CHRISTINA MAHMOUD

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ACADEMIC BACKGROUND AND EXPERIENCE

Since 2023 **PhD in Applied Mathematics** — CNRS / Institut Montpelliérain Alexander Grothendieck (IMAG), University of Montpellier, France

Supervisor : Hélène Mathis — helene.mathis@umontpellier.fr

Thesis topic : *Approximation of hyperbolic systems with relaxation; application to two-phase flows (ongoing PhD thesis)*

Main research topics :

- Construction of two *unsplit asymptotic-preserving* schemes for hyperbolic systems with relaxation.
- Relative entropy analysis for asymptotic preserving schemes to the Jin & Xin model
- Hierarchy of hyperbolic relaxation models (two-phase flows).

2024–2026 **Additional teaching duties** — University of Montpellier, France

Teaching load : 63 h/year (2024–2026); 48 h (2023–2024)

Courses taught : Scientific reasoning (L1–SVSE) `HAV220X` ; Mathematical tools 3 (L1–PCSI) `HAS202X` ; Remedial mathematics (L1–SVSE) `HAS202X`

2022–2023 **Master 2 (MANU) — Modelling and Numerical Analysis** — University of Montpellier, France

M2 internship : *LAMPS* — University of Perpignan, France

Supervisor : Mikaël Barboteu — barboteu@univ-perp.fr

Co-supervision : Francesco Bonaldi — francesco.bonaldi@univ-perp.fr ; Serge Dumont — serge.dumont@univ-perp.fr

Title : A mathematical and numerical formulation of hyperelastic problems for the modelling of soft biological tissues (6 months)

Work : hyper–visco–elasticity; numerical approximation and analysis; solution via *Primal–Dual Active Set method*; simulations

2021–2022 Private mathematics tutor for high-school students.

2019–2021 **Master's degree — Fundamental and Applied Mathematics** — Lebanese University, Beirut, Lebanon

M2 internship : *Institut P' (PPrime)* — University of Poitiers, France (4 months)

Work : high-performance computing; turbulence; natural convection; numerical analysis and simulations

2016–2019 **Bachelor's degree — Mathematics** — Lebanese University, Beirut, Lebanon

PUBLICATIONS

Published articles

1. **M. Barboteu, F. Bonaldi, S. Dumont, C. Mahmoud**. *An energy-consistent discretization of hyper-viscoelastic contact models for soft tissues*. **Computer Methods in Applied Mechanics and Engineering**, 2024, In press. `https://doi.org/10.1016/j.cma.2024.116785`

Submitted work

1. **C. Mahmoud, H. Mathis**. *Asymptotic Preserving Schemes for Hyperbolic Systems with Relaxation*. **Preprint (HAL)**, 2025, HAL-05291431 v1. `https://cnrs.hal.science/IMAG-MONTPELLIER/hal-05291431v1`

Work in progress

1. Relative entropy analysis for asymptotic preserving schemes to the Jin & Xin model. [In preparation]
2. Relative-Entropy Analysis of a Hierarchy of Phase-Change Relaxation Models.

CONFERENCES

Talks

10/2024 Lyon (FR) **CJC-MA2024** — *Uniformly accurate asymptotic-preserving schemes for hyperbolic systems with relaxation*.

Posters

06/2025 Darmstadt (DE) **Numerical Methods for Hyperbolic Problems** — *Unsplit asymptotic-preserving schemes for hyperbolic systems with relaxation*.

05/2025 Strasbourg (FR) **Seventh Workshop on Compressible Multiphase Flows** — *Unsplit asymptotic-preserving schemes for hyperbolic systems with relaxation*.

06/2024 Lille (FR) **New Trends in the Numerical Analysis of PDEs** — *Uniformly accurate schemes for hyperbolic relaxation systems*.

06/2024 Strasbourg (FR) **Sixth Workshop on Compressible Multiphase Flows** — *Uniformly accurate schemes for hyperbolic relaxation systems*.

COMPUTING SKILLS

Python Development of simulation and analysis codes (PhD work).

C++ Scientific programming (M2 MANU practical sessions) — *beginner*.

R Data analysis tools — *beginner*.

MODULEF Finite element code: use and adaptation — *beginner*.

Maple, MATLAB Symbolic and numerical computation (second-year practicals) — *beginner*.

LANGUAGES

Arabic Reading, writing, speaking.

French Reading, writing, speaking.

English Reading, writing, speaking.

ADMINISTRATIVE ACTIVITIES

Since 2025 Member of the ANGUS team (Inria), supervised by Nicolas Seguin.

2022 **Early childhood educator** — Fingerprints, Beirut (Lebanon).

2019 Participation in the organisation of the international conference **LICMA'19** (Mathematics and Applications), Lebanese University — Hadath, Lebanon.