Louis Garrigue
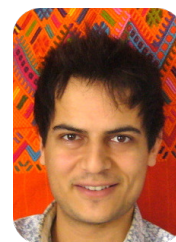
Researcher in mathematical physics

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Positions

Feb 2023 –	**Tenure track**, *Cergy's university*, laboratory "analysis, geometry and modeling"
Oct 2022 – Jan 2023	**Postdoc**, *Stuttgart's university*, in the team of Benjamin Stamm
2020 – 2022	**Postdoc**, *École des ponts, Cermics*, in the team of Éric Cancès

Education

2017 – 2020	**Doctorate in mathematical quantum physics**, *university Paris-Dauphine*, supervised by Mathieu Lewin, on mathematical aspects of Density functional theory
2016 – 2017	**Master's degree in fundamental mathematics**, *university Paris-Diderot*
2014 – 2016	**Master's degree in theoretical physics**, *École normale supérieure*
2012 – 2017	**Student and civil servant at the École normale supérieure**

Preprints

[9] G. Dusson, L. Garrigue, B. Stamm. A multipoint perturbation formula for eigenvalue problems (arxiv:2305.08151), preprint (2023).

[8] L. Garrigue. Mixed state representability of entropy-density pairs (arxiv:2203.16441), preprint (2022).

Publications

[7] É. Cancès, L. Garrigue, D. Gontier. A simple derivation of moiré-scale continuous models for twisted bilayer graphene (arxiv:2206.05685), Physical Review B (2023).

[6] É. Cancès, L. Garrigue, D. Gontier. Second-order homogenization of periodic Schrödinger operators with highly oscillating potentials (arxiv:2112.12008), SIAM Journal on Mathematical Analysis (2022).

[5] L. Garrigue. Building Kohn-Sham potentials for ground and excited states (arxiv:2101.01127), Archive for Rational Mechanics and Analysis (2022).

[4] L. Garrigue. Some properties of the potential-to-ground state map in quantum mechanics (arxiv:2012.04054), Communications in Mathematical Physics (2021).

[3] L. Garrigue. Unique continuation for many-body Schrödinger operators and the Hohenberg-Kohn theorem. II. The Pauli Hamiltonian (arxiv:1901.03207), Documenta Mathematica (2020).

[2] L. Garrigue. Hohenberg-Kohn theorems for interactions, spin and temperature (arxiv:1906.03191), Journal of Statistical Physics (2019).

[1] L. Garrigue. Unique continuation for many-body Schrödinger operators and the Hohenberg-Kohn theorem (arxiv:1804.07564), Mathematical Physics, Analysis and Geometry (2018).

Teaching

Feb 2023 –	**Tutorials and lectures**, *CY Cergy Paris university*

Oct 2022 – Jan 2023	**Tutorials of exercices**, *Stuttgart's university* Master's degree course "Numerical methods for eigenvalue problems"
Oct 2022 – Jan 2023	**Students seminar**, *Stuttgart's university* Supervision of two coding and theoretical projects for bachelor's degree students
Feb 2022 – Jun 2022	**Personal projects**, *École des ponts* Presentation and management of a numerical project, coded by the students (first year, equivalent to L3)
Sep 2017 – Jun 2020	**Tutorials of exercices**, *university Paris-Dauphine* Sessions of exercices in analysis (L2), linear algebra (L1) and optimization (M1)
Sep 2017 – Jun 2020	**Physics for all**, *École normale supérieure* Three lectures for the class "Physics for all", addressed to students of the ENS in humanities. Notes at akrajenbrink.weebly.com/teaching.html
2016 – 2017	**Oral interrogations**, *college Stanislas*, in mathematics, to train students for competitive examinations for entrance in grandes écoles

Contributed talks

Apr 15, 2023	**Seminar of the physics laboratory**, *Cergy, France*
Feb 1, 2023	**Quantum Dynamics GDR, 15$^{\text{th}}$ meeting**, *Rennes, France*
Jan 24, 2023	**Seminar PDE and mathematical physics**, *Bordeaux, France*
Dec 13, 2022	**Mathematical physics seminar**, *Stuttgart, Germany*
Dec 8, 2022	**PDE seminar**, *Besançon, France*
Sep 26, 2022	**Conference Aspect'22, Asymptotic Analysis & Spectral Theory**, *Oldenburg, Germany*
Aug 17, 2022	**92$^{\text{nd}}$ annual meeting of the International association of applied mathematics and mechanics**, *Aachen, Germany*
Jun 21, 2022	**Workshop at the Center for Advanced Study**, *Norwegian academy of sciences, Oslo, Norway*
Apr 11, 2022	**Seminar of mathematical physics**, *Fourier institute, Grenoble, France*
Mar 21, 2022	**Seminar of mathematical physics**, *Mathematics institute of Bourgogne, Dijon*
Mar 7, 2022	**Seminar of spectral theory**, *Institut Henri Poincaré, Paris*
Jan 12, 2022	**Quantum N-body problem GDR, 3$^{\text{rd}}$ meeting**, *online*
Sep 17, 2021	**Seminar on mathematical modelling, analysis and simulation of molecular systems (MOANSI)**, *Gamm group, led by Benjamin Stamm, Gero Friesecke and Reinhold Schneider*
Aug 6, 2021	**International congress on mathematical physics**, *Geneva, Switzerland*
Jun 14, 2021	**Seminar on multiscale problems in mathematical physics**, *Angers, France*
Mar 31, 2021	**Seminar of mathematical physics of the Centre for theoretical physics**, *Toulon, France*
Mar 3, 2021	**Seminar of the laboratory of mathematics of the university of Bourgogne**, *Dijon, France*
Sep 15, 2020	**Conference Algorithms in Quantum Molecular Dynamics**, *CIRM, Marseille, France*
Sep 15, 2020	**Seminar of the laboratory**, *Marseille, France*
Nov 21, 2019	**Seminar on Lie theory, geometry and analysis**, *université de Lorraine, Metz, France*
Oct 24, 2019	**The analysis of complex quantum systems**, *CIRM Marseille, France*
Sep 22, 2019	**Density functionals for many-particle systems**, *university of Singapore*

Apr 18, 2019	**PDE seminar of the laboratory of mathematics of Versailles**, *France*
Jan 28, 2019	**Optimal transport methods in Density functional theory**, *Banff research station, Canada*
Jul 20, 2018	**Young researchers symposium of ICMP**, *Montréal, Canada*, satellite event of the International congress of mathematical physics
Jul 9, 2018	**Conference on DFT with magnetic potentials**, *Oslo, Norway*

Participation to conferences

Jul 3-7, 2023	**26th general congress of the Société Française de Physique, subseminar on quantum technologies**, *Paris, France*
Jun 26-28, 2023	**Frontiers in mathematical physics**, *CY Cergy Paris Université, France*
Jun 12-14, 2023	**"Precision many-body physics" workshop**, *Collège de France, Paris, France*
Feb 1-3, 2023	**Quantum Dynamics GDR, 15th meeting**, *Rennes, France*
Jan 9-13, 2023	**The analysis of relativistic quantum system**, *Cirm, Marseille*
Sep 26-30, 2022	**Conference Aspect'22, Asymptotic Analysis & Spectral Theory**, *Oldenburg, Germany*
Sep 21,23, 2022	**Workshop of the Collaborative research center (CRC) on "sparsity and singular structures"**, *Aachen, Germany*
Aug 15-19, 2022	**92nd annual meeting of the International association of applied mathematics and mechanics**, *Aachen, Germany*
Jun 20-24, 2022	**Workshop at the Center for Advanced Study**, *Oslo, Norway*
Mar 28 - Apr 1, 2022	**Advancing quantum mechanics with mathematics and statistics, workshop 1: multiscale approaches in quantum mechanics**, *IPAM UCLA, Los Angeles*
Feb 23-25, 2022	**Quantum Dynamics GDR, 14th meeting**, *Toulouse, France*
Jan 10-13, 2022	**Quantum N-body problem GDR, 3rd meeting**, *online*
Sep 16-17, 2021	**Moansi annual meeting**, *Gamm group, led by Benjamin Stamm, Gero Friesecke and Reinhold Schneider*
Aug 25-27, 2021	**Solid Math 2021**, *École des ponts, France*
Oct 27-29, 2021	**Congress of young researchers in applied mathematics**, *École polytechnique, France*
Aug 2-7, 2021	**International congress on mathematical physics and Young researchers symposium**, *Geneva, Switzerland*
Jun 14-16, 2021	**Seminar on multiscale problems in mathematical physics**, *Angers, France*
May 17-28, 2021	**SIAM conference on mathemtical aspects of material science**, *Bilbao, Spain*, online
Mar 10-12, 2021	**Quantum Dynamics GDR, 13th meeting**, *Dijon, France*, online
Feb 8-12, 2021	**Quantum N-body problem GDR, 2nd meeting**, *online*
Sep 14-18, 2020	**Algorithms in Quantum Molecular Dynamics**, *Cirm, Marseille, France*
Sep 2-4, 2020	**New horizons in density functional theory**, *online*, Faraday discussions workshop
Feb 5-7, 2020	**Quantum Dynamics GDR, 12th meeting**, *Strasbourg, France*
Jan 8-10, 2020	**Quantum N-body problem GDR, 1st meeting**, *Lille, France*
Oct 21-25, 2019	**The analysis of complex quantum systems : large Coulomb systems and related matters**, *CIRM Marseille, France*

Sep 23-27, 2019	**Density functionals for many-particle systems : mathematical theory and physical applications of effective equations**, *institute for mathematical sciences, university of Singapore*
May 27-31, 2019	**Souriau 2019**, *University Paris-Diderot, France*, Conference in honour of Jean-Marie Souriau
Feb 13-15, 2019	**Quantum Dynamics GDR, 11$^{\text{th}}$ meeting**, *Bordeaux, France*
Jan 28- Feb 1$^{\text{st}}$, 2019	**Optimal transport methods in Density functional theory**, *Banff research station, Canada*
Jul 20-28, 2018	**International congress on mathematical physics and Young researchers symposium**, *Montréal, Canada*
Jul 9-13 2018	**Seminar on DFT with magnetic potentials**, *Oslo, Norway* Entitled "Do electron current densities determine all there is to know ?"
Feb 19-24, 2018	**Mathematical Challenges in Quantum Mechanics**, *Sapienza university, Roma, Italy*, workshop and winter school
May 31$^{\text{th}}$-Jun 7$^{\text{th}}$, 2017	**Density functional theory meets Optimal transport**, *Jyväskylä, Finland*, workshop

Research interships

Jan – Feb 2016	**Vaccums of a supersymmetric theory**, *laboratory of theoretical physics of the ENS, Paris*, supervised by Jan Troost Seiberg-Witten theory and solving the structure of inequivalent vaccums of the supersymmetric $\mathcal{N} = 1^*$, $SU(4)$ theory.
Feb – Jul 2015	**Cosmology**, *Berkeley's laboratory of cosmology*, USA, supervised by Robert Cahn Development and implementation of the algorithm of the assigment of fibers of the telescope to sky objects for the DESI project.
Jun 2013	**Quantum electrodynamics in cavity**, *laboratory Kastler-Brossel ENS, Paris*, supervised by Igor Dotsenko Sampling quantum measurements after time reversal of a Rydberg atom/photon system.

Miscellaneous

2009	**French mathematical olympiad**, *second prize of the region Auvergne*
Reviewer for journals	**Communications in Mathematical Physics, Journal of Mathematical Physics**
Coding	Julia, Python, C++, Javascript