

Matteo A. C. Rossi

Curriculum Vitae

Personal Information

website <https://www.matteoacrossi.com>

Current positions

Aug. 2021 - present Postdoctoral Researcher, **Aalto University**, Espoo, Finland

I work in the PICO group led by Prof. Jukka Pekola. I am working on the theoretical analysis of experiments for realizing thermometers using superconducting qubits.

Aug. 2020 - present CTO and co-founder, **Algorithmiq**. A startup developing quantum algorithms for the life sciences. After successfully closing a Series A funding round, we reached more than \$ 18m in equity investment. <https://algorithmiq.fi>

Previous positions

August 2018 - July 2021 Postdoctoral researcher of the Turku Collegium for Science and Medicine, University of Turku, Finland.

November 2017 - July 2018 Postdoctoral researcher at the Turku Centre for Quantum Physics, University of Turku, Finland

Education

October 2023 **Docent in Theoretical Physics**, University of Helsinki, Finland

November 2017 **PhD in Physics** - *Università degli Studi di Milano*.

Thesis: Dynamics and characterization of quantum systems interacting with classical noise

Supervisor: Prof. Matteo G.A. Paris, Cosupervisor: Prof. Bassano Vacchini

July 2014 **Laurea Magistrale (MSc) in Physics** - *Università degli Studi di Parma*. 110/110 cum laude

Thesis: Dynamics of a two-qubit system interacting with a noisy classical environment

Advisors: Prof. Matteo G.A. Paris (Università degli Studi di Milano), Prof. Raffaella Burioni (Università degli studi di Parma)

July 2012 **Laurea Triennale (BSc) in Physics** - *Università degli Studi di Parma*. 110/110 cum laude

Publications

I published **35 articles** on international peer-reviewed journals (11 as first author). I have **6** preprints and 2 conference proceedings.

ORCID <https://orcid.org/0000-0003-4665-9284>

Google Scholar <https://scholar.google.com/citations?user=97NUjusAAAAJ>

Web of Science <https://www.webofscience.com/wos/author/record/572451>

Organized conferences

2021 IBM Qiskit Research Unconference, Member of the organizing and program committees. <https://qiskit.org/events/finland-unconference/>.

Dissemination

I participated in more than 22 international conferences and workshops, where I gave 5 invited talks, 10 contributed talks, and 7 poster presentations.

- Invited Talks *Quantum Chemistry on Quantum Computers: Challenges and New Directions*, Numerical methods in quantum chemistry 23, 5-8 June 2023, Tromsø, NO
- Overcoming challenges in quantum chemistry simulations on near-term quantum computers* Near-term quantum computers workshop, 21-24 March 2023, Warsaw, PL
- Continuous-time quantum walks on graphs with classical noise* Quantum2Classical Workshop at University of Strathclyde, 18-19 June 2018, UK
- Simulating Open Quantum Systems with IBM Q Experience*. 4th AQM Meeting, 20 December 2019, Milano, Italy
- Effective description of the short-time dynamics in open quantum systems*. Workshop on Continuous variable quantum information theory and applications, 5 June 2017, University of Nottingham, UK

- Contributed talks *Self-consistent tomography based on semidefinite programming for quantum device characterization*, CEWQO 2023, 3-7 July 2023, Milano, Italy
- Noisy quantum metrology enhanced by continuous nondemolition measurement*, YIQIS 2020, 28 Sep - 2 Oct 2020, Italy (Online event)
- Continuous measurements for advanced quantum metrology*, Quantum 2019, 31 May, Torino, Italy
- Restoring Heisenberg scaling in noisy metrology by continuous monitoring* OSA QIM V, 4-6 April 2019, Roma, Italy
- Quantum walks & spatial search on graphs affected by classical noise* IQIS 2018, 17-20 September, Catania, Italy
- Continuous-time quantum walks on graphs with classical noise* Quantum Roundabout, 11-13 July 2018, University of Nottingham, UK
- Continuous-time quantum walks on spatially correlated noisy lattices* QuProCS III meeting, 21-23 March 2018, Oxford, UK
- All-optical quantum simulator of qubit noisy channels* Young IQIS 2017, 11-15 September, Florence, Italy
- Probing the diamagnetic term in light-matter interaction*. Quantum Roundabout, 6-8 July 2016, Nottingham, UK
- Entangled quantum probes for classical environmental noise*. Non-Markovian Quantum Dynamics conference, 24-28 August 2015, Cortona, Italy

- Invited seminars *Informationally complete generalised quantum measurements for near-term quantum algorithms*. Invited seminar at University of Wien, Austria, 30 November 2022.
- Informationally complete generalised quantum measurements for near-term quantum algorithms*. Invited seminar at University of Milan, Italy, 10 November 2022.
- Learning to measure: Adaptive IC-POVMs for quantum algorithms*. Invited seminar at Gemini-Center on Quantum Computing, Norway, 2 Feb 2022.
- IBM Quantum devices for research in quantum information*. Invited seminar at University of Milan, Italy, 16 March 2021.
- Continuous measurements for advanced quantum metrology*. Invited seminar at INRIM, Torino, 3 July 2020.

Schools

- 2021 Machine Learning in Quantum Physics and Chemistry, Aug 24 - Sep 3, Warsaw, Poland
- 2018 *Quantum Complex Systems out of Equilibrium*, Lake Como School of Advanced Studies, Italy, July 29 - August 3, 2018
- 2017 *Quantum Machine Learning Summer School 2017*, Alpine Heath Resort, South Africa, 23rd January - 1st February 2017
- 2016 International Summer School Enrico Fermi 198 on *Quantum Simulators*, Varenna, Italy, 22-27 July 2016

2015 SUSSP71 on *Frontiers in Quantum Dynamics & Quantum Optics*, University of Strathclyde, Glasgow, 21st July to 2nd August 2015

Grants and awards

- 2018 **Turku Collegium for Science and Medicine postdoctoral research position** Three-year postdoctoral position for carrying research at University of Turku.
- 2020 **HPC-Europa3 grant** covering a 3-week visit to the University of Milan for developing HPC code.
- IBM Q Awards Teach me Quantum. 8k \$ prize** for the best university level course on quantum physics using Qiskit. Together with Daria Anttila, Boris Sokolov, Guillermo García-Pérez.

Academic merits

- 2023 Member of the steering group of the TORQS Project (Business Finland, budget 1.2 M€)
- 2021 Italian National Scientific Qualification as Associate Professor in theoretical physics of matter and theoretical physics of fundamental interactions
- Referee for *Nature Communications*, *Physical Review Letters*, *PRX Quantum*, *npj Quantum Information*, *Scientific Reports*, *PNAS Nexus*, *Quantum Science and Technology*, *Physical Review Research*, *New Journal of Physics*, *Advanced quantum technologies*, *Physical Review A*, *Physical Review E*, *Europhysics Letters*, *AVS Quantum Science*, *Quantum Information Processing*, *Physics Letters A*, *Annals of Physics*
- Referee for the National Science Centre in Poland
- Referee for funding applications to PRIN 2017 (Progetti di ricerca di Rilevante Interesse Nazionale), Ministry of Education and Research, Italy
- Referee for Rita Levi Montalcini fellowships, Ministry of Education and Research, Italy

Teaching

Pedagogical training

- 2022 University Pedagogy training 1 (5 ECTS), University of Helsinki
- Course Design (5 ECTS), Aalto University

Courses

- 2022 Coordinator of the course *Quantum Computing*, FYS2029 (5 ECTS), Bachelor's Programme in Physical Sciences, University of Helsinki
- 2021 Course *Open Quantum Systems with Qiskit* with Prof. Maniscalco at ICFO PhD programme (Barcelona, Spain), 8h
- Guest lecture *Practical quantum computing on IBM quantum devices* for Quantum Computing course FYS2029 at University of Helsinki, 2h
- Guest lecture *Practical quantum computing on IBM quantum devices* for Quantum Information course TFYS7039 at University of Turku, 1h
- 2018-2019 Coordinator of the course Seminars in Theoretical Physics TFYS7011 (4 ECTS). Topic: Simulating open quantum systems with IBM Quantum computers (University of Turku)
- 2017-2018 Teaching assistant for the General Physics course for Chemistry, e-learning project, 60h (University of Milan)
- 2017-2018 Teaching assistant for Programming Laboratory (C++) for Physics, 25h (University of Milan)
- 2016-2017 Teaching assistant for Programming Laboratory (C++) for Physics, 50h (University of Milan)
- 2015-2016 Teaching assistant and tutor for the Mathematics course for Chemistry, 20h (University of Milan)
- 2014-2015 Teaching assistant for the General Physics course for Chemistry, 20h (University of Milan)

Teaching material

- 2019 D. Anttila, G. García-Pérez, M. A. C. Rossi and B. Sokolov, Open Quantum Systems with Qiskit, Online interactive book available at <https://matteoacrossi.github.io/oqs-jupyterbook/> (2019).

Thesis supervision

PhD theses

- 2019-2023 Co-supervisor of Marco Cattaneo, cotutelle PhD student at IFISC (Spain) and University of Helsinki (Finland). Thesis: *Characterization and simulation of multipartite open quantum systems*
- 2022-present Co-supervisor of Keijo Korhonen, PhD student at the University of Helsinki (Finland)
- 2022-present Co-supervisor of Daniele Morrone, PhD student at Università degli Studi di Milano (Italy), with an internship agreement with Algorithmiq
- 2022-present Co-supervisor of Joonas Malmi, PhD student at the University of Helsinki (Finland)

Bachelor/Master Theses

- 2022 *Exploring the use of Adaptive POVM Measurements in the VQE*, Keijo Korhonen, Master degree in Physics, University of Helsinki (Finland)
- 2021 *Reinforcement Learning for Feedback Control of Continuous-Variable Quantum Systems*, Alessio Fallani (Master degree in Physics, Università degli Studi di Milano, Italy). Resulted in publication
- 2021 *Quantum computation and experiments on IBM quantum systems*, Juho Nykänen (Master degree in Theoretical Physics, University of Turku, Finland)
- 2020 *Spatial search by continuous-time quantum walks on complex networks*, Joonas Malmi (Master degree in Theoretical Physics, University of Turku, Finland). Resulted in publication
- 2018 *Quantum walks and spatial search on graphs subject to dynamical noise*, Marco Cattaneo (Master degree in Physics, Università degli Studi di Milano, Italy). Resulted in publication
- 2016 *Quantum limits to precision in probing deformed commutators*, Tommaso Giani (Bachelor degree in Physics, Università degli Studi di Milano, Italy). Resulted in publication
- 2015 *Sonde quantistiche per sistemi complessi classici* Luca Vismara (Bachelor degree in Physics, Università degli Studi di Milano, Italy)

Outreach

- Quantum Jungle *Quantum Jungle - The Dance of Quanta* is an interactive art installation visualising the fascinating world of quantum particles. (See eg. <https://www.aalto.fi/en/news/aalto-and-instituteq-are-partners-of-quantum-jungle-the-dance-of-quanta-exhibition>)
- Seminar *The era of quantum technologies*. 2 Nov 2020. Public lecture at the Turku City Library <https://fb.me/e/4Ku7C4l0C>
- Quantum Garden *Quantum Garden* is an art piece realised with artist Robin Baumgarden that showcases phenomena in quantum mechanics <http://quantum.garden>.
- QPlayLearn Co-developer of QPlayLearn, an on-line platform containing multimedia resources for learning about quantum science and technologies in a playful way. <https://www.qplaylearn.com>
- QPlay QPlay is a EU H2020 project on gamification of science and quantum physics. I collaborated in the project by realizing prototype games and by participating in quantum game jams like the Quantum Wheel Game Jam, Helsinki 2019 (<http://www.finnishgamejam.com/quantumwheel/>).