Averil Aussedat | Math apprentice

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in averil-aussedat

Born 22/02/2000, French.

Academic background

Post-doctoral contract in the ConFine project (led by Adolfo Arroyo-Rabasa)   *Since 2025*
ConFine stands for Concentrations and Fine properties of PDE-constrained measures.
University of Pisa

PhD thesis in applied mathematics   *2022 –2025*
LMI - Laboratory of Mathematics of INSA Rouen Normandie
Optimal control problems and Hamilton-Jacobi-Bellman equations in some curved metric spaces.
Manuscript available at https://theses.hal.science/tel-05133552/
Defended on June 19th 2025 in front of the following jury:

- Nicola Gigli (rapporteur)
- Quentin Mérigot (rapporteur)
- Filippo Santambrogio (president)
- Yves Achdou (examinator)
- Pierre Cardaliaguet (examinator)
- Chloé Jimenez (examinator)
- Nicolas Forcadel (advisor)
- Hasnaa Zidani (advisor)

Master internship on numerical methods for Hamilton-Jacobi equations   *March-July 2022*
Lab. J. L. Lions, with Olivier Bokanowski
https://github.com/averil-aussedat/numHJ

Master in Fundamental and Applied Mathematics   *2021–2022*
Double cursus in M2 (second year of master program) jointly with INSA Rouen
University of Rouen Normandie

Engineering diploma in Applied Mathematics   *2017-2022*
National Institute of Applied Sciences - INSA Rouen Normandie

Integration of Graduate School MINMACS   *2021–2022*
Excellence scholarship in M2

Undergraduate internship on an implicit-explicit scheme for the wave equation   *June-August 2021*
CEA Saclay, with Alexandre Impériale
https://www.github.com/averil-aussedat/Wonderbubbleland

Participation to projects

ConFine - Concentrations and Fine Properties of PDE-constrained measures   *2024-2029*
ERC Starting Grant held by Adolfo Arroyo-Rabasa

ANR COSS - Control over Stratified Structures   *2023-2026*
National Research Agency project held by Nicolas Forcadel

COPTI - Optimal control for mathematical modelling and numerical simulation with applications in environment, transport and image processing   *2021-2025*
European excellence chair on OPTImal Control held by Hasnaa Zidani

ANID-ECOS - Sensitivity Analysis of State Constrained Optimal Control Problems   *2021-2023*
Chilean-French research cooperation project held by Hasnaa Zidani

Preprints and publications

The links to preprint versions are available on `https://averil-aussedat.github.io/publications`.

Geometry of the Wasserstein space

Geodesics in the space of measures have velocities which are essentially gradients of convex functions. When taking the cone and a suitable closure over it, we obtain a generalization of the closure of gradients in L^2, this time for any arbitrary measure μ. The "orthogonal" is a generalization of the closure of divergence-free fields. Here many questions arise: for instance, is there a generalization of the Liouville theorem, saying that for these "divergence-free" things, a "flow" lets the measure invariant? Quick answer: not in general, and this was a surprise.

Characterization of measures on the real line that are critically unstable under small shifts (*preprint*)
`https://arxiv.org/abs/2603.00775`

Locality of centred tangent cones in the Wasserstein space (*preprint*)
`http://arxiv.org/abs/2508.10837`

On the structure of the tangent cone to the Wasserstein space
`https://www.sciencedirect.com/science/article/pii/S0022039625005479`

Hamilton-Jacobi-Bellman equations

In $\mathbb{R}^d$, the value function of a control problem satisfies a PDE in the viscosity sense. Now, control problems can be written down in far uglier spaces than $\mathbb{R}^d$, so the question is to write the PDE – and the viscosity theory behind.

A Cauchy-Lipschitz setting for control problems in complete CAT(0) spaces (*preprint*)
Joint work with H. Zidani
`https://hal.science/hal-05567013`

A minimality property of the value function in optimal control over the Wasserstein space
Joint work with C. Hermosilla
`https://epubs.siam.org/doi/10.1137/24M1634679`

Viscosity solutions of centralized control problems in measure spaces
Joint work with O. Jerhaoui and H. Zidani
`https://www.esaim-cocv.org/articles/cocv/abs/2024/01/cocv240040/cocv240040.html`

Master works

Due to the particular status of engineering schools in France, I ended up doing "two" master thesis: a bibliographic one aside courses during the first semester of last year ("master thesis" below), and a second in the form of an internship with O. Bokanowski in Paris Cité, leading to an article. In addition, the said internship was interrupted by 2022's CEMRACS, a five-week research school with proceedings, explaining that perhaps messy section.

Neural networks for first order HJB equations and application to front propagation with obstacle terms
Joint work with O. Bokanowski and X. Warin
`https://link.springer.com/article/10.1007/s42985-023-00258-8`

High order numerical methods for Vlasov-Poisson models of plasma sheaths (CEMRACS project)
Joint work with V. Ayot, M. Badsi, A. Crestetto, N. Crouseilles, M. Mehrenberger and C. Tayou-Fotso
`https://www.esaim-proc.org/articles/proc/abs/2024/02/proc2407711/proc2407711.html`

Master's thesis - First approach of non-linearity
Introduction to Navier-Stokes equations and their control
`https://github.com/averil-aussedat/NonLinearite`

Mobility and participation to research thematic schools

CMM Visiting program **UTFSM, Valparaíso**
6-months academic stay in the Universidad Técnica Federico Santa María *July - December 2023*

SEME - Research summer school **Pointe-à-Pitre**
Academic-Industry research week (Semaine d'Étude Mathématique-Entreprise) *15th - 19th May 2023*
`https://hal.science/hal-04108539`

CEMRACS - Vlasov-Poisson plasma sheath   **CIRM, Luminy**
Summer school on Transport in Physics, Biology and Urban traffic   *July - August 2022*
`https://hal.science/hal-03926305/`

Teaching activities

In France, PhD students can be contracted to teach for max. 64 hours per year. I benefited three years from such contracts, all at INSA Rouen, which has students from the first to fifth year (2y common cursus, 3y department).

Numerical methods for Partial Differential Equations
4th year, dep. of Mathematics. Course and exercise sessions.   *Jan. - May 2024 & 2025*

Differential equations
3rd year, dep. of Mathematics. Exercise sessions.   *Jan. - May 2025*

Computer-assisted mathematics
2nd year, Common cursus. Course and exercise sessions.   *April 2025*

Linear algebra
2nd year, Common cursus. Exercise sessions.   *Jan. - May. 2024*

Numerical optimization
4th year, dep. of Mathematics. Exercise sessions.   *Sept. - Dec. 2022*

Introduction to probability
2nd year, Common cursus. Exercise sessions.   *Sept. - Dec. 2022*

Service for the community

Co-organizer of the doctoral seminar   **INSA Rouen/University of Rouen**
Joint seminar between the LMI and LMRS   *July - Dec. 2023*
`https://sites.google.com/view/atelier-des-doc-lmi-lmrs`

Member of the local organizing committee   **UTFSM, Valparaíso**
Workshop Optimal control and Applications   *Dec. 2023*

Organizer of the doctoral seminar   **UTFSM, Valparaíso**
Joint seminar ($K\alpha f\varepsilon\mu\iota\nu\alpha\rho\iota o$) between the consortium of universities of Valparaíso   *July - Dec. 2023*
`https://whitengine.github.io/2023/09/cafeminario/`

Elected representant of the doctoral students   **INSA Rouen**
Participation to the scientific council of the institution   *since Oct. 2022*

Oral communications

In general the slides are available on `https://averil-aussedat.github.io/presentations`. I also participated regularly to various student seminars during my phd years, but almost never to present my own research.

Second blow-ups of squared Wasserstein distances in dimension one   **Nice**
SMAI MODE Days 2026   *March 2026*

Weird measures near the edges of Otto's manifold in dimension one   **Padova**
Workshop OT in GMT – GMT in OT (or the converse)   *March 2026*

Locality of the centred Wasserstein tangent cone   **Pisa**
Joint Unipi-SNS Geometric Analysis seminar   *February 2026*

Decomposition of a measure according to Wasserstein tangent cones   **Toulon**
Modelling and Applied Analysis Seminar   *December 2025*

Local characterization of tangent plans that are martingale plans   **Orsay**
Workshop "New directions in OT"   *November 2025*

Who's who in $\mathscr{P}_2$: Towards a characterization of the geometric tangent cone   **Orsay**
Working group (GT) OT-EDP-ML   *May 2025*

Follow the distance: Viscosity solutions of monotone PDEs in some metric spaces   **Dijon**
SPOC seminar of the Institut the Mathématiques de Bourgogne   *February 2025*

A relaxation theorem in $\mathrm{CAT}(0)$ spaces   **Pavia**
Poster at the Italian-Japanese workshop on variational perspectives for PDEs   *September 2024*

Swirling measures: The quotient structure of the tangent cone to the Wasserstein space   **Rouen**
Journée de la Fédération Normandie Mathématiques   *July 2024*

Think horizontally: Control problems with possibly infinite cost in the Wasserstein space   **Nantes**
LMJL Seminar, Nantes   *April 2024*

Viscosity solutions in the Wasserstein space   **Lyon**
SMAI MODE Days 2024   *March 2024*

D_μ vs $\langle \cdot, \cdot \rangle_\mu$: Test functions versus semidifferentials in Wasserstein   **Paris (Dauphine)**
ANR COSS Meeting Days   *March 2024*

Befriending $\mathscr{P}_2(\mathbb{R}^d)$: viscosity solutions of centralized control problems in measure spaces   **Valparaíso**
Workshop Optimal Control and Applications   *March 2023*

Using optimal transport to define viscosity solutions of control problems   **Paris (Jussieu)**
Poster in Foundations of Computational Mathematics (FoCM 2023)   *June 2023*

A neural network Lagrangian scheme for HJB equations   **Pointe-à-Pitre**
SMAI – 11th French Biennial of Applied and Industrial Mathematics   *May 2023*

Quadratic is the new smooth: a notion of viscosity for control problems in $\mathscr{P}_2(\mathbb{R}^d)$ **Rouen**
Optimization and Control research group seminar   *April 2023*

Languages

Human (besides native french)
○ English: fluent, spanish: minimal, italian: bad

Computer
○ Julia, C++, Matlab, LaTeX, Python if unavoidable

Completed on March 28, 2026.