Claire ROCHE

Site: claireroche.github.io
GitHub: claireroche
LinkedIn: claire-roche

WORK EXPERIENCE

Meshing Research Engineer — **Dec. 2025 - Now**
CEA — *Bruyères-le-Châtel, France*

- C++ Programming, Git.

Meshing Software Engineer — **Oct. 2024 - Dec. 2025**
Siemens DISW — *Châtillon, France*

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

PhD — **Oct. 2021 - Oct. 2024**
LiHPC (Paris-Saclay University, CEA) & CEA-CESTA — *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 — **May 2023 - Aug. 2023**
Lawrence Livermore National Laboratory — *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 — **Feb. 2021 - Aug. 2021**
CEA-CESTA — *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 — **2021 - 2024**
LiHPC (Paris-Saclay University, CEA), France

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

Engineering Degree in Applied Mathematics & Mechanics　　　　　　　　**2018 - 2021**
ENSEIRB-MATMECA, Bordeaux INP, France

Master Degree in Numerical Methods for High Performance Computing　　　**2019 - 2021**
Bordeaux University, France

Bachelor of Engineering Sciences　　　　　　　　　　　　　　　　　**2016 - 2019**
Bordeaux University, France

PUBLICATIONS

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, Hocquellet 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, LaTeX, 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

INTERESTS AND ACTIVITIES

Climbing   **2010 - Now**
- Bouldering (2016-Now)
- Lead climbing (2010-2016)
- President of ENSEIRB-MATMECA Climbing Association (2019-2020)