short course on “Surrogate models for reliability estimation”**, Prof. Carsten Poppe, at the Department of Engineering, University of Palermo;
- *October-December, 2016*: **40-hour course in the use of 3DS Max design 2017 Software**, Eureka Engineering s.r.l., Autodesk Authorized Academic partner.

SEMINARS

- *April, 2022*: “Virtual Element Method for fracture mechanics/elements of programming with python and applications with VEM”, by Prof. Elio Sacco, University of Naples;
- *October, 2021*: “Virtual Element Method for (2D) structural mechanics”, by Prof. Elio Sacco, University of Naples;
- *January, 2020*: “Integrated simulation tools for virtual analysis and design of complex engineering systems”, University of Palermo;
- *January, 2020*: “A nobel formula”, by Prof. Marco Li Calzi, University of Palermo;
- *November, 2019*: “Come scrivere un Paper”, by Prof. Antonio Russo, University of Palermo;
- *November, 2019*: “Low damage design of steel structures” by Prof. Charles Clifton from University of Auckland (New Zeland), University of Palermo;
- *May, 2019*: “Energy scenarios, climate change and low-carbon technologies”, University of Palermo;
- *May, 2019*: “National and international patenting”, University of Palermo;
- *April, 2019*: “Application of the Multiple Timescale Spectral analysis”, University of Palermo;
- *March-July, 2019*: Cycle of seminars on issues of cultural interest: 1. “Mathematical models in everyday life”; 2. “Anthropocene and landscape”; 3. “Specialism and communication”; 4. “Fire - myths, rites and technical symbols”; 5. “The role of technical knowledge in the dimension of conflict”, University of Palermo;
- *February, 2019*: “In-depth meeting on the Third Mission: enterprise incubation, spin-off, patents and intellectual property”, University of Palermo.

3 Academic and Scientific activities

3.1 Main Research topics

- **Analysis of strain localization in quasi-brittle materials.** This physical phenomenon has been investigated by analyzing its main theoretical aspects as well as the numerical procedures and the computational approaches implemented to include the arising of weak and strong discontinuities and to predict its possible evolution in the framework of the Finite Element Method (FEM). From the dynamic point of view, the spectral analysis of the acoustic tensor and the related flutter instability have been studied for the analysis of the local conditions for the material stability.
- **Continuous/Discontinuous models.** Going through the analysis of continuum and discrete models, I focused on some newly developed hybrid approaches which, starting from a continuum, introduce discontinuities by means of appropriate mechanical devices that simulate the cohesive forces. The basics of X-FEM, G-FEM, extended VEM and the A-FEM have been investigated. A finite element with an embedded InterPhase (IPH) element has been implemented in the framework of Isotropic Damage Models (IDM), following the A-FEM technique.
- A **crack-tracking algorithm** has been formulated, which is capable to predict the formation and propagation of the fracture among the finite elements of the numerical model. The effectiveness of the implemented procedure has been tested through both numerical and experimental tests.

3.2 Accademic awards

- March 01,2024 - Finalist for the **Premio GIMC - Best PhD Thesis in Meccanica Computazionale dei Solidi**.

4 Engineering experience characterized by research activities

- **April 2023/in progress** "Project of the consolidation and restoration works of the projections and facades of the building located in Palermo, Via Cavour nos. 40 to 60, following the collapse of a balcony" - Carrying out the geometric and material survey of the balcony corbels. Extraction of specimens for subsequent mechanical tests. Realization of uniaxial compressive strength, indirect tensile strength and Mode-I fracture toughness tests through CCNBD. Processing of experimental data. Calibration of the experimental results through the implemented numerical approach in the framework of IDM - Client: University of Palermo.
- **September 2023/in progress** "Conservative restoration of a residential building - Seismic improvement and partial reconstruction of the portion in its current semi-ruined state of a building with load-bearing masonry structure of six elevations above ground - Seismic improvement of existing buildings in medium seismic locations" - Realization of boards related to the carpentry of the attics; construction detail of the beam-breaker; construction detail of the board-beams; checks at the ultimate limit state and at the limit state of operation of a steel-concrete composite beam - Client: Condominio Palazzo Sammartino.
- **March 22, 2023/July 22, 2023** "Assignment for investigations, supported by in situ tests and thermographic analysis, to analyze the typological, morphological, material and constructive aspects of the roofs of the Pontifical Basilica of San Francesco of Assisi in Palermo" - Survey of the state and cracking framework with tables of: land survey, roof plan, plan of the carpentry, cross and longitudinal sections of the tribune and apsidal chapels of the Church under investigation, construction detail of the truss, construction detail of the flat roof. Finite element modeling of the roof and local verification of the masonry in the framework of IDM. Thermographic analysis. Monitoring plan. - Client: University of Palermo - Scientific responsible: Prof. Rossella Corrao.
- **August 2022/in progress** "Project of valorization and conservative restoration of the church of Santuzza in Castelbuono (Palermo) - PNRR - M1C3- 2.2" - Survey of the existing work. Realization of technical drawings with regard to plans, elevations and sections of the actual state and photographic documentation. Mapping of the damage and crack pattern. - Design Studio: Eng. Giuseppina Castiglia - Client: Municipality of Castelbuono.
- **March 2022/in progress** "Collaboration for the completion of the Gal Hassin Astronomical Park in Isnello (Palermo)" - Survey of the existing work. Realization of technical drawings with regard to plans, elevations and sections of the actual state and photographic documentation; calculation and verification of the retaining wall of the parking area. - Design Studio: Eng. Giuseppina Castiglia - Client: Fondazione Gal Hassin - Centro Internazionale per le Scienze Astronomiche.
- **June 2021/July 2021** "Project of demolition and reconstruction of the building B, part of the former agricultural consortium - Via Archirafi (Palermo)" - Realization of technical drawings regarding: carpentry plans and construction details related to steel nodes of beams, pillars, foundations and roof; calculation and verification of stress states in the most stressed nodes. - Client: University of Palermo.

5 Published research

1 paper in peer-reviewed international journals

9 papers in international/national conference proceedings

Number of total citations:

7 (according to the Google Scholar database)

3 (according to the Scopus database)

5.1 Scientific papers on peer-reviewed journals

1. Puccia M., Spada A., and Giambanco G., *Finite elements with embedded interphases for strain localization in quasi-brittle materials*, Engineering Fracture Mechanics 277 (2023): 108956 - <https://doi.org/10.1016/j.engfracmech.2022.108956>.

5.2 Abstract/Proceedings of International Conferences

1. Puccia M., Corrao R., Giambanco G. and Vinci C., *Material-constructive features of the roofs in the Basilica of San Francesco D'Assisi in Palermo. Decay, instability, hypotheses of intervention and monitoring*, 10th Colloqui.AT.e 2024 Conference, 12-15 June 2024, Palermo, accepted.

2. Giambanco G., Puccia M., Sacco E. and Spada A., *Simulation of crack propagation coupling FEM and VEM*, 9th European Community on Computational Methods in Applied Sciences Congress, 3-7 June 2024, Lisbon.
3. Giambanco G., Puccia M., Sacco E., Spada A., *Non-linear analysis of quasi-brittle materials through a FEM-VEM approach*, Engineering Mechanics Institute International Conference, 27-30 August 2023, Palermo.
4. Giambanco G., Puccia M., Sacco E., Spada A., *Crack propagation in quasi-brittle materials using a FEM-VEM tracking algorithm*, 7th International Conference on Computational Modeling of Fracture and Failure of Materials and Structures, 21-23 June 2023, Prague.
5. Puccia M., Spada A., and Giambanco G., *Finite elements augmented with embedded interphases for application in quasi-brittle materials*, 11th European Solid Mechanics Conference, 4-8 July 2022, Galway.
6. Puccia M., Spada A., and Giambanco G., *Crack propagation in finite elements augmented with embedded interphases*, 8th European Community on Computational Methods in Applied Sciences Congress, 5-9 June 2022, Oslo.

5.3 Abstract/Proceedings of National Conferences

1. Giambanco G., Puccia M., and Spada A., *Experimental and numerical analysis of fracture in sandstone rocks*, 26th Convegno Associazione Italiana di Meccanica Teorica e Applicata, 2-6 September 2024, Naples.
2. Giambanco G., Puccia M., Sacco E., Spada A., *Numerical simulation of crack propagation using interphases and a FEM-VEM environment*, 23th Covegno Gruppo Italiano Meccanica Computazionale, 12-14 July 2023, Reggio Calabria.
3. Puccia M., Spada A., and Giambanco G., *Strain localization and crack propagation in finite elements augmented with embedded interphases*, 25th Convegno Associazione Italiana di Meccanica Teorica e Applicata, 4-9 September 2022, Palermo.

6 Teaching

6.1 Teaching assistant

- **Mechanics of Solids** - Course in Bachelor Building Engineering program - Responsible: Prof. Giuseppe Giambanco - a.y. 2020/2021, 2021/2022, 2022/2023, 2023/2024 - University of Palermo.
- **Structural Modeling** - Course in Master Building Engineering program - Responsible: Prof. Giuseppe Giambanco - a.y. 2021/2022, 2022/2023, 2023/2024 - University of Palermo.
- **Mechanics of Solids** - Course in Master Civil and Architectural Engineering program - Responsible: Prof. Giuseppe Giambanco - a.y. 2019/2020, 2020/2021 - University of Palermo.
- **Analysis and Structural Recovery Project of Buildings** - Course in Master Building Engineering program - Responsible: Prof. Giuseppe Giambanco - a.y. 2020/2021 - University of Palermo.

6.2 Extra didactic activities

- **Tutor for the performance of 200 hours of tutoring and for teaching-integrative activities, preparatory and recovery** a.y 2021/2022 - Disciplinary area of Mechanics of Solids at the Department of Architecture, University of Palermo.

7 Language skills

- **English:** B2

8 Computer skills

- Office package: Microsoft Word, Excel, Power Point;
- Programming languages: MATLAB, Python, Wolfram Mathematica, L^AT_EX;
- Editors: Overleaf;
- Open-Source codes e IDEs: CALFEM, Gmsh, Spyder;

- Computer-Aided Design (CAD), modeling and rendering software: AutoCAD, SketchUP, 3DS max, Fusion 360;
 - 3D modelling and printing: PrusaSlicer;
 - Post-production and photo-editing software: Adobe Photoshop, Adobe Illustrator;
 - Pre and post-processing software: Straus7, Abaqus, ParaView;
 - Accounting management software: Primus;
 - Structural Analysis Software: CDS, Prosap.
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La sottoscritta dichiara che il presente curriculum dell'attività didattica e scientifica è redatto ai sensi degli artt. 46 e 47 del D.P.R. 445/2000.

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