

Luca Cirrottola

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Continuously learning about how computational mechanics works, from bits to functional spaces.

Experience

- 02/2022 –onward **Research engineer in scientific computing and HPC**, *Inria (SED)*, Bordeaux, France.
◦ Development of parallel data structures for unstructured hybrid meshes in high-order finite element methods.
- 05/2021 –01/2022, 11/2018 –10/2020, 09/2018 –10/2018 **Postdoc/Research engineer in parallel mesh adaptation**, *Inria (Cardamom)*, Bordeaux, France.
◦ Research and development on the open source ParMmg library (<https://github.com/MmgTools/ParMmg>) in the context of the European research project ExaQute (<http://exaquete.eu>).
◦ Maintain of the ParMmg library.
◦ User support, documentation, and reporting for the European project.
- 11/2020 –04/2021 **Deputy lead developer, Mmg open source consortium**, *Inria (SED, InriaSoft)*, Bordeaux, France.
◦ Development of remeshing capabilities in the Mmg library according to the consortium roadmap.
◦ Maintain of the Mmg platform (<https://www.mmgtools.org>) and software releases.
◦ User technical support, and partner scientific support.
◦ Administrative support for the consortium contracts and the European projects.
- 07/2014 –10/2014 **Research assistant on multibody simulations**, *Politecnico di Milano (DAER)*, Milan, Italy.
11/2014 –05/2015 Multibody modeling of a Twin Engine Pack System and preliminary design of a very light twin-piston driven helicopter, with Robby Moto Engineering Srl and the Dept. of Mechanical Engineering of PoliMi.

Teaching

- 2017 –onward **Co-supervision of master students internships**.
- 2019 –onward **Teaching assistant**, *ENSEIRB-MATMECA*, Bordeaux, France.
◦ Exercises of *Mechanics of deformable solids I* (2019 –2020).
◦ Seminars on software debug and performance analysis for HPC (2022 –2023).

Education

- 11/2014 –10/2017 **Ph.D. in Aerospace Engineering**, *Politecnico di Milano*, Milan, Italy.
(Defended 10/2018) Thesis *Conservative interpolation-free mesh adaptation for three-dimensional aeroelastic simulations in unsteady compressible flows*, under the supervision of G. Quaranta and B. Re.
- 09/2011 –04/2014 **M.Sc. in Aeronautical Engineering**, *Politecnico di Milano*, Milan, Italy, 110/110.
Specialisation in aerodynamics. Thesis *Optimal feedback control of plane channel flow over porous walls*, under the supervision of M. Quadrio and L. Cortelezzi.
- 09/2008 –09/2011 **B.Sc. in Aerospace Engineering**, *Politecnico di Milano*, Milan, Italy, 109/110.

Short Trainings

- 04 –08/11/2019 **Autumn school High Performance Numerical Simulation**, *Inria*, Bordeaux, France.
- 19 –20/01/2016 **Workshop GPU parallel computing with CUDA**, *Politecnico di Milano*, Milan, Italy.
- 15 –19/09/2014 **Summer school Uncertainty Quantification in CFD**, *VKI*, Rhode-Saint-Genèse, Belgium.
- 02 –13/09/2013 **Summer School on Parallel Computing**, *CINECA*, Casalecchio di Reno (BO), Italy.

Competences

Management Support	<i>Fundamentals of management of an open source consortium for a scientific software User forum and scientific consulting for partners</i>
Physics Numerical methods for PDEs Discrete methods	<i>Fluid dynamics, structural dynamics, multibody dynamics Finite elements, finite volumes, spectral methods, ALE and adjoint formulations Mesh adaptation and partitioning, graph coloring</i>
Data structures Programming languages Parallel paradigms	<i>Finite elements, adaptive meshes, objects, hash tables, octrees, graphs C, C++, Fortran 2003, Python, MATLAB MPI, OpenMP, CUDA-OpenCL (basics), task-based parallelism (basics)</i>
Debugging, profiling	<i>gdb, lldb, Valgrind, Intel VTune, Arm Forge</i>
Versioning, build, CI	<i>Git, CMake, Jenkins</i>
Job scheduling	<i>Slurm, PBS</i>

Languages

Italian (mother tongue), **English** (proficient), **French** (proficient), **German** (basic).

Certifications

- 2011 **Test of English for International Communication (TOEIC)**, ETS, Score 940/990 - Level C1.
2007 **First Certificate in English (FCE)**, Cambridge ESOL, Score B - Level B2.

Ongoing contributions

- Maintainer **AeroSo1 software**, (C++98).
Library maintain.
- Developer **ParMmg software**, <https://github.com/MmgTools/ParMmg>, (C).
Development of mesh repartitioning schemes, parallel surface analysis, library maintain.
- Developer **Mmg software**, <https://github.com/MmgTools/mmg>, (C).
Developments to support three-dimensional anisotropic adaptation in parallel.
- Maintainer **Fmg software**, <https://gitlab.inria.fr/Fmg/fmg>, (C).
Development of three-dimensional PDE-based adaptation. Library maintain.
- Developer **hex2tet software**, <https://github.com/MmgTools/hex2tet>, (C).
Reference preservation in tetrahedral split of hexahedral meshes.
- Maintainer **xmesh software**, <https://gitlab.inria.fr/lcirrott/xmesh>, (C++11).
(Prototype project) Arbitrary-order conservative interpolation on adapted meshes by mesh intersections.
- Contributor **MmgTools forum**, <https://forum.mmgtools.org/u/lcirrott/summary>.
Support to Mmg and ParMmg users.

Publications

Journal papers

- [Various authors](#), **Tetrahedral remeshing in the context of large-scale numerical simulation and high performance computing**, MathS In Action, 2022.
- [L. Cirrottola](#), M. Ricchiuto, A. Froehly, B. Re, A. Guardone, G. Quaranta, **Adaptive deformation of 3D unstructured meshes with curved body fitted boundaries with application to unsteady compressible flows**, Journal of Computational Physics, Vol. 433, 15 May 2021.

Book chapters

- L. Arpaia, H. Beaugendre, [L. Cirrottola](#), A. Froehly, M. Lorini, L. Nouveau, M. Ricchiuto, **H- and r-adaptation on simplicial meshes using MMG tools**, submitted to the SEMA-SIMAI Springer Series "Mesh Generation and Adaptation: Cutting-Edge Techniques", 2022.

Research reports

- [L. Cirrottola](#), A. Froehly, **Parallel unstructured mesh adaptation using iterative remeshing and repartitioning**, INRIA Research Report 9307, November 2019.

Conference proceedings

- A. Assonitis, R. Paciorri, M. Ciallella, M. Ricchiuto, A. Bonfiglioli, [L. Cirrottola](#), **Numerical simulations of shock interactions on 3D structured grids using a shock-fitting approach**, AIAA SCITECH 2023 Forum.
- M. Potse, [L. Cirrottola](#), A. Froehly, **A practical algorithm to build geometric models of cardiac muscle structure**, ECCOMAS 2022, Oslo, Norway.

- [L. Cirrottola](#), A. Froehly, **Parallel unstructured mesh adaptation based on iterative remeshing and repartitioning**, WCCM-ECCOMAS 2020, Paris (Virtual), January 11–15, 2021.
- [L. Cirrottola](#), A. Froehly, A. Guardone, G. Quaranta, B. Re, M. Ricchiuto, **R-adaptation for unsteady compressible flow simulations in three dimensions**, International Conference on Adaptive Modeling and Simulation (ADMOS), El Campello (Alicante), Spain, May 27–29, 2019.
- [L. Cirrottola](#), G. Quaranta, B. Re, C. Dobrzynski, A. Guardone, **Numerical simulation of nonclassical aileron buzz over 3D unstructured adaptive meshes**, ECCOMAS ECCM-ECFD 2018, Glasgow, June 11–15, 2018.
- [L. Cirrottola](#), M. Morandini, G. Quaranta, **Generalized beam models analysis for aeroelastic morphing applications**, ECCOMAS ECCM-ECFD 2018, Glasgow, June 11–15, 2018.
- [L. Cirrottola](#), R. Alicino, G. Quaranta, R. Papetti, **Conceptual design of a piston driven light twin helicopter**, 5th EASN Association International Workshop on Aerostructures, Manchester, United Kingdom, September 2–4, 2015.
- [L. Cirrottola](#), M. Morandini, G. Quaranta, **A generalized beam formulation for the dynamic analysis of camber-morphing helicopter blades**, International Forum on Aeroelasticity and Structural Dynamics (IFASD), St. Petersburg, Russia, June 28–July 2, 2015.
- R. Alicino, [L. Cirrottola](#), G. Quaranta, A. Albertoni, M. Massera, R. Papetti, **Twin Engine Pack System: A twin piston engine propulsion unit for Very Light Rotorcraft**, AHS International's 71st Annual Forum and Technology Display, Virginia Beach, Virginia, USA, May 5–7, 2015.

Most of my publications can be found on my webpage <https://lcirrottola.github.io>.