



Filippo Vicentini

Contacts

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Filippo Vicentini 🌐

PhilipVinc 🐙

Address

19 Boulevard
Poniatowski,
75012, Paris
France

Birth

Born in Padova, Italy
1st August 1992

Skills

Machine Learning
Quantum Computing
Quantum Machine L.
VQE
Scientific Progr.
Differentiable Progr.
Neural Networks
Natural Gradient
Python
Jax
Julia
LLVM
C++
Matlab
Parallel-Computing
(S)DE solvers

Filippo Vicentini, Prof.

Computational Quantum Physicist

In short: I am a professor in Physics, holding the chair of Quantum Physics and Artificial Intelligence of Ecole Polytechnique in Paris. I am among the most influential figures in the field of Machine-Learning for Quantum Physics, and my major contributions involve the development of a machine-learning-inspired algorithm, Neural-Network Quantum States, to solve quantum mechanical problems. My career goal is to effectively solve hard problems in quantum chemistry and material science with flexible algorithms. I am a strong proponent of scientific computing and actively push for change in the scientific ecosystem to better support open-, high-quality scientific software. I also leverage my knowledge to work on Quantum Computing algorithms and hybrid quantum-classical techniques. Within that realm, I have consulted for quantum computing companies.

Current Positions

June 2026 - present: *Discovery Scientist, Stream Lead, Mistral AI*

Leading a research stream on AI methods for cross-scale quantum chemistry, alongside my position at Ecole Polytechnique.

April 2023 - present: *Assistant Professor, Ecole Polytechnique, France*

Chair of Quantum Physics and Artificial Intelligence.

Past Positions

May 2022 - December 2023: *Scientific Consultant, Xanadu (Toronto)*

Provided expert guidance to the PennyLane R&D team on scientific applications of Differentiable Quantum Computing and their algorithmic improvements.

Sept 2020 - March 2023: *Postdoctoral Researcher, Swiss Federal Institute of Technology (EPFL), Lausanne, Switzerland*

Research on neural-network quantum states and variational quantum algorithms, lead developer of the open-source NetKet library, and advisor to several doctoral students.

May-Sep 2020: *Visiting Research Scholar, Flatiron Institute, New York*

Development of Neural Network simulation methods for open quantum systems and DFT methods for dissipative light-matter systems.

Jan-Mar 2020: *Postdoctoral Researcher, Université de Paris, France*

Education

2016 - 2019: *Ph.D. in Physics, Université de Paris, France*

- Laboratoire Matériaux et Phénomènes Quantiques
- **Thesis:** Stochastic and Neural Network methods for many-body open quantum systems (defended December 11, 2019)

Advisor: Prof. Cristiano CIUTI

2014 - 2016: *M.Sc. in Physics, Università di Padova, Italy*

- **2015-2016: *Exchange Student, Ecole Normale de Paris, France***



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- **Thesis:** Single Spin Manipulation in a cQED architecture (110/110 cum Laude)

Advisor: Prof. Takis KONTOS (LPA-ENS, Paris)

April 2013: Masterclass in Plasma Physics, TU/Eindhoven, NL

2011 - 2014: B.Sc. in Physics, Università di Padova, Italy

- **Thesis:** Variational study of a 1D supersolid model (104/110)

Prizes

ATOS Joseph Fourier Award 2019

- **Special Jury Prize for Artificial Intelligence** - awarded for my research bridging machine learning and quantum physics. For more info see ([press release](#)) and ([link to University communication](#)).

Grants

ANR AI4CorrelatedMaterials (700k EUR, 2026)

- French National Research grant awarded in April 2026 for the project "AI4CorrelatedMaterials", as Principal Investigator.

Hi!Paris Grant (130k EUR)

- Manager of a Hi!Paris grant hosting a postdoctoral researcher working on AI for Science.

ANR JCJC (240k EUR, 2023)

- French National Research grant on the project "Neural Dynamics of Quantum Matter", 3.5 years duration.

Organised Conferences

Workshop: Recent Advances in Neural Fermionic Wavefunctions

- **Collège de France, Paris, December 2025** Organiser of the workshop, together with Antoine Georges.

MPI-PKS Workshop: Machine Learning for Quantum Matter

- **Max Planck Institute for the Physics of Complex Systems, Dresden, 24-28 February 2025** Scientific coordinator of the [international workshop](#), organised with [Juan Carrasquilla](#) and [Markus Schmitt](#).

Bernoulli Workshop: Variational Learning Quantum Matter II

- **Lausanne, 8-12 May 2023** Second edition of the workshop. Curiously being organised with [Annabelle Bohrdt](#) and [Ryan LaRose](#).

APS March Meeting 2023: Focus Session "Machine Learning for Quantum Matter"

- **Las Vegas, 5-10 March 2023** organiser of the focus session together with [Evert van Nieuwenburg](#). More than 63 planned talks.

Bernoulli Workshop: Variational Learning Quantum Matter

- **Lausanne, 4-8 July 2022** First edition of the workshop listed above with 50 participants. Secured $\approx 75k$ CHF funding from 2 different entities. Conference website: <https://vlqm.org> Organised with [Jannes Nys](#).

EPFL AI4Science Day

- **Swisstech Convention center, 18 June 2022** The goal of the AI-4Science day was to gather faculty, researchers and students who work or are



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interested in applications of machine learning to science. [Conference Website](#)

Articles

- 29 R. P. Nutakki, [F. Vicentini](#), Ground-state phases of Heisenberg models on the body-centered cubic lattice, [arXiv:2602.10008](#)
- 28 L. Sharma, A. Shokry, R. P. Nutakki, O. Simard, M. Ferrero, [F. Vicentini](#), Comparing symmetrized determinant neural quantum states for the Hubbard model, [Phys. Rev. B](#) **113**, 245104 (2026)
- 27 A. Kahn, L. Gravina, [F. Vicentini](#), Variational subspace methods and application to improving variational Monte Carlo dynamics, [Quantum](#) **10**, 2082 (2026)
- 26 A. Sinibaldi, D. Hendry, [F. Vicentini](#), G. Carleo, Time-dependent neural Galerkin method for quantum dynamics, [Phys. Rev. Lett.](#) **136**, 120402 (2026)
- 25 A. Misery, L. Gravina, A. Santini, [F. Vicentini](#), Looking elsewhere: improving variational Monte Carlo gradients by importance sampling, [Mach. Learn.: Sci. Technol.](#) **7**, 015035 (2026)
- 24 A. Santini, S. Barison, [F. Vicentini](#), Classically Prepared, Quantumly Evolved: Hybrid Algorithm for Molecular Spectra, [arXiv:2510.24911](#)
- 23 A. Shokry, A. Santini, [F. Vicentini](#), When Less is More: Approximating the Quantum Geometric Tensor with Block Structures, [arXiv:2510.08430](#)
- 22 L. Gravina, V. Savona, [F. Vicentini](#), Neural Projected Quantum Dynamics: a systematic study, [Quantum](#) **9**, 1803 (2025)
- 21 G. Acampora, [...], [F. Vicentini](#) et Al., Quantum computing and artificial intelligence: status and perspectives (whitepaper), [arXiv:2505.23860](#)
- 20 R. P. Nutakki, A. Shokry, [F. Vicentini](#), Design principles of deep translationally-symmetric neural quantum states for frustrated magnets, [Phys. Rev. Research](#) (2025)
- 19 S. Dash, L. Gravina, [F. Vicentini](#), M. Ferrero, A. Georges, Efficiency of neural quantum states in light of the quantum geometric tensor, [Communications Physics](#) **8**, 92 (2025)
- 18 S. Barison, [F. Vicentini](#), G. Carleo, Variational Embeddings for Many Body Quantum Systems, [arXiv:2309.08666](#)
- 17 D. Eeltink, [F. Vicentini](#), V. Savona, Variational dynamics of open quantum systems in phase space, [arXiv:2307.07429](#)
- 16 H. Zhao, G. Carleo, [F. Vicentini](#), Empirical Sample Complexity of Neural Network Mixed State Reconstruction, [Quantum](#) **8**, 1358 (2024)
- 15 C. Giuliani, [F. Vicentini](#), R. Rossi, G. Carleo, Learning ground states of gapped quantum Hamiltonians with Kernel Methods, [Quantum](#) **7**, 1096 (2023)
- 14 A. Sinibaldi, C. Giuliani, [...], [F. Vicentini](#), [...], Unbiasing time-dependent Variational Monte Carlo by projected quantum evolution, [Quantum](#) **7**, 1131 (2023)
- 13 D. Wu, R. Rossi, [F. Vicentini](#), [...], Variational Benchmarks for Quantum Many-Body Problems, [Science](#) **386**, 296-301 (2024)
- 12 [F. Vicentini](#), R. Rossi and G. Carleo, Positive-definite parametrization of mixed quantum states with deep neural networks, [arXiv:2206.13488](#)
- 11 D. Wu, R. Rossi, [F. Vicentini](#), and G. Carleo, From Tensor Network Quantum States to Tensorial Recurrent Neural Networks, [Physical Review Research](#) **5** (3), L032001
- 10 Anna Dawid, [...], [F. Vicentini](#) et Al., Modern applications of machine



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learning in quantum sciences, published as the book "[Machine Learning in Quantum Sciences](#)", [Cambridge University Press](#) (2025)

- 9 S. Barison, [F. Vicentini](#), I. Cirac and G. Carleo, Variational dynamics as a ground-state problem on a quantum computer, [Phys. Rev. Research](#) **4**, 043161 (2022)
- 8 [F. Vicentini](#), D. Hoffman et Al. NetKet 3: Machine Learning Toolbox for Many-Body Quantum Systems, [Scipost Physics Codebases](#) **7**, (2022),
- 7 D. Hafner and [F. Vicentini](#), mpi4jax: Zero-copy MPI communication of JAX arrays, [Journal of Open Source Software](#) **6**, 3419 (2021)
- 6 S. Barison [F. Vicentini](#) and G. Carleo, An efficient quantum algorithm for the time evolution of parameterized circuits, [Quantum](#) **5**, 512 (2021)
- 5 G. Carleo, [...] [F. Vicentini](#) et Al., NetKet: A Machine Learning Toolkit for Many-Body Quantum Systems, [SoftwareX](#) **100311** (2019)
- 4 V. Goblot, B. Rauer, [F. Vicentini](#), A. Le Boité, E. Galopin, A. Lemaitre, L. Le Gratiet, A. Harouri, I. Sagnes, S. Ravets, C. Ciuti, A. Amo, J. Bloch, Discrete nonlinear domains for polariton fluids in a flat band, [Phys. Rev. Lett](#) **123** (11) 113901 (2019)
- 3 [F. Vicentini](#), A. Biella, N. Regnault and C. Ciuti, Variational neural network ansatz for steady states in open quantum systems, [Phys. Rev. Lett.](#) **122** (25) 250503 (2019)
- 2 [F. Vicentini](#), F. Minganti, A. Biella, G. Orso and C. Ciuti, Optimal stochastic unraveling of disordered open quantum systems: Application to driven-dissipative photonics lattices, [Phys. Rev. A](#) **99** (1) 032115 (2019)
- 1 [F. Vicentini](#), F. Minganti, R. Rota, G. Orso and C. Ciuti, Critical slowing down in driven-dissipative Bose-Hubbard lattices, [Phys. Rev. A](#) **97** (1) 013853 (2018)

Scientific Software

- 2 [NetKet collaboration](#): The machine learning toolbox for quantum many-body physics. Lead developer and maintainer for the collaboration which counts about 5 co-maintainers and several tens of users. 420 Github stars as of february 2023.
- 1 [MPI4jax](#): automatic differentiation for distributed computing. Co-maintainer and creator with Dion Haefner. 250 GitHub stars as of february 2023.

Talks and Schools

44. July 2026: Invited talk at the "**TENORS**" yearly meeting, Trento, Italy
43. June 2026: Invited talk at the "**Neural-Tensor**" workshop, Grenoble, France
42. June 2026: Invited lecturer at the summer school "**ISTPC 2026**" (electronic structure Theory and Physical Chemistry), Aussois, France
41. June 2026: Invited lecturer at the school on Open Quantum Systems, CY Advanced Studies (Cergy IAS), Cergy, France
40. May 2026: Invited talk at the workshop "**AUTOMATE 2026**", Cergy-Pontoise, France
39. March 2026: Invited seminar at SISSA, Trieste, Italy
38. November 2025: Invited talk at the "**GDR MEETIC 2025**" meeting, Banyuls-sur-Mer, France
37. September 2025: Invited talk at the **SIF National Congress 2025**, Palermo, Italy
36. June 2025: Invited talk at the "**ICQE 2025**" conference, Padova, Italy
35. May 2025: Invited talk at the workshop "**Correlations in complex sy-**



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- stems: from squeezing to non-Gaussian statistics**", Institut d'Optique, Palaiseau, France
34. April 2025: Invited talk at the workshop **"MEOQS 2025: Methods for Open Quantum Systems"**, Trento, Italy
 33. November 2024: Invited talk at the **"MATOQS"** workshop, Padova, Italy
 32. November 2024: Invited talk at the **NQS/TDVP Symposium**, Regensburg, Germany
 31. October 2024: Invited talk at the **IBM/CNRS Quantum Day**, France
 30. September 2024: Invited talk at the **"QuaSiT"** workshop, Modica, Italy
 29. July 2024: Organiser and Lecturer at the **"Sacl-AI 4 Science"** summer school, Paris-Saclay, France
 28. June 2024: Invited lecturer at the **8th Les Houches School in Computational Physics: "Variational Approaches for quantum matter in and out of equilibrium"**, Les Houches, France
 27. April 2024: Invited lecturer at the **Joint ICTP-WE Heraeus School "Frontiers at the Intersection of Quantum Simulation and Machine Learning"**, ICTP Trieste, Italy
 26. April 2024: Invited seminar at SISSA, Trieste, Italy
 25. March 2024: Invited talk at the **"Machine Learning and Quantum Physics" workshop**, Obergurgl, Austria
 24. January 2024: Invited seminar at the Institut d'Optique (IOGS), Palaiseau, France
 23. December 2023: Online seminar @ **IQM Quantum Computing**
 22. November 2023: Invited speaker at the workshop **"Machine Learning techniques in Quantum Physics"** Kyoto, Japan
 21. September 2023: Invited speaker at the workshop **"Many Body quantum physics with Machine Learning"** Trento, Italy
 20. July 2023: Lecturer at the Doctoral training program **"Ab Initio Methods and emerging technologies for Nuclear Structure"** Trento, Italy
 19. May 2023: Invited talk at the **"Quantum Science Generation"** Workshop, Trento, Italy
 18. April 2023: Invited lecturer at the spring school **"ML Approaches in Computational Material Science"**, Roscoff, France
 17. January 2023: Invited lecturer at the doctoral school **"The Mathematics of Deep Learning"**, Scuola Normale di Pisa, Italy
 16. January 2023: Invited Speaker at workshop **"Numerical Methods for many-body quantum systems"**, Dundee, Scotland
 15. September 2022: Contributed talk at conference **"Machine Learning in Natural Sciences"**, Hamburg, Germany
 14. July 2022: **Invited lecturer** at the Perimeter Institute, Waterloo (Canada)
 13. July 2022, Invited academic lecturer at Xanadu Quantum Computing, Toronto (Canada)
 12. April 2022: Invited lecturer at doctoral school **"Toulouse Summer School on Machine Learning for Quantum-Many Body Physics"**, Toulouse, France
 11. March 2022: Contributed talk **"Neural Network Ansatz for Finite Temperature"** at APS March Meeting, Chicago, USA
 10. November 2021-February 2021: Contract Lecturer at doctoral course **"Introduction to Deep Learning"**, Como, Italy
 9. September 2021: Invited Lecturer at Doctoral school **"Machine-Learning for Quantum Physics"**, Warsaw, Poland
 8. January 2021: Lecturer at **"Machine Learning for Condensed Matter"** conference, ICTP Trieste, Italy



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7. June 2020: Invited talk at **Machine Learning for Quantum Simulation** virtual conference hosted by Flatiron Institute, New York
6. July 2019: Contributed talk at **Congres General de la Societé Francaise de Physique**, Nantes, France
5. June 2019: *Machine Learning for Physical application*, talk at UFR Physique, Paris 7 University
4. May 2019: Contributed talk at **ML for Quantum Technologies** conference, Max Planck for Quantum Optics, Erlangen
3. March 2019: Invited seminar at **ENS Lyon**, Lyon, France
2. March 2019: Contributed talk at **Artificial Intelligence and Physics Conference** conference, Paris, France
1. January 2018: Invited talk at **Numerical Methods for Quantum Optics** workshop, Max Planck for Quantum Physics, Munich

Supervised Students

- 17-. (October 2024 - ongoing) Supervision of PhD student Antoine Misery (Ecole Polytechnique).
- 16-. (November 2023 - ongoing) Supervision of PhD student Ahmedeo Shokry (Ecole Polytechnique).
- 15-. (October 2023 - ongoing) Supervision of PhD student Adrien Kahn (Ecole Polytechnique).
- 14-. (September 2023 - ongoing) co-Supervision of PhD student Alessandro Sinibaldi (EPFL).
- 13-. (September-* 2023) **Supervision** of four 2nd year X student for their PSC.
- 12 (April-August 2023) co-**Supervision** of visiting PhD student "Pavlo Pelikh" from University of Ottawa.
- 10-11. (April-July 2023) **Supervision** of 2 ICFP **M2 Master students** for their internship projects (Edison Carrera and Naila Betatache).
- 8-9. (January-June 2022) Co-Supervision of 2 **M2 Master students** for their internship projects (Alessandro Sinibaldi and Wuan Phi).
- 6-7. (January-June 2022) Co-Supervision of 2 **M1 Master students** for their internship projects (Alessandro Sinibaldi and Pauline de Schoulepnikoff)
5. (February-July 2021) Co-Supervised 1 **M2 Master** student (Louis Pezon) from another group for his 6+ months internship project.
4. (2021-ongoing) Co-Supervised 1 **M2 Master** student (Clemens Giuliani) for his 6 months internship project. He is **now a Ph.D. Student** whom I co-supervise on his project about ML methods for Quantum Dynamics.
3. (2021-ongoing) Co-Supervision of Ph.D. Student **Stefano Barison** working on Hybrid Quantum Algorithms
- 1-2. (March-June 2020) tutored two M2 internship students at the **C12 Star-tup (LPA-ENS)** on Machine Learning techniques and device modelling for Quantum Optical Control.

Professional Skills

Programming

- I mainly code in **Python** (Jax) or **Julia**. I'm familiar with the tech stach down to LLVM and MLIR. I'm also familiar with **Matlab**.
- I used to code in **C++14** and parallelize code with threads and MPI. Nowadays I'd rather work in **Julia** unless necessary.
- I am lead developer of the **NetKet** collaboration, an open-source project in Python with 12 active contributors, and organize the work of the whole



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(S)DE solvers

collaboration. I wrote some high-profile code for Jax.

[M]ath, [P]hysics and [N]eural-Networks

- P** I worked daily on **Open Quantum System**, and extensively studied their mapping to **Stochastic Markov Equations**. I studied Out-Of-Equilibrium Phase Transitions. I am familiar with **Quantum MonteCarlo** Methods and with **MPS/MPO** solvers.
- P** I have developed variational quantum algorithms (p-VQD) to compress the time-evolution of a quantum system, inspired by higher-order techniques such as Natural Gradient.
- M** I have a very good knowledge on numerically solving Stochastic Differential Equations (**SDE**).
- N** I have worked extensively with Machine Learning frameworks and Neural Networks in uncommon use-cases, mainly higher-order optimisation methods and generative models.

Languages

- **Italian:** Mothertongue
- **English:** (C1 in 2011) Fluent, used daily in work and life
- **French:** (B2) Fluent, used daily in work and life

References

Prof. **Giuseppe Carleo**, EPFL (Lausanne) *Collaborator, Postdoc Advisor*
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