Adrien SUAU

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Doctor & entrepreneur in quantum computing

PhD in quantum computing, currently building my own software company in quantum computing.

☰ COMPETENCES

Knowledge	Quantum computing & algorithms, Computer science, Applied mathematics
Programming	🐍 Python, C++, ☕ Java, C, 🐚 Bash
Libraries	🌐 Qiskit, 🔵 myQLM, ▼ Pennylane, 🔷 numpy, 🟠 scipy, ✳ matplotlib, 🔵 boost
Development tools	△ Linux, Ⓔ Emacs, 🔶 git, 🅿 PyCharm, ⬡ GitHub, 🦊 Gitlab, LaTeX

🎓 FORMATION

October 2022 November 2019	**PhD in quantum computing, CERFACS, LIRMM & TotalEnergies, France** Research on quantum algorithms and hardware. Special emphasis on algorithms related to linear algebra and partial differential equations. Deep interest in understanding quantum chips through characterisation and benchmarking. Collaboration between CERFACS, LIRMM and TotalEnergies as well as IBM Montpellier. `🐍 Python` `🌐 Qiskit` `🔵 myQLM` `🔶 git`
February 2018 September 2017	**M.Sc. in Industrial and Applied Mathematics (MSIAM), Université Grenoble-Alpes (UGA), France** Courses entirely in English, several projects in team with foreign students. `🐍 Python` `C++` `🔶 git`
February 2018 September 2015	**ENSIMAG, INP Grenoble, France** 2nd year specialisation: Mathematical Modelling, Vision, Graphics and Simulation. 3rd year spent in the MSIAM master program. Acquired experience doing group projects, in communication and in development tools such as version control software. `🐍 Python` `C++` `🔶 git`
July 2015 September 2013	**La Prépa des INP, INP Toulouse, France** Two-year highly selective classes to prepare for the competitive entrance examinations to French "Grandes Ecoles" ❯ Highly theoretical lectures in mathematics, physics and chemistry with notions in biology `🐍 Python`
2013	**French Baccalaureate, Lycée Jospeh Saverne, France**

💼 WORK EXPERIENCE

October 2019 October 2018	**Research engineer, CERFACS, France** Research on quantum algorithms applied to scientific computing problems: ❯ Implementation of Hamiltonian simulation algorithms. ❯ Implemented a partial differential equation solver using a quantum algorithm and solving the 1-dimensional wave equation with Dirichlet boundary conditions. ❯ Redaction of a comprehensive documentation comparing the different Hamiltonian Simulation algorithms. `🔵 myQLM` `🐍 Python` `LaTeX`
June 2018 February 2018	**Intern, CERFACS, France** ❯ State of the art on quantum algorithms. Particular emphasis on algorithms that are of interest for scientific computing, partial differential equations and computational fluid dynamics. ❯ Implementation of a simplified HHL algorithm. ❯ Implementation of several tools to help analysing the HHL implementation. `🌐 Qiskit` `🐍 Python`
October 2016 January 2018	**Bug Busters, ENSIMAG association, France** Technical advice to students needing help with their computer or the school IT environment: ❯ Assisted the school IT team. ❯ Helped students with technical difficulties. `CentOS` `Ubuntu` `ArchLinux`

💻 Recent projects

Asynchronous Quantum Computing 2022

nelimee/qhack2022 🔗 Blog post

Submission for the QHack Open Hackathon 2022. Implementation of an asynchronous backend abstraction that allows anyone to transparently submit circuits on multiple hardware asynchronously. Also implemented several asynchronous optimisation algorithms such as the Asynchronous Stochastic Gradient Descent (ASGD) or an asynchronous-compatible version of SPSA.

`Python` `Qiskit`

qprof, a quantum-ready gprof 2020–2022

QComputing/qprof 🔗 Blog post 📄 `https://doi.org/10.1145/3529398`

`qprof` is the first profiler for quantum programs able to analyse quantum circuits from a variety of different frameworks. Inspired by `gprof`, `qprof` mimics as much as possible its output format, allowing a seemless integration with the `gprof` "post-processing" tool ecosystem.
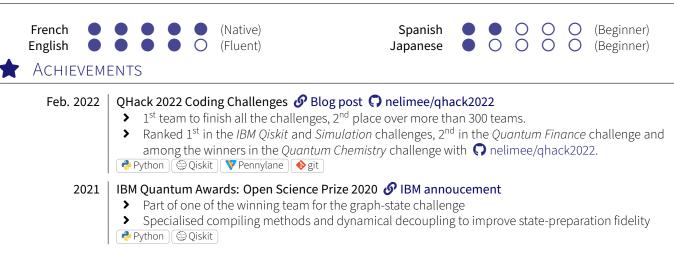
`Python` `myQLM` `Qiskit` `profiler`

Quantum implementation of a 1-dimensional wave equation solver 2019

CERFACS/QatHS 🔗 Blog post 📄 `https://doi.org/10.1145/3430030`

A 1-dimensional wave equation solver implementation. It uses a Hamiltonian simulation implementation also developed in the QatHS library to solve the 1-dimensional wave equation. It has been analysed and optimised using `qprof`.

`Python` `myQLM`

🔤 Languages

French ● ● ● ● ● (Native) Spanish ● ● ○ ○ ○ (Beginner)
English ● ● ● ● ○ (Fluent) Japanese ● ○ ○ ○ ○ (Beginner)

⭐ Achievements

Feb. 2022	QHack 2022 Coding Challenges 🔗 Blog post ⬤ nelimee/qhack2022
	❯ 1st team to finish all the challenges, 2nd place over more than 300 teams.
	❯ Ranked 1st in the *IBM Qiskit* and *Simulation* challenges, 2nd in the *Quantum Finance* challenge and among the winners in the *Quantum Chemistry* challenge with ⬤ nelimee/qhack2022.
	`Python` `Qiskit` `Pennylane` `git`
2021	IBM Quantum Awards: Open Science Prize 2020 🔗 IBM annoucement
	❯ Part of one of the winning team for the graph-state challenge
	❯ Specialised compiling methods and dynamical decoupling to improve state-preparation fidelity
	`Python` `Qiskit`

📑 Publications

❯ Adrien Suau, Gabriel Staffelbach, and Aida Todri-Sanial. "Qprof: A Gprof-Inspired Quantum Profiler". In: *ACM Transactions on Quantum Computing* 4.1 (Oct. 2022). ISSN: 2643-6809. DOI: `10.1145/3529398`. URL: `https://doi.org/10.1145/3529398`

❯ Adrien Suau, Jon Nelson, et al. *Single-Qubit Cross Platform Comparison of Quantum Computing Hardware*. 2021. arXiv: `2108.11334 [quant-ph]`

❯ Adrien Suau, Gabriel Staffelbach, and Henri Calandra. "Practical Quantum Computing: Solving the Wave Equation Using a Quantum Approach". In: *ACM Transactions on Quantum Computing* 2.1 (Feb. 2021). ISSN: 2643-6809. DOI: `10.1145/3430030`. arXiv: `2003.12458 [quant-ph]`. URL: `https://doi.org/10.1145/3430030`

❯ S. Niu, A. Suau, et al. "A Hardware-Aware Heuristic for the Qubit Mapping Problem in the NISQ Era". In: *IEEE Transactions on Quantum Engineering* 1 (2020), pp. 1–14. DOI: `10.1109/TQE.2020.3026544`

❯ Sanchayan Dutta, Adrien Suau, et al. *Quantum circuit design methodology for multiple linear regression*. Oct. 2020. DOI: `10.1049/iet-qtc.2020.0013`. arXiv: `1811.01726 [quant-ph]`. URL: `https://doi.org/10.1049/iet-qtc.2020.0013`

🎤 Talks

❯ *Quantum technologies and computing*, HiPEAC CSW Autumn 2021, Lyon, France. 🔗 HiPEAC CSW Autumn 2021
▶ youtube.com/watch?v=6NGqOE7OSL4

❯ *Advances in implementation of Hamiltonian Simulation algorithms — Application to the 1-dimensional wave equation*, École Polytechnique, Paris, France. 🔗 14th edition of the Teratec Forum 🔗 Blog post

❯ *Premiers développements Cerfacs sur QLM, un retour d'expérience*, TGCC, Bruyères-le-Châtel, France. 🔗 CCRT Days 2019
🔗 Blog post