Daniele Cucurachi

Computational Physicist · VC collaborator

daniele.cucurachi@scientificavp.it | danielecucurachi.github.io/personal-website | github.com/DanieleCucurachi | linkedin.com/in/daniele-cucurachi

Summary

Computational physicist with experience in scientific software development and research. Currently, I am finalizing and preparing a research project in collaboration with the Quantum Information Group (University of Cambridge) for submission to a peer-reviewed journal. On the side, I also collaborate with Scientifica VC, a venture capital firm specializing in deep tech start-ups.

Education

University of Cambridge — *Cambridge, UK*

Visiting Student in the Physics Department — *Sep 2022 - Mar 2023*

EPFL - École Polytechnique Fédérale de Lausanne — *Lausanne, Switzerland*

Master of Science in Applied Physics — *Sep 2020 - Jun 2023*

- Final GPA: **5.63/6.00** (**top 10%** in the class of 2023)
- Relevant coursework: Machine Learning for Physicists, Quantum Computing & Quantum Information

Politecnico di Torino — *Torino, Italy*

Bachelor's degree in Physics Engineering — *Sep 2017 - Jul 2020*

- Final Grade: **110/110 with honours**

Professional Experience

AdVenture Partner — *remote*

Scientifica Venture Capital — *Nov 2023 - Present*

- Responsible for identifying promising start-ups and innovative technological projects within universities and research departments, fostering potential investments by Scientifica Venture Capital.

Quantum Software Engineer — *Helsinki, Finland*

IQM Quantum Computers — *Feb 2022 - Aug 2022*

- Developed Python libraries for the design and simulation of superconducting quantum processors:
  - Submitted 25 merge/pull requests within my first six months for projects involving up to 15 contributors. A small part of my contributions (open source projects only) can be found at *https://github.com/iqm-finland/KQCircuits/commits?author=danielecucurachiiqm*.
  - Hands-on experience with large codebases, collaborative programming tools such as GitHub and GitLab with Git, and software engineering best practices such as unit testing and conducting code reviews.
  - Developed a novel feature to exponentially speed up the routing of quantum processors, currently utilized by the *IQM Design & Simulation Team*.
  - Collaborated closely with the *IQM Fabrication Team* to design photomasks' layouts and various superconducting circuit elements.
- Modelling electromagnetic coupling in quantum processing units (QPUs) through finite element methods (ANSYS HFSS).

Technical Skills

Programming Languages Python, C/C++ (basic), MATLAB (basic)

Python Packages PyTorch, Scikit-Learn, Numpy, Pandas, Scipy, Ray, Matplotlib, Qiskit, KQCircuits, Gdspy, QuTip

Software & Tools GitLab and GitHub with Git (version control) for collaborative software development, ANSYS High Frequency Simulation Software (HFSS), KLayout, Sonnet Software, LTspice (analog circuit simulations), LaTeX (technical writing)

Experience with Numerical Simulations, Algorithms, Data Analysis and Visualization | **OS:** Windows, Linux (Ubuntu)

Research Experience

Quantum-enhanced Monte Carlo Markov chain optimisation — *Cambridge, UK and remote*

Quantum Information Group (University of Cambridge) — *Sep 2022 - Present*

Supervisors: Prof. G. Carleo, Dr. H. V. Lepage, Prof. C. Barnes

Developed a subroutine for optimising parametrised proposal strategies in quantum-enhanced Monte Carlo Markov chains (MCMC). A Python simulator of the first version of the algorithm is available at *https://github.com/DanieleCucurachi/QMCMC.git* (based on the packages NumPy, SciPy, Pandas). I am currently Working on improving the simulator through GPU-accelerated computing (PyCUDA) to perform faster large matrix operations and distributed computing (Python module Ray) to reduce the simulation time (private code).

Apodization of coupled cavity array for waveguide QED (Quantum Electrodynamics) *Lausanne, Switzerland*

Hybrid Quantum Circuits Lab (EPFL) *Sep 2021 – Jan 2022*

Supervisor: Prof. P. Scarlino

Designed coupled resonator waveguides tailored for slow light applications in superconducting circuits. The project involved finite element method simulations (ANSYS HFSS and Sonnet) and the development of a Python library (based on the Python module gdspy) to optimize and speed up the design workflow. For more details, please visit my website at *https://danielecucurachi.github.io/personal-website/project/slowlight/*.

Localized crystallization of Germanium nanowires for hole spin qubits fabrication *Lausanne, Switzerland*

Laboratory of Semiconductor Materials (EPFL) *Sep 2020 – Jan 2021*

Supervisor: Prof. A. Fontcuberta i Morral

Conducted data analysis on Raman spectroscopy experiments (hands-on experience with optical setups) to characterize Ge nanowires, aiming to optimize the crystallization process and enhance the crystal quality. My work enabled the utilization of the nanowires to produce fully functioning hole spin qubits. For more details, please visit my website at *https://danielecucurachi.github.io/personal-website/project/ge_nanowires/*.

Associations

Vice President *Lausanne, Switzerland*

EPFL Quantum Computing Association *Feb 2021 - Sep 2022*

- As team leader for a group of five, organized three successful association events and managed advertising campaigns to promote them.
- Last organized event ”EPFL Quantum Hackathon” (*https://memento.epfl.ch/event/epfl-quantum-hackathon-2/*): approximately 100 international participants, the event was focused on quantum computation and its ties to chemistry simulations.
- Secured event funding from the company *Quantum Machines*.
- Guided and supported three junior members in the process of landing their first internship in the quantum computing industry.

Awards & Achievements

2023	**Scientifica VC ”Thesis” award:** awarded a grant of €3000 and access to the Scientifica Venture Capital mentorship program. I was selected as a winner for my master’s thesis on quantum-enhanced MCMC.	*UK/Italy*
2023	**Winner of the IMC ”Trading simulation”:** ranked first among around 40 participants at the ”Trading simulation” workshop organized by IMC Trading at the ”EPFL Forum” event (2023 edition).	*Switzerland*
2020	**Graduated ”with honours”** for outstanding academic performance (Politecnico di Torino).	*Italy*
2018-20	**”Riduzione per Merito”:** awarded merit-based tuition fee reduction for two consecutive academic years (2018/19 & 2019/20), granted to the top students at Politecnico di Torino maintaining a GPA above 27/30.	*Italy*

Volunteering

Pool Lifeguard *Novara, Italy*

Federazione Italiana Nuoto *2015*

- License “Piscina (P) Rif. PIE-432/2014-5”

Volunteer at a Children’s Summer Camp *Novara, Italy*

Parrocchia Madonna Pellegrina *Jun 2014 - Jun 2017*

- Organized activities, trips and excursions for a group of around 60 children
- Assisted the summer camp organizers with handling the finances

Languages

Italian	Native Proficiency
English	Full Professional Proficiency: **Level C1 - C2**
French	Elementary Proficiency: **Level A2 - B1**

Hobbies

Chess	Currently holding a rating of 2000 in rapid chess and 1700 in blitz chess on Lichess.org, I am always up for a game.
Cross country running	Achieved a personal best with an average pace of 4 minutes and 7 seconds per kilometer in a 10 km run.

References available upon request.