UNIVERSITÀ
POLITECNICA
DELLE MARCHE

Supervisor: Prof. Marco Rossi

Dept. of Industrial Engineering and Mathematical Sciences (DIISM)

Research Vision

- ***Revealing the complex mechanics of materials*** in standard and extreme conditions (e.g. dynamic and impact) through cutting-edge experiments that combins full-field measurements, data fusion, and machine learning.
- ***Bridging experiments and simulation***, developing and implementing advanced numerical models and constitutive laws able to capture multiphysics behavior and damage mechanisms.
- ***Designing and understanding next-generation materials***, like metamaterials, architected materials or functionally graded materials, for advanced engineering applications.

Projects

I am involved in national and European research and industrial projects focused on advanced material characterization, full-field experimental techniques, and virtual testing through numerical modeling and simulations.

Two examples:

- **Vform-x-Steels** (*European Project – RFCS*): development of an efficient and accurate methodology for material characterization and material parameters identification for thermomechanical models, using a dedicated single test that involve nonhomogeneous temperature and strain fields.

- **RELIFE** (*National Project - PRIN*): a Circular Economy strategy that goes beyond conventional recycling: directly reshaping sheet-metal *End-of-Life* components using Flexible Sheet Metal Forming . The approach aims to reduce environmental impact and enable component reuse with minimal re-processing.

International roles

Board member and session organizer of several international conference in the field of experimental mechanics including SEM, ESAFORM, ICEM.

Organizer of summer schools and advanced courses in international context (e.g. Machine Learning for Mechanics in the SEM 2025 and 2026 conference)

Served as associated editor of Journal of Dynamic Behavior of Materials and currently board member of the journal Strain.

Supervision and mentorship

- Supervisor of more than 80 master thesis often in collaboration with companies in the mechanical and aerospace sectors
- Supervisor of 6 PhD students
- Supervisor of 3 PostDoc

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Description

List of 10 publications representative of the main aspect of my research

Rossi M. et al. (2026) **Reference-free full-field strain measurement via deep learning**. Eng. Appl. Artif. Intell. 172:114302

Lattanzi A. et al. (2023) **Uncertainty analysis in ultra-high-speed DIC for dynamic rupture**. Exp. Mech. 63:529–563

Rossi M. et al. (2022) **Inverse identification of large-strain plasticity via bulge test & full-field data**. Int. J. Solids Struct. 242:111532

Lattanzi A. et al. (2021) **Fast characterization and simulation of laser heat-treated blanks**. Int. J. Mech. Sci. 192:106134

Rossi M. et al. (2018) **Volume deformation evaluation from surface DIC**. Exp. Mech. 58:1181–1194

Wang P. et al. (2016) **Optimised characterisation of polymeric foams via DIC & VFM**. Strain 52:59–79

Cortese L. et al. (2016) **Ductile damage under multiaxial non-proportional loading**. Int. J. Plast. 85:77–92

Rossi M. et al. (2016) **Virtual Fields Method for large-strain anisotropic plasticity**. Int. J. Solids Struct. 97:322–335

Genovese K. et al. (2016) **360°digital image correlation system for materials testing**. Opt. Lasers Eng. 82:127–134

Rossi M. et al. (2015) **Impact of DIC resolution and noise on VFM identification.** Strain 51:206–222

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SUN RISE SMALLER (STRATEGIC) UNIVERSITIES NETWORK FOR REGIONAL INNOVATIVE AND SUSTAINABLE EVOLUTION

HR EXCELLENCE IN RESEARCH

Research group

Marco Rossi – Associate Professor
Marco Sasso – Full Professor
Mattia Utzeri – Assistant Professor

Impact and Matererial Mechanics Lab (IM² Lab)

IM² Lab/Static is located within the main building of the department focuses on advanced material testing and material testing 2.0 approaches. Image analysis and thermography are used to extract material properties. The Lab is equiped with a tensile test machine, bulge test setup, Nakajima test system, and a set of multiple cameras for image analysis.

IM² Lab/Dynamic is located in the university's facilities dedicated to large-scale equipment. It includes two Hopkinson bars, a drop tower, and a hydraulic fatigue testing machine. A high-speed camera and a high-speed IR camera are available for dynamic measurements and full-field diagnostics.

Project ideas

I am open to a broad range of research directions within the field; the following topics outline potential lines of investigation

- Development of data-driven and machine learning approaches for model discovery, enabling autonomous identification of constitutive behavior directly from full-field experimental data
- Application of advanced inverse methods to characterize the mechanical response of novel materials under complex conditions, including micro and nanoscale scenarios as well as high strain-rate or dynamic loading
- Investigation and design of metamaterials and functionally graded materials to tailor mechanical response, with a focus on impact mitigation, energy absorption, and dynamic performance