# GUILLAUME STEIMER

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## EDUCATION

2021 – 2025 **PhD in Applied Mathematics** — **University of Strasbourg**
Model order reduction method for Hamiltonian dynamics using deep learning
Development of non-linear model order reduction methods preserving the symplectic structure of the full order model (Saint-Venant, Vlasov-Poisson...) using machine learning (deep learning, autoencoder, Hamiltonian neural network...)

2019 – 2021 **Master's in Mathematics and Applications** — **University of Strasbourg**
Scientific Computation and Mathematics of Innovation (CSMI) track
Modeling, simulation, optimization, scientific computing, machine learning, PDEs, graphs, signal processing, compilation, high-performance computing, uncertainties quantification, networks.
*Graduated with honors (très bien)*

2018 – 2019 **Bachelor's in Mathematics** — **University of Strasbourg**
Applied Mathematics track
*Graduated with honors (très bien)*

2016 – 2018 **DEUG (2 years of BSc) in Mathematics** — **University of Strasbourg**
Advanced Mathematics and Physics (MPA) track
*Graduated with honors (très bien), class major*

## PUBLICATION & PREPRINT

**Reduced Particle in Cell method for the Vlasov-Poisson system using auto-encoder and Hamiltonian neural networks**
R. Côte , E. Franck , L. Navoret , G. Steimer, V. Vigon.
*Submitted*

**Hamiltonian reduction using a convolutional auto-encoder coupled to an Hamiltonian neural network**
R. Côte , E. Franck , L. Navoret , G. Steimer, V. Vigon.
10.4208/cicp.OA-2023-0300
*Commun. in Comput. Phys., 2025*

**Hyperbolic reduced model for Vlasov-Poisson equation with Fokker-Planck collision**
E. Franck, I. Lannabi„ Y. Nasseri, L. Navoret, G. Parasiliti Rantone, G. Steimer.
doi:10.1051/proc/202477213
*ESAIM Proc. Surveys, 2024*

## TEACHING

2024-2025 **Algebra (BSc 1st year in Mathematics)** — **University of Strasbourg**
Basics of Matrix calculations and arithmetic on $\mathbb{Z}$.
35h of lectures per year.

2024-2025 **Scientific Computing (BSc 2nd year in Mathematics)** — **University of Strasbourg**
Fundamentals of numerical analysis, applications in Python.
18h of directed studies per year.

2024-2025 **Computer Science (BSc 2nd year in Mathematics)** — **University of Strasbourg**
Basics of object-oriented programming in Python.
14h of lectures and 14h of practical sessions per year.

2021-2024 **Computer Science (BSc 3rd year in applied mathematics)** — **University of Strasbourg**
Object-oriented programming in C++.
34h of directed studies per year.

2021-2023 **Computer Science (BSc 2nd year in Mathematics)** — **University of Strasbourg**
Basics of object-oriented programming in Python.
30h of practical sessions per year.

## INTERNATIONAL CONFERENCES

June 2025 — **4th International Nonlinear Dynamics Conference (NODYCON 2025)** — **New-York, USA**
Reduced Particle in Cell method for the Vlasov-Poisson system using auto-encoder and Hamiltonian neural networks
E. Franck, L. Navoret, G. Steimer, V. Vigon

February 2025 — **3rd IACM Digital Twins in Engineering Conference & 1st ECCOMAS Artificial Intelligence and Computational Methods in Applied Science (DTE & AICOMAS)** — **Paris, France**
Reduced Particle in Cell method for the Vlasov-Poisson system using auto-encoder and Hamiltonian neural networks
E. Franck, L. Navoret, G. Steimer, V. Vigon

May 2023 — **Math 2 Product (M2P) : Emerging Technologies in Computational Science for Industry, Sustainability and Innovation** — **Taormina, Italy**
Reduced order modeling using auto-encoder and Hamiltonian neural networks
E. Franck, L. Navoret, G. Steimer, V. Vigon

November 2022 — **Numerical Methods for the Kinetic Equations of Plasma Physics (NumKin)** — **Garching, Germany**
Data driven reduced modeling of the Vlasov-Poisson equation
E. Franck, L. Navoret, G. Steimer, V. Vigon

September 2022 — **Model Reduction and Surrogate Modeling (MORE)** — **Berlin, Germany**
Data driven reduced modeling of the Vlasov-Poisson equation
E. Franck, L. Navoret, G. Steimer, V. Vigon

June 2022 — **8th European Congress on Computational Methods in Applied Sciences and Engineering (ECCOMAS)** — **Oslo, Norway**
Data driven reduced modeling of the Vlasov-Poisson equation
E. Franck, N. Crouseilles, L. Navoret, G. Steimer, V. Vigon

## INTERNSHIPS & PROJECTS

2/2021 – 8/2021 — **Master's 2nd year internship: data-driven reduction of the Vlasov-Poisson model** — **INRIA TONUS team, IRMA, Strasbourg**
Study of the Vlasov-Poisson equation, simulation using PIC method, construction of reduced models via Singular Value Decomposition (SVD), autoencoder, and learning the dynamics with Hamiltonian neural networks.

10/2020 – 1/2021 — **Master's 2nd year project: learning the Hamiltonian dynamics of a physical system with neural networks** — **MOCO team, IRMA, Strasbourg**
Implementation of neural networks capable of learning the dynamics of simple physical systems using Hamiltonian mechanics, where "classical" networks fail. Applications to conservative physical systems.

3/2020 – 8/2020 — **Master's 1st year project and internship: tsunami modeling, the contribution of neural networks compared to classical numerical schemes** — **MOCO team, IRMA, Strasbourg**
Development of a tsunami prediction method for the Mediterranean Sea: writing a 1D simulation code in C++ with real topographies, followed by the design of various deep learning neural networks to predict tsunami arrival times.

Spring 2020 — **Project: homicide report, can we predict a murderer's traits?** — **University of Strasbourg**
Descriptive statistics and machine learning work for predicting a murderer's characteristics based on the murder and victim characteristics with the Homicide Report database from Kaggle, which lists all homicides in the United States from 1980 to 2014, collected by the FBI. Done in collaboration with P. Bernard.

## SPECIFIC SKILLS

**Mathematics:** Numerical analysis, scientific computing, model reduction, Hamiltonian systems, algorithms, numerical methods for ODEs/PDEs, scientific machine learning, optimization, stochastic models, high-performance computing.

**Languages & librairies:** C, C++, Python, Tensorflow, Scikitlearn, Keras, MPI, openMP, CUDA, Openturns, Pandas, git.

**Languages:** English (fluent), Norwegian (bokmål, beginner)