

Massy, France

Claire ROCHE

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WORK EXPERIENCE

Meshing Research Engineer
CEA

Dec. 2025 - Now
Bruyères-le-Châtel, France

- C++ Programming, Git.

Meshing Software Engineer
Siemens DISW

Oct. 2024 - Dec. 2025
Châtillon, France

- Development in the volume mesher of STAR-CCM+.
- Work with an **international** team.
- STAR-CCM+, C++ Programming, Git.

PhD

LiHPC (Paris-Saclay University, CEA) & CEA-CESTA

Oct. 2021 - Oct. 2024
Bruyères-le-Châtel, France

- Development of an advancing front algorithm for linear hexahedral block structure generation around a vehicle, dedicated to flow simulation around the vehicle, with particular care to the boundary layer structure.
- *A posteriori* block curving using Bézier elements to approximate the vehicle's surface and discretization of the curved blocks with special refinement in the boundary layer.
- Application to numerical simulations using different dedicated CFD codes.
- C++ Programming, Paraview, SU2 CFD, Git.
- <https://github.com/LIHPC-Computational-Geometry/gmds>

Supervisors: Franck LEDOUX, Jérôme BREIL, Thierry HOCQUELLET

Internship

Lawrence Livermore National Laboratory

May 2023 - Aug. 2023
Livermore, CA, United States

- High-order mesh rp-adaptivity for multi-material interface alignment in MFEM.
- C++ Programming, Git.
- <https://github.com/mfem/mfem>

Supervisor: Ketan MITTAL

Internship

CEA-CESTA

Feb. 2021 - Aug. 2021
Le Barp, France

- Implementation of methods for refinement, regularization, and adaptation of structured meshes in the boundary layer.
- Application to simulations of hypersonic flows using a stationary/unsteady 3D Navier-Stokes CFD code.
- Fortran 90 Programming, Open MP, Paraview, VisIt.

Supervisors: Marina OLAZABAL-LOUME, and Jérôme BREIL

EDUCATION

PhD in Applied Mathematics & Computer Science

LiHPC (Paris-Saclay University, CEA), France

2021 - 2024

Title: Hexahedral Curved Block-Structured Mesh Generation for Atmospheric Re-Entry.

Engineering Degree in Applied Mathematics & Mechanics <i>ENSEIRB-MATMECA, Bordeaux INP, France</i>	2018 - 2021
Master Degree in Numerical Methods for High Performance Computing <i>Bordeaux University, France</i>	2019 - 2021
Bachelor of Engineering Sciences <i>Bordeaux University, France</i>	2016 - 2019

PUBLICATIONS

Roche, C., Breil, J., Calderan, S., Hocquetlet, T., Ledoux, F. (2026). Automatic curved block structure and hexahedral mesh generation for hypersonic CFD. *Computer Methods in Applied Mechanics and Engineering*, 461, 119209.

<https://www.sciencedirect.com/science/article/pii/S0045782526004822>

Roche C. Hexahedral curved block-structured mesh generation for atmospheric re-entry. Diss. Université Paris-Saclay, 2024.

<https://theses.hal.science/tel-04831511/>

Mittal K, Dobrev V.A., Knupp P, Kolev T, Roche C, Tomov V.Z. Mixed-Order Meshing using *rp*-adaptivity for Surface Alignment with Implicit Geometries. *International Meshing Roundtable 2024 (SIAM IMR24)*.

<https://internationalmeshingroundtable.com/assets/papers/2024/1004.pdf>

Roche C, Breil J, Hocquetlet T, Ledoux F. Block-structured quad meshing for supersonic flow simulations. *International Meshing Roundtable 2023 (SIAM IMR23)*.

<https://internationalmeshingroundtable.com/assets/papers/2023/11-Roche-compressed.pdf>

Roche C, Breil J, Olazabal-Loumé M. Mesh regularization of ablating hypersonic vehicles. In *8th European Congress on Computational Methods in Applied Sciences and Engineering (ECCOMAS 2022)*. Jun 2022, Oslo, Norway.

<https://hal-cea.archives-ouvertes.fr/cea-03783795/>

COMMUNICATIONS

Apr. 3 - 5, 2024

Avrainville, France

"Génération de maillages hexaédriques 3D pour la rentrée atmosphérique". Journées Des Doctorants de la DAM.

Mar. 5 - 8, 2024

Baltimore, MD, United States

"Curved Hexahedral Block Structure Generation by Advancing Front". SIAM International Meshing Roundtable Workshop (SIAM IMR24).

<https://internationalmeshingroundtable.com/assets/research-notes/imr32/2010.pdf>

Mar. 29 - 31, 2023

Bordeaux, France

"Advancing-front block structure generation for atmospheric re-entry simulations". 57th 3AF International Conference on Applied Aerodynamics, High-speed aerodynamics, from transonic to hypersonic.

Mar. 6 - 9, 2023

Amsterdam, The Netherlands

"Block-structured quad meshing for supersonic flow simulations". SIAM International Meshing Roundtable Workshop (SIAM IMR23).

Dec. 8, 2022

Paris, France

Poster. "Block-structured 2D mesh generation for supersonic flow simulation". Scientific evaluation of the CEA in high-performance computing.

Nov. 16, 2022

Bordeaux, France

Poster. "Automatic 2D curved block-structured mesh generation for atmospheric re-entry". Scientific evaluation of the CEA in atmospheric re-entry.

Jun. 5 - 9, 2022

Oslo, Norway

8th European Congress on Computational Methods in Applied Sciences and Engineering (ECCOMAS 2022).

May 10, 2022

Arcachon, France

Poster. "Automatic hexahedral mesh generation for atmospheric re-entry". Journée des doctorants.

PROJECT

Mesh adaptation in PETSc

Oct. 2020 - Jan. 2021

Master's Project

- Replacing Pragmatic remesher by MMG in PETSc.
- Setting up test cases for the implementation.

SKILLS

Programming	C++, Fortran 90, Python, Git, L ^A T _E X, TikZ, Markdown
Softwares	STAR-CCM+, CLion, VS Code, gmsh, Paraview, Visit, SU2 CFD
Communication	French (native), English (B2 - TOEIC: 870), Spanish (beginner)
Other	Mesh Generation, Computational Fluid Dynamics