Giacomo Castiglioni

Obere Bergstrasse 10
5425 Schneisingen
Switzerland

+41 77 513 15 29

giacastiglioni@gmail.com

https://castiglionis.com

Languages

- Italian ●●●●●
- English ●●●●●
- German ●●○○○
- French ●●○○○

Skills

Programming Languages

- C++
- Cuda
- MLIR
- C
- Python
- Fortran
- x86 ATT
- arm v8.x

Debuggers

gdb | lldb | valgrind | Linaro DDT

Profilers

likwid | Nsight | Linaro MAP | HPCToolkit

Development

git | | | CMake | gtest | SCRUM

Meshing/Visualization

gmsh | Paraview | TecPlot

Professional Experience

3/2026 – present
Senior Researcher
Huawei, Zürich, Switzerland
- AI Software stack and compilation

10/2024 – 2/2026
Research Software Engineer
Swiss National Supercomputing Center (CSCS/ETH), Zürich, Switzerland
- Exploring different code generation pipelines for JAX and PyTorch (OpenXLA, Triton, IREE)
- Profiling and optimizing supported applications on CSCS supercomputing infrastructure
- Wrote passes in MLIR to optimize the computational graph of a domain-specific, high-level MLIR dialect

10/2021 – 09/2024
HPC Software Engineer
Eidgenössische Technische Hochschule Zürich (ETH), Zürich, Switzerland
- HPC Software Engineer for QuICC, a software for dynamo (magneto-hydrodynamics) simulations
- Designed and wrote a domain-specific, high-level MLIR dialect to optimize the computational graph
- Refactored for hybrid parallelization (mpi+GPU/threads)
- Refactored building (CMake) and testing infrastructure (CI/CD)

10/2021 – 12/2023
Freelance Software Engineer
Zürich, Switzerland
- Freelance Software Engineer working on the C++ based, open-source, spectral finite element framework Nektar++
  `https://www.nektar.info/community/development-team`
- Implemented a DSL using MLIR framework for generating performance critical kernels for different back-ends
- Implemented Arm SVE back-end for in-house SIMD library

09/2020 – 09/2021
HPC Software Performance Engineer
École Polytechnique Fédérale de Lausanne (EPFL), Geneva, Switzerland
- HPC Software Performance Engineer at the Blue Brain Project
- Developer for HBP (Human Brain Project) STEPS (STochastic Engine for Pathway Simulation)
- Investigated explicit SIMD libraries as a possible alternative to auto-vectorization in CoreNEURON
  `https://github.com/BlueBrain/CoreNeuron`

07/2018 – 08/2020
Research Associate
Imperial College, London, UK
- Senior developer of the C++ based, open-source, spectral finite element framework Nektar++
- Optimization of compressible solver with in-house SIMD library
- High fidelity simulations (LES/DNS) to predict shock wave unsteadiness in turbofan intake cowls at off-design conditions
- Implementation and validation of shock capturing schemes in an open-source high-order finite element CFD software

06/2019 – 12/2019
Consultant
London, UK
- Private consultant as aerodynamicist for Simplehuman LLC

11/2016 – 06/2018
Postdoctoral Fellow
California Institute of Technology / Jet Propulsion Laboratory, Pasadena, USA
- DNS simulations of multi-species, high-pressure flows relevant to fuel injection
- Implemented a thermodynamic model to predict phases of fuel-air mixtures

07/2016 – 10/2016
Senior Engineer External Aerodynamics
Tesla Motors, Hawthorne, USA
- Responsible for researching alternative CFD methodologies

Giacomo Castiglioni

Personal

Amateur woodworker, car and motorcycle enthusiast. I like many sports including off-road cycling, sailing, skiing, and playing soccer.

07/2015 – 07/2016 **Senior Engineer Thermal/Aero Systems**
Tesla Motors, Palo Alto, USA
- Responsible for HVAC aerodynamics of Model 3
- US patent for novel air vent design (US010464397B2)

2010 – 2015 **Research Assistant**
University of Southern California, Los Angeles, USA
- Prediction of laminar separation bubbles over wing/blade geometries
- Large Eddy Simulations
- Quantification of numerical dissipation
- Immersed Boundary, Finite Volume code
- Parallel computing

05/2012 – 08/2012 **Computational Fluid Dynamics Analyst**
Tesla Motors, Fremont, USA
- internship

2010 – 2013 **Teaching Assistant**
University of Southern California, Los Angeles, USA

Education

05/2015 **PhD in Aerospace Engineering**
University of Southern California, Los Angeles, USA
- Thesis title: 'Numerical modeling of separated flows at moderate Reynolds numbers appropriate for turbine blades and unmanned aero vehicles'
  `https://search.proquest.com/docview/1728323911`

12/2011 **MS in Aerospace and Mechanical Engineering**
University of Southern California, Los Angeles, USA
- Computational Fluid and Solid Mechanics track

08/2008 – 08/2009 **MS coursework in Mechanical Engineering**
Technical University of Delft, Delft, The Netherlands

02/2009 **BS in Mechanical Engineering**
Polytechnic University of Milan, Milan, Italy

Awards and Patents

- US patent for novel air vent design (US010464397B2)
- Visiting research-fellow at SFB-TR40 summer program, Technische Universität München 2011, 2013, and 2017

Publications

Journal Papers

1. D. Tolmachev, P. Marti, **Castiglioni, G.**, and A. Jackson. High performance solution of tridiagonal systems on the GPU. *ACM Trans. Parallel Comput.*, 2025
2. W. Chen, T. Carel, O. Awile, N. Cantarutti, **Castiglioni, G.**, A. Cattabiani, B. Del Marmol, I. Hepburn, J. G. King, C. Kotsalos, P. Kumbhar, J. Lallouette, S. Melchior, F. Schürmann, and E. De Schutter. Steps 4.0: Fast and memory-efficient molecular simulations of neurons at the nanoscale. *Frontiers in Neuroinformatics*, 16, 2022
3. Z.-G. Yan, Y. Pan, **Castiglioni, G.**, K. Hillewaert, J. Peiró, David Moxey, and S. J. Sherwin. Nektar++: Design and implementation of an implicit, spectral/hp element, compressible flow solver using a Jacobian-free Newton Krylov approach. *Comput. Math. Appl.*, 81:351–372, 2021
4. J. Marcon, **Castiglioni, G.**, David Moxey, S. J. Sherwin, and J. Peiró. rp-adaptation for compressible flows. *Int. J. Numer. Meth. Eng.*, 121(23):5405–5425, 2020

5. D. Moxey, C. D. Cantwell, Y. Bao, A. Cassinelli, **Castiglioni, G.**, S. Chun, E. Juda, E. Kazemi, K. Lackhove, J. Marcon, G. Mengaldo, D. Serson, M. Turner, H. Xu, J. Peiró, R. M. Kirby, and S. J. Sherwin. Nektar++: enhancing the capability and application of high-fidelity spectral/hp element methods. *Comput. Phys. Commun.*, 249:107110, 2020

6. **Castiglioni, G.**, G. Sun, and J. A. Domaradzki. On the estimation of artificial dissipation and dispersion errors in a generic partial differential equation. *J. Comp. Phys.*, 397, 2019

7. **Castiglioni, G.** and J. R. Bellan. On models for predicting thermodynamic regimes in high-pressure turbulent mixing and combustion of multi-species mixtures. *J. Fluid Mech.*, 843:536–574, 2018

8. **Castiglioni, G.** and J. A. Domaradzki. A numerical dissipation rate and viscosity in flow simulations with realistic geometry using low-order compressible Navier-Stokes solvers. *Comp. & Fluids*, 119:37–46, 2015

9. **Castiglioni, G.**, J. A. Domaradzki, V. Pasquariello, S. Hickel, and M. Grilli. Numerical simulations of separated flows at moderate Reynolds numbers appropriate for turbine blades and unmanned aero vehicles. *Int. J. Heat and Fluid Flow*, 49:91–99, 2014

Proceedings

1. **Castiglioni, G.**, J. R. Bellan, G. Lamanna, and S. Baab. Simulations of high-pressure jet. In *Proceedings of the fourth TRR40 Summer Program, Technische Universität München*, 2017

2. **Castiglioni, G.**, Domaradzki J. A., N. Krais, A. Beck, C.-D. Munz, and F. Schranner. Characterization of numerical dissipation rates in numerical simulations performed using Discontinuous Galerkin methods. In *Proceedings of the third TRR40 Summer Program, Technische Universität München*, 2015

3. **Castiglioni, G.**, Domaradzki J. A., V. Pasquariello, S. Hickel, and M. Grilli. Numerical modeling of 3-D separated flows at Reynolds numbers appropriate for turbine blades and unmanned aero vehicles. In *Proceedings of the second TRR40 Summer Program, Technische Universität München*, pages 177–190, 2013

4. **Castiglioni, G.**, J. A. Domaradzki, M. Grilli, and S. Hickel. Numerical modeling of separated flows at moderate Reynolds numbers appropriate for turbine blades and unmanned aero vehicles. In *Proceedings of the first TRR40 Summer Program, Technische Universität München*, pages 67–76, 2011

Conference Proceedings

1. **Castiglioni, G.** and J. R. Bellan. The thermodynamic regime during mixing under high-pressure conditions. In *2018 AIAA Aerospace Sciences Meeting*, page 1188, 2018

2. **Castiglioni, G.** and J. A. Domaradzki. On the evaluation of numerical dissipation rate and viscosity in a commercial code. In *Proceedings of 9th International Symposium on Turbulence and Shear Flow Phenomena (TSFP9)*, 2015

3. F. Cadiuex, **Castiglioni, G.**, J. A. Domaradzki, T. Sayadi, S. Bose, M. Grilli, and S. Hickel. LES of separated flows at moderate Reynolds numbers appropriate for turbine blades and unmanned aero vehicles. In *Proceedings of 8th International Symposium on Turbulence and Shear Flow Phenomena (TSFP8)*, 2013