Yoann Le Hénaff

Born on Oct. 31, 1997, in Aubergenville, France.

Tübingen, Germany

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Numerical Analysis
Applied mathematics

Employment

2024-... **Postdoctoral researcher**, *University of Tübingen (Germany)*
Working on the theoretical and numerical aspects of the Bogoliubov approximation in the nonlinear Schrödinger equation. Under the supervision of Christian Lubich. Member of the SFB-funded research group TRR 352 *Mathematics of Many-Body Quantum Systems and Their Collective Phenomena*, and active in the research project B4 *Numerical Gaussian-Based and Tensor-Network Methods in Quantum Dynamics.*

Education

2021-2024 **PhD in mathematics**, *University of Rennes, France*, defended on 12 June 2024
***Modulated particle methods and high orders*: a few contributions in numerical analysis.**
- Theoretical and numerical study of a particle scheme for the approximation of the solution to the Vlasov-Poisson equation.
- Study of a modulated particle method for the cubic nonlinear Schrödinger equation.
- Study of the spectral concentration problem, and of a robust approximation algorithm overcoming the numerical instabilities.

Supervised by Erwan Faou and Nicolas Crouseilles (University of Rennes, INRIA Brittany.).
Reviewers: Martin Campos Pinto, Bruno Després.
Jury: Virgine Ehrlacher, Katharina Schratz, Pierre Vernaz-Gris.

2019-2021 **Master's degree in fundamental mathematics**, *University of Rennes (France)*

2019 **Semester of study**, *Korean Advanced Institute of Science and Technology (South Korea)*

2015-2021 **Engineering degree in Applied mathematics**, *INSA Rennes (France)*

Notable projects

2022 **CEMRACS '22 research project**, *CIRM*, Marseille (France)
Study of a variation of a finite-volume scheme.
Supervised by Philippe Hoch (CEA DAM, Saclay, France)

2021 **Research internship**, *INRIA & Cailabs*
Theoretical and numerical study of an industrial problem (confidential).
Supervised by Erwan Faou (University of Rennes, INRIA Brittany)

2020 **Research internship**, *CEA*, Saclay (France)
Study of numerical schemes in the modelling of hydraulic systems in the incompressible case.
Supervised by Xavier Merlhiot (CEA, lab. Nano Innov)

2019 **Research project**, *Université Rennes I*
Part of my master's degree. Study of the pseudospectra of a matrix.
Supervised by Benjamin Boutin (University of Rennes)

2018 **Software development**, *TDF, Cesson-Sévigné (France)*
Creation of a software used to analyze logs coming from transmission equipments.
Supervised by Jean-François Travers (TDF)

Research project, *INSA Rennes*
Part of my engineering degree. Analysis of the convexity of the Gibbs functions in the thermodynamical model of Van der Waals.
Supervised by Mounir Haddou (INSA Rennes)

Languages

French Native.
English **C1** level, fluent. *TOEIC (Feb. 04, 2021) : 980 / 990*
Spanish **B1** level.
German **A1** level.

Computer skills

Programming **Julia, Python, Matlab, Octave, C++, C, LaTeX**
Tools **Git, VisualStudioCode**

Talks given

2025 **Maths Applis seminar**, *LMJL*, Nantes (France)
Seminar of the numerical analysis and scientific computing group. Presentation of some results on the spectral concentration problem.

Seminar, *University of Tübingen*, (Germany)
Seminar of the numerical analysis group. Presentation of some results on the spectral concentration problem.

2024 **PhD students' day**, *IRMAR*, Rennes (France)
Meeting of all PhD students in Rennes. Presentation of some results on the spectral concentration problem.

Workshop on molecular dynamics, *LAREMA*, Angers (France)
Presentation of some modulation techniques for the Schrödinger equation.

2023 **INRIA MINGuS team meeting**, *INRIA Brittany*, Rennes (France)
Presentation of some modulation techniques for the Schrödinger equation.

ANR KEN meeting, *LMJL*, Nantes (France)
Presentation of a convergence result of a particle method on the Vlasov-Poisson equation.

PhD seminar, *IRMAR*, Rennes (France)
Presentation of some modulation techniques for the Schrödinger equation.

Congress of young researchers in mathematics and their applications, Gif-sur-Yvette (France)
Presentation of a convergence result of a particle method on the Vlasov-Poisson equation.

2022 **CEMRACS**, Marseille (France)
Mathematical modelling, analysis and numerical simulation of transport problems. Presentation of some results obtained after 5 weeks of a research project.

Events attended without giving a talk

2025 **SFB TRR 352 Junior meeting**, Stuttgart (Germany)
Meeting of the junior members of the SFB-funded research group TRR 352 on Quantum systems and many-body interactions

SFB TRR 352 annual meeting, Farchant (Germany)
Annual meeting of all members of the SFB TRR 352 research group.

2022 **CEMRACS**, Marseille (France)
Mathematical modelling, analysis and numerical simulation of transport problems. 1 week of summer school

Dobbacio summer school, Dobbiaco (Italy)
Numerical methods for kinetic equations. Lecturers: E. Sonnendrücker and L. Einkemmer.

Teaching

2025 **Lecture on numerical methods**, *University of Tübingen*, (Germany)
26h at graduate level.

2021-2024 **Mathematics tutorial sessions for undergraduates**, *University of Rennes*, (France)
+120h at undergraduate level.

Communications and public outreach

2023 **Math C2+**, *Rennes, France*
Public outreach about research in mathematics for an audience made of high-school students.

Publications and preprints

[1] Erwan Faou and Yoann Le Henaff. A generalized spectral concentration problem and the varying masks algorithm, October 2024.

[2] Mohamed Boujoudar, Emmanuel Franck, Philippe Hoch, Clément Lasuen, Yoann Le Hénaff, and Paul Paragot. A composite finite volume scheme for the Euler equations with source term on unstructured meshes, April 2024.

[3] Yoann Le Hénaff. Grid-free weighted particle method applied to the Vlasov–Poisson equation. *Numerische Mathematik*, 155(3-4):289–344, December 2023.

[4] Erwan Faou, Yoann Le Hénaff, and Pierre Raphaël. Modulation algorithm for the nonlinear Schrödinger equation, October 2023. An improved version of this paper is to appear in *Recent progress on numerical analysis for nonlinear dispersive equations* published by World Scientific.