

# Averil Aussedat | PhD student in Applied Mathematics

✉ averil.aussedat@gmail.com • 🌐 <https://averil-aussedat.github.io>  
📄 averil-aussedat • in averil-aussedat

Born 22<sup>th</sup> Feb. 2000 in France.

## Academic background

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**PhD in Applied Mathematics, with Nicolas Forcadel and Hasnaa Zidani** since Oct. 2022

LMI - Laboratory of Mathematics of INSA Rouen Normandie

- Control problems in networks and applications to urban traffic
- Scholarship of INSA Rouen

**Master in Fundamental and Applied Mathematics** 2021–2022

University of Rouen Normandie

**Engineering diploma in Applied Mathematics** 2017–2022

National Institute of Applied Sciences - INSA Rouen

**Integration of Graduate School MINMACS** 2021–2022

Excellence scholarship in M2

## Participation to projects

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**ANR COSS - Control over Stratified Structures** 2023–2026

National Research Agency project

**COPTI - Optimal control for mathematical modelling and numerical simulation** 2021–2025

with applications in environment, transport and image processing

European excellence chair on OPTImal Control

**ANID-ECOS - Sensitivity Analysis of State Constrained Optimal Control Problems** 2021–2023

Chilean-French research cooperation project

## Publications

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**A Cauchy-Lipschitz setting for control problems in complete CAT(0) spaces** in preparation

**A minimality property of the value function in optimal control over the Wasserstein space** submitted

Joint work with C. Hermosilla

<https://hal.science/hal-04427139>

**Viscosity solutions of centralized control problems in measure spaces** published

Joint work with O. Jerhaoui and H. Zidani

<https://www.esaim-cocv.org/articles/cocv/abs/2024/01/cocv240040/cocv240040.html>

**Neural networks for first order HJB equations and application** published

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** submitted

Joint work with V. Ayot, M. Badsì, A. Crestetto, N. Crouseilles, M. Mehrenberger and C. Tayou-Fotso

<https://hal.science/hal-03926305/>

**Master's thesis - First approach of non-linearity**

Introduction to Navier-Stokes equation and their control

<https://github.com/averil-aussedat/NonLinearite>

## Mobility

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### CMM Visiting program

6-months academic stay in the Technical University Federico Santa María

UTFSM, Valparaíso

1<sup>st</sup> July - 22<sup>th</sup> Dec. 2023

## Thematic schools

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### Autumn school - Rencontres normandes sur les EDP

Mini-courses by Stéphanie Salmon, Jean-Michel Roquejoffre and Pierre Cardaliaguet

Rouen

4<sup>th</sup> - 8<sup>th</sup> November 2024

### SEME - Research summer school

Academic-Industry research week (Semaine d'Étude Mathématique-Entreprise)

Pointe-à-Pitre

15<sup>th</sup> - 19<sup>th</sup> May 2023

○ On a workaround for an overflow in streaming process mining.

<https://hal.science/hal-04108539>

### Summer school on Mean-Field Games

Mini-courses by François Delarue, Pierre-Emmanuel Jabin and Eva Löcherbach

Centre Henri Lebesgue

12<sup>th</sup> - 16<sup>th</sup> June 2023

### CEMRACS - Vlasov-Poisson plasma sheath

Summer school on Transport in Physics, Biology and Urban traffic

CIRM

15<sup>th</sup> July - 31<sup>th</sup> Aug. 2022

○ Numerical methods for a bispecies plasma sheath with absorbing wall.

<https://hal.science/hal-03926305/>

## Internships

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### Numerical methods for Hamilton-Jacobi equations

Master internship (4.5 months) with Olivier Bokanowski

Lab. J.L. Lions

1<sup>st</sup> Mar. - 15<sup>th</sup> Jul. 2022

○ Semi-Lagrangian scheme for obstacle problems with neural networks.

<https://github.com/averil-aussedat/numHJ>

### Implicit-explicit scheme for the wave equation

Undergraduate internship (3 months) with Alexandre Impériale

CEA Saclay

Jun - Aug. 2021

○ Multi-scale semi-implicit scheme in inhomogeneous media, with finite elements.

<https://www.github.com/averil-aussedat/Wonderbubbleland>

## Teaching activities

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### Numerical methods for Partial Differential Equations

4<sup>th</sup> year, dep. of Mathematics. Course and exercise sessions.

INSA Rouen

Jan. - May 2024 & 2025

Introduction to spectral theory, parabolic/hyperbolic second order equations.

### Differential equations

3<sup>rd</sup> year, dep. of Mathematics. Exercise sessions.

INSA Rouen

Jan. - May 2025

### Computer-assisted mathematics

2<sup>nd</sup> year, Common cursus. Course and exercise sessions.

INSA Rouen

April 2025

Shared course, intervention on linear algebra and numerical schemes for ODEs.

### Linear algebra

2<sup>nd</sup> year, Common cursus. Exercise sessions.

INSA Rouen

Jan. - May. 2024

### Numerical optimization

4<sup>th</sup> year, dep. of Mathematics. Exercise sessions.

INSA Rouen

Sept. - Dec. 2022

### Introduction to probability

2<sup>nd</sup> year, Common cursus. Exercise sessions.

INSA Rouen

Sept. - Dec. 2022

## Service for the community

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### Co-organizer of the doctoral seminar

Joint seminar between the LMI and LMRS

<https://sites.google.com/view/atelier-des-doc-lmi-lmrs/accueil?authuser=1>

INSA Rouen/University of Rouen

July - Dec. 2023

### Member of the local organizing committee

Workshop Optimal control and Applications

UTFSM, Valparaíso

Dec. 2023

### Organizer of the doctoral seminar

Joint seminar ( $K\alpha f\epsilon m\iota n\alpha r\iota o$ ) between the consortium of universities of Valparaíso

<https://whitengine.github.io/2023/09/cafeminario/>

UTFSM, Valparaíso

July - Dec. 2023

### Elected representant of the doctoral students

Participation to the scientific council of the institution

INSA Rouen

since Oct. 2022

## Oral communications

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### A relaxation theorem in $CAT(0)$ spaces

Poster at the Italian-Japanese workshop on variational perspectives for PDEs

<https://averil-aussedat.github.io/files/presentations/Relaxation.pdf>

Pavia

September 2024

### Swirling measures: The quotient structure of the tangent cone to the Wasserstein space

Talk in the Journée de la Fédération Normandie Mathématiques

<https://averil-aussedat.github.io/files/presentations/hodge.pdf>

Rouen

July 2024

### Think horizontally: Control problems with possibly infinite cost in the Wasserstein space

Talk in the LMJL Seminar, Nantes

<https://averil-aussedat.github.io/files/presentations/thinkHorizontally.pdf>

Nantes

April 2024

### Viscosity solutions in the Wasserstein space

Talk in the SMAI MODE Days

<https://averil-aussedat.github.io/files/presentations/viscWass.pdf>

SMAI MODE 2024

March 2024

### $D_\mu$ vs $\langle \cdot, \cdot \rangle_\mu$ : Test functions versus semidifferentials in Wasserstein

Talk in the ANR COSS Meeting Days

<https://averil-aussedat.github.io/files/presentations/twonotions.pdf>

ANR COSS Days

March 2024

### Befriending $\mathcal{P}_2(\mathbb{R}^d)$ : viscosity solutions of centralized control problems in measure spaces

Talk in the Workshop Optimal Control and Applications, Valparaíso

<https://averil-aussedat.github.io/files/presentations/befriend.pdf>

WOpCoT

March 2023

### Using optimal transport to define viscosity solutions of control problems

Poster in Foundations of Computational Mathematics (FoCM)

<https://averil-aussedat.github.io/files/posters/FoCM23.pdf>

FoCM 2023

June 2023

### A neural network Lagrangian scheme for HJB equations

Talk in the 11<sup>th</sup> French Biennial of Applied and Industrial Mathematics

<https://averil-aussedat.github.io/files/presentations/SMAI2023.pdf>

SMAI 2023

May 2023

### Quadratic is the new smooth: a notion of viscosity for control problems in $\mathcal{P}_2(\mathbb{R}^d)$

Talk in the Optimization and Control research group seminar

<https://averil-aussedat.github.io/files/presentations/BPviscosity.pdf>

LMI Seminar

April 2023

## Languages

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### Human

○ French: native, English: C1, Spanish: B1, Italian: A1

### Computer

○ Favorites: Julia, C++, Matlab, comfortable in Python