Mauro Murer

| **Date of birth:** | | **Nationality:** | | **Gender** | | | |

About me: I'm a civil engineer and a researcher at University of Rome "La Sapienza" with a strong passion for computational mechanics applied to several physical problems. I During my Ph.D., at University of Pavia, I mainly dealt with numerical methods for solid and fluid mechanics applied to Additive Manufacturing processes. My skills are in FEM analysis, Computational Fluid Dynamics and algorithms development for scientific computing with open-source libraries and software. I had experience of collaboration with researchers and students during courses and thesis drafting.

WORK EXPERIENCE

01/04/2021 – CURRENT – Rome, Italy
RESEARCHER – UNIVERSITY OF ROME "LA SAPIENZA"

Research project: *Modeling, experimental characterization and identification of cellular metamaterials with embedded vibration absorbers*
Funds: AFOSR - A high damping cellular material with integrated arrays of nanocomposite web-like vibration absorbers
Scientific coordinator: Prof. Walter Lacarbonara

Department of Structural and Geotechnical Engineering

2016 – 2017 – Rome, Italy
PROJECT ENGINEER – I.R.I.D.E. SRL

Main activities: (i) setting up numerical simulations to model acoustic waves propagation due to aeronautic and road traffic, (ii) writing final reports for environmental impact studies, and (iii) implementation of MATLAB script algorithms in order to optimize the data import process within calculation software.

EDUCATION AND TRAINING

2010 – 2014
B.SC. IN CIVIL ENGINEERING – Roma Tre University

100/110 | "River Arrone embankment adjustment project with HEC-RAS"

2014 – 2017
M.SC. IN STRUCTURAL ENGINEERING – Roma Tre University

110/110 cum laude | "Modeling and simulation of nonlinear dynamics of suspension bridge using VPL"

2017 – 2021
PH.D. IN COMPUTATIONAL MECHANICS – University of Pavia

CFD simulations of Laser Metal Deposition process exploring open source software

LANGUAGE SKILLS

Mother tongue(s): ITALIAN

Other language(s):

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken production	Spoken interaction	
ENGLISH	B2	B2	B2	B2	B2

Levels: A1 and A2: Basic user; B1 and B2: Independent user; C1 and C2: Proficient user

DIGITAL SKILLS

Programming languages

C++ | MathWorks MATLAB | Python | Wolfram Mathematica

Open-source software

Deal.II | FEniCS | OpenFOAM | MPI | Paraview | Git | LaTeX

Linear algebra libraries

Eigen | PETSc | Trilinos | SLEPc

Commercial software

SAP2000 | SAFIR | COMSOL Multiphysics | Star CCM+

CAD software

Autodesk Maya | Autodesk AutoCAD | Rhinoceros | Salome

OS

Windows | Mac OS | Linux

ACADEMIC EXPERIENCE

Computational Fluid Dynamics (CFD)

Developer of a FEM code for the simulation of particles flow in additive manufacturing processes using a C++ finite element library (Deal.II). The coupling of the Navier-Stokes system of equations with the heat advection-diffusion equation, together with a Lagrangian particle tracking method able to interact with Eulerian fields, are the main topics. Previous investigations were performed with OpenFOAM and Star CCM+ software. The study is supervised by Prof. Giovanni Formica, Dr. Franco Milicchio and Prof. Ferdinando Auricchio for the PhD thesis in Design, Modeling and Simulation in Engineering at University of Pavia.

Virtual Element Method (VEM)

Developer of a C++ code for the analysis of the "Virtual Element Method" used to spatially discretize partial differential equations. A comparison with the Finite Element Method is performed implementing the Poisson equations. The study was supervised by Prof. Ferdinando Auricchio and Dott. Giulia Scalet during my PhD in Design, Modeling and Simulation in Engineering at University of Pavia.

Non-linear Mechanics

Developer of a Python code, fully integrated in the 3D CAD tool Autodesk's Maya, in order to model and analyze the nonlinear response of suspended bridges subject to aerodynamical loading conditions. PRIN research project in collaboration with Prof. Giovanni Formica and Dr. Franco Milicchio.

Fluid-Structure Interaction (FSI)

Fluid-Structure Interaction (FSI) code implementation for morphing problem using the C++ finite element library Deal.II.

Structural Design

- Development of a MATLAB user-friendly code for the design of prestressed reinforced concrete beams for bridge decks (Theory and Design of Bridges, M.Sc. in Structural Engineering).
- Structural modeling and analysis employing the SAP2000 software (Theory and Design of Bridges and Design is Seismic Zone, M.Sc. in Structural Engineering).
- Development of a Wolfram Mathematica code for the application of linear dynamic analysis to design structures in seismic zones (Design is Seismic Zone, M.Sc. in Structural Engineering).
- Study of elastic and viscoelastic beam models by means COMSOL Multiphysics software (Theory of Structures course, M.Sc. in Structural Engineering).
- Development of a Wolfram Mathematica code for the study of forced oscillations of a non-inertially homogeneous wedged beam (Computational Mechanics, M.Sc. in Structural Engineering).
- Study of the vibration modes of a multi-storey frame through the use of COMSOL Multiphysics software (Dynamic of Structures, M.Sc. in Structural Engineering).
- Development of a MATLAB code for the study of wave propagation (Coastal Engineering, M.Sc. in Structural Engineering).

PUBLICATIONS

G.Formica, F.Milicchio, M.Murer, "An Integrated CAD Strategy for Nonlinear Dynamics of 3D Suspended Bridges", Computer-Aided Design and Applications, 16(6):1046-1062.

http://cad-journal.net/files/vol_16/CAD_16(6)_2019_1046-1062.pdf – 2019

M. Murer, V. Furlan, G. Formica, S. Morganti, B. Previtali, F. Auricchio, Numerical simulation of particles flow in Laser Metal Deposition technology comparing Eulerian-Eulerian and Lagrangian-Eulerian approaches, Journal of Manufacturing Processes 68 (2021) 186–197.

https://doi.org/10.1016/j.jmapro.2021.05.027 – 2021

M. Murer, G. Formica, F. Milicchio, S. Morganti, , F. Auricchio, An efficient and accurate numerical method for advection-diffusion coupled problems, submitted for publication in Computers & Fluids, # CAF-D-21-00232 (April 2021).

M. Murer, G. Formica, F. Milicchio, S. Morganti, , F. Auricchio, A coupled multiphase Lagrangian-Eulerian fluid-dynamics framework for numerical simulation of Laser Metal Deposition process, submitted for publication in Additive Manufacturing, (July 2021).

PROCEEDINGS IN INTERNATIONAL CONFERENCES

2018
G.Formica, F.Milicchio, M.Murer.

"An Integrated CAD Strategy for Nonlinear Dynamics of 3D Suspended Bridges", ESMC 2018 - European Solid Mechanics Conference (2-6 July 2018, Bologna, Italy).

2019
M.Murer, G.Formica, S.Morganti, F.Auricchio.

"Numerical simulation of particles flow in Laser Metal Deposition technology", II International Conference on Simulation for Additive Manufacturing 2019 (11-13 September 2019, Pavia, Italy).

2021
S.Morganti, G.Alaimo, A.Cattenone, M.Murer, G.Formica, F.Auricchio.

"Computational simulations for industrial applications in additive manufacturing", ECCOMAS-WCCM XIV - World Congress on Computational Mechanics (11-15 January 2021, Paris, France).

● TEACHING ACTIVITIES

2019 – 2021
Teaching assistant for the course of "Solid Mechanics"

The course is taught by Prof. Fabio Carli for bachelor's degrees in Civil Engineering, Department of Civil Engineering and Architecture (DICAr), University of Pavia.

2017 – 2021
Teaching assistant for the course of "Calcolo automatico delle strutture (Computer-Aided Structural Mechanics)"

The course is taught by Prof. Giovanni Formica for master's degrees in Architecture, Department of Architecture, Roma Tre University.

● RELEVANT COURSES

2019
"Computational Methods for Nonlinear Mechanics"

 taught by Prof. F. Auricchio and Prof. A. Reali at the Department of Civil Engineering and Architecture (DICAr), University of Pavia.

2019
"State of the art computational methods for nonlinear solid mechanics"

 taught by Prof. F. Auricchio, Prof. J. Gil, Prof. C. H. Lee, Prof. J. Bonet and Prof. R. Ortigosa at Palazzo Vistarino, University of Pavia.

2019
"Introductory Course in OpenFOAM CFD Toolbox"

taught by Dr. A. Georgoulas at the Department of Civil Engineering and Architecture (DICAr), University of Pavia.

2019
"Isogeometric Analysis"

taught by Prof. A. Reali, Dr. G. Lorenzo and Dott. A. Patton at the Department of Civil Engineering and Architecture (DICAr), University of Pavia.

2018
"Advanced Materials Methods"

taught by Prof. F. Auricchio at the Department of Civil Engineering and Architecture (DICAr), University of Pavia.

2018
"ECCOMAS Advanced Course NL18: Nonlinear Computational Solid and Structural Mechanics"

taught by Prof. F. Brezzi, Prof. R. L. Taylor, Prof. A. Reali and Prof. F. Auricchio at Palazzo Vistarino, University of Pavia.

2018
"Computational Mechanics for Scientific Problems"

 taught by Prof. G. Sangalli, Dr. G. Lorenzo, Dr. J. E. Dufour and Prof. A. Reali at the Department of Mathematics, University of Pavia.

● **EXTRAS**

2017 – 2021
Nume-lab member of the HPC Compmech Group

Department of Civil Engineering and Architecture (DICAr), University of Pavia.

2017
Licensed Professional Civil Engineer (State examination)