FEDERICO GHIOLDI, PHD

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SUMMARY

- **Assistant Professor** at the Department of Aerospace Science and Technology (DAER) in Politecnico di Milano (Italy)
- **Graduate Teaching Assistant** at Politecnico di Milano for CFD / Propulsion MSc and BSc courses
- **Multi-year experience** in CFD analysis with a core focus on combustion problems in Aerospace.
- **CFD developer** of hybrid techniques for heterogeneous (GPGPU) High-Performance Computing
- **European Projects Participant**: software developer in Horizon-2020 projects under Principal Investigator Prof. F. Piscaglia

EDUCATION

Doctoral Degree in Aerospace Engineering — **with honors**
Politecnico di Milano (Italy) — *11/2019-01/2023*

Master Degree in Aeronautical Engineering — **110/110 with honors**
Politecnico di Milano (Italy) — *10/2016-04/2019*

TEACHING AND MENTORING

- Teaching Assistant for the M.Sc. course "*Computational Techniques for Thermochemical Propulsion*" 09/2020 - present
- Teaching Assistant for the M.Sc. course "*Aerodynamics*" 09/2022 - present
- Teaching Assistant for the B.Sc. course "*Aerospace Propulsion*" 09/2024 - present
- Mentoring 3-5 students per year in their M.Sc. Thesis activities 09/2020 - present

RELEVANT PROJECTS

exaFOAM — **https://exafoam.eu**

05/2021 - 04/2024

Project to overcome the current limitations of CFD technology exploiting massively parallel HPC architectures. Developments implemented in the open-source software OpenFOAM. Consortium composed of 12 partners including code release authority OpenCFD. Main carried out developments include:

- hybrid CPU-GPU solution of reactive flow problems;
- re-design of the solution method employed for ODEs integration to suite the GPU massive parallelism;
- GPU acceleration of ray-tracing calculation for radiative heat transfer in OpenFOAM.

ENGIMMONIA — **https://engimmonia.eu**

09/2021 - present

The project addresses 5 objectives to prove reliability and cost-effectiveness of ammonia engines; it targets future decarbonization of the maritime shipping sector. Consortium is composed of 22 partners from 8 EU countries. Main carried out developments include:

- multi-injection in dual-fuel configurations (diesel + ammonia);
- new breakup model: coupling of Huh-Gosman, Reitz-KHRT, and Rayleigh-Taylor approaches;
- automatic mesh generation of multi hexa-block morphing structures, suited for advanced mesh motion techniques.

Green Propulsion Optimization at Vitesco — **https://vitesco-technologies.com/en-us**

11/2019 - present

The project aims at developing Fast Computational Methods for Optimal Thermal Design of Anisotropic Multilayer Structures for Electrified Propulsion Systems. Goals are reducing the environmental impacts of the automotive industry and promoting emission-free mobility and long term sustainability.

TECHNICAL SKILLS

- **CFD development and analysis:** +5 years experience (OpenFOAM), mainly covering incompressible and compressible flows, chemically reactive flow problems, combustion models, lagrangian particle tracking, HPC methods.
- **Programming capability:** +5 years experience in C++, C, CUDA-C, Bash, Python, and Matlab.
- **CAD software:** +5 years experience in the use of Solid Works, Solid Edge, Inventor, Salome, AutoCAD.
- **Other software worth of mention:** Fluent, Git, XFLR5, FreeFEM++, Office suite, LaTeX

PERSONAL

Languages	**Italian:** mother tongue (native). **English:** professional proficiency (C1, TOEIC score 965). **Spanish:** elementary.
Attributes	Competitive attitude; dynamic, creative, adaptive, results-oriented problem solver. Thrive in a team environment.
Speaking	Confident and professional speaker; persuasive speaker in public, to groups, or via electronic media.
Hobbies	Team and individual sports, board games. Community service.
Voluntary work	Volunteer experiences; help to elderly and people with disabilities. Member of Italian blood donation association.

PUBLICATIONS

- F. Ghioldi, F. Piscaglia, "*A hybrid CPU-GPU Paradigm to Accelerate Reactive CFD Simulations*", International Journal for Numerical Methods in Fluids (2024), DOI
- F. Piscaglia, F. Ghioldi, "*GPU acceleration of CFD Simulations in OpenFOAM*", Aerospace (2023), DOI
- F. Ghioldi, F. Piscaglia, "*Acceleration of Supersonic/Hypersonic Reactive CFD Simulations via Heterogeneous CPU-GPU Supercomputing*", Computer & Fluids (2023), DOI
- F. Ghioldi, J. Hélie, F. Piscaglia, "*Multivariable Optimization of Pyramidal Compound Substrates for Cooling of Power-Electronics in Modern Hybrid and Electric Propulsion Systems*", Applied Thermal Engineering (2023), DOI
- F. Ghioldi, J. Hélie, F. Piscaglia, "*A Fast Computational Method for the Optimal Thermal Design of Anisotropic Multilayer Structures with Discrete Heat Sources for Electrified Propulsion Systems*", Int. J. of Heat and Mass Transfer (2021), DOI

CONFERENCE PRESENTATIONS

- F. Ghioldi, J. E. Guerrero Rivas, I. Spisso, F. Piscaglia, "*A Unified GPGPU Implicit Density-Based Solver for Hypersonic and Combustion Simulations in OpenFOAM*", 2^{nd} Italian OpenFOAM User Meeting (2024)
- F. Ghioldi, F. Piscaglia, S. M. Aithal, "*Efficient Design of Low-NOx Hydrogen Combustors by GPU-Accelerated Simulations in OpenFOAM*", 35^{th} Int. Conf. on Parallel Computational Fluid Dynamics (2024)
- F. Piscaglia, F. Ghioldi, F. Magugliani, S. M. Aithal, "*Accelerated CFD of Aerospace Propulsion Systems in OpenFOAM*", 14^{th} Int. Workshop on Combustion and Propulsion (2024)
- F. Ghioldi, F. Piscaglia, "*GPU Acceleration of CFD Simulations in OpenFOAM*", 18^{th} OpenFOAM Workshop (2023)
- F. Ghioldi, F. Piscaglia, "*GPU-Accelerated Simulation of Supersonic Combustion in Scramjet Engines by OpenFOAM*", 33^{rd} International Conference on Parallel Computational Fluid Dynamics (2022)
- D. Costero, F. Ghioldi, S.M. Aithal, F. Piscaglia, "*Novel Developments for Rapid Reactive CFD Simulations of Dual-Fuel IC Engines*", 33^{rd} Int. Conf. on Parallel Computational Fluid Dynamics (2022)
- E. Gallorini, F. Ghioldi, S. M. Aithal, F. Magugliani, F. Piscaglia, "*A Methodology for the Aero-thermal Optimization of Hybrid and Electric Propulsion Systems*", 9th Annual OpenFOAM User Conference (2021)
- F. Ghioldi, E. Gallorini, S.M. Aithal and F. Piscaglia, "*A CFD Methodology for the Optimal Thermal Design of the Propulsion System in Electric Motors*", AIDAA, XXVI International Congress (2021)
- F. Ghioldi, F. Piscaglia, "*A CPU-GPU Paradigm to Accelerate Turbulent Combustion and Reactive-Flow CFD Simulations*", 8th Annual OpenFOAM User Conference (2020)