Louis Follet

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Summary

PhD student at MIT specializing in **AI for Science**, **quantum optics**, and **photonics**. I am developing a strong interest in leveraging machine learning (ML) to tackle complex physics and engineering challenges. With expertise in designing photonic devices and building ML-driven models for semiconductor fabrication, I aim to apply **interdisciplinary approaches** to advance scientific discovery and technology innovation.

Research Experience

Massachusetts Institute of Technology - Quantum Photonics & AI Group Sep. 2023 – Present
Graduate Research Assistant - EECS | Advisor : Prof. D. Englund *Cambridge, MA, USA*

- Developing novel **physics-informed ML frameworks** (PINNs, Neural Operators, Bayesian Inference) to create surrogate models and solve the **Inverse Problem** of modeling fabrication variations in foundry processes.
- **Designing and optimizing photonic crystal cavities** for quantum and information processing through advanced modeling techniques (Guided-Mode Expansion, FDTD) and full-cycle fabrication workflows (GlobalFoundries, AIM Photonics).
- Building **automated characterization systems** that integrate complex optical metrology with ML-driven data analysis, enabling rapid and high-precision measurements of photonic devices and quantum systems.

Collège de France - Laboratoire Kastler Brossel Mar. 2023 – Jul. 2023
Research Intern - Ultracold Atoms | Advisor : Prof. S. Nascimbene *Paris, FR*

- Conducted **theoretical modeling** and **simulations** to **optimize atom transport in a Dysprosium dipole trap**.
- **Designed and built a high-power laser setup** with acousto-optic modulation, integrating beam imaging techniques for precise control of transport processes.

University of Cambridge - Cavendish Laboratory Mar. 2022 – Aug. 2022
Research Intern - Quantum Optics | Advisor : Prof. M. Atatüre *Cambridge, UK*

- Contributed to **spectroscopy of spin-active defects in hexagonal Boron Nitride films**, leading to a publication in Nature Materials [2].
- **Developed Python-based control software** and conducted advanced ODMR experiments to characterize spin properties using a confocal microscope setup.
- Microwave delivery structure design on COMSOL Multiphysics and quantum systems simulations using Qutip.

NTT Research - Physics and Informatics laboratory May 2021 – Aug. 2021
Research Intern - Nonlinear Optics | Advisor : Dr. MG. Suh *Sunnyvale, CA, USA (remote)*

- Worked on the project **Ultrafast Optics Technology applied to a high speed Coherent Ising Machine**.
- Conducted a literature review over integrated photonics applied to AI hardware.
- **Developed a Matlab solver** for numerical simulation of nonlinear optical phenomena in microresonators, especially the nonlinear Schrödinger equation and soliton generation.

Education

Massachusetts Institute of Technology | EECS department 2023 – Present
PhD Student

- Research in the **Quantum Photonics & AI Group**, supervised by Professor Dirk Englund.
- Courses: Deep Learning, Applied Quantum and Statistical Physics, Numerical simulations, Silicon Photonics. (GPA: 5.0/5.0)

École Normale Supérieure (ENS) Paris-Saclay | Physics department 2019 – 2023
Diplôme de Normalien - Bachelor and Master of Science in Physics

- The **ENS** is the most prestigious French academic institution for the training of future researchers. Double diploma with the Institut d'Optique Graduate School.
- Included a **specialization year in Quantum Technologies** (ARTeQ), providing interdisciplinary training in computer science, fundamental physics, and applied physics.
- **Weekly labwork**, including: Quantum optics, Microscopy, Optical tweezers, Cleanroom fabrication techniques.
- Relevant courses: Quantum Information, Neuromorphic Engineering and Machine Learning, Quantum Optics (by Prof. A. Aspect), Second Quantization, Solid-State Devices.

Institut d'Optique Graduate School – Paris-Saclay University 2019 – 2023

Diplôme d'ingénieur - Bachelor and Master of Science in Engineering

- Being one of the top French "Grandes Écoles", the IOGS delivers a training in applied physics, especially in **Photonics** and **Optics**. Double diploma with the ENS Paris-Saclay. (GPA: 4,44/4,5)
- **Weekly Photonics and Electronics labwork**.
- Relevant courses: Light-Matter Interaction (by Prof. A. Aspect), Nonlinear Optics, Atomic Physics, Statistical Physics.

Lycée Chateaubriand 2017 – 2019

French Preparatory Classes

- Intensive two-year college-level program in mathematics, physics and chemistry, to prepare a nation-wide competitive examination, for admission to the top engineering institutions (Grandes Écoles) in France.

Publications

[1] P. Anand*, **L. Follet***, O. Hooybergs*, D. R. Englund, "*Programmable Quantum Matter: Heralding Large Cluster States in Driven Inhomogeneous Spin Ensembles*", **arXiv preprint** arXiv:2509.02992 (2025).

[2] H. Stern, C. Gilardoni, Q. Gu, S. Eizagirre Barker, O. Powell, X. Deng, **L. Follet**, C. Li, A. Ramsay, H. Tan, I. Aharonovich, M. Atatüre, "*A quantum coherent spin in hexagonal boron nitride at ambient conditions*", **Nature Materials** (2024).

* *Equal contribution.*

Conferences

[1] **L. Follet**, *"Thermal Infrared Detection with an Optically-Probed Photonic Crystal Bolometer"*, CLEO: Conference on Lasers and Electro-Optics (CLEO), 2025.

[2] **L. Follet**, I. Berkman, Q. Gu, C. Panuski, I. Christen, D. Englund, *"Pathway towards large-scale characterization of Er^{3+}-doped state-of-the-art Si nanophotonic cavities"*, QSEC Annual Research Conference (QuARC), 2024.

[3] O. Powell, H. Stern, C. Gilardoni, Q. Gu, S. Eizagirre Barker, X. Deng, **L. Follet**, C. Li, A. Ramsay, H. Tan, I. Aharonovich, M. Atatüre, *"Spin and optical properties of two-dimensional single color centers in hexagonal boron nitride"*, Bulletin of the American Physical Society, 2024.

Awards - Scholarships

IDEX Excellence Scholarship 2022

- Delivered by the Paris-Saclay University for international mobility, upon excellent academic results.

Quantum Paris-Saclay Scholarship 2021-2022

- Delivered to top students majoring in Physics with an emphasis on Quantum Technologies, within the framework of the French Quantum Plan.

Skills

- **Languages**: English (Proficient, **IELTS 8/9**), French (Native), Spanish (Intermediate).
- **Programming**: Python (data analysis, hardware control, QuTiP, PyTorch, GDSFactory), MATLAB (simulation, data visualization, numerical modeling).
- **Tools - Software**: Ansys Lumerical, FlexCompute Tidy3D, COMSOL Multiphysics, Tesselmax.EM, SolidWorks, Zemax.
- **Machine Learning**: Familiar with Deep Learning architectures (CNNs, GNNs, Transformers), Generative Models (VAEs, Diffusion Models), Neural Operators, PDE solving, Physics-Informed Modeling, and Inverse Problems.
- **Experimental Techniques**: Automated characterization setups, optical metrology, balanced homodyne detection, free-space and integrated photonics.
- **Soft Skills**: Proactive problem-solving, communication, interdisciplinary collaboration, and leadership in technical projects.

Extra-Curricular activities

Graduate Application Assistance Program (GAAP) 2023 – Present

- Mentoring underrepresented students in their PhD application process, offering guidance on research statements and academic positioning.

MIT's annual quantum hackathon (iQuHACK) 2024

- Member of the volunteers team, helping students among the 1300 participants overcoming technical challenges posed by industry partners.