



Stefano Mangini

PHD STUDENT · THEORETICAL PHYSICS

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*"Let's get this on the table right away, without mincing words.
With regard to the climate crisis, yes, it's time to panic."*

- Raymond Pierrehumbert (IPCC)

Introduction

I am currently a research scientist in Algorithmiq, and postdoctoral researcher at the University of Helsinki (Finland), where I conduct research on (near-term) quantum information and computation. I am waiting to defend my Ph.D. in Theoretical Physics, carried out in the Quantum Information Theory (QUIT) group at the University of Pavia (Italy), under the supervision of Professor Chiara Macchiavello. My research during the Ph.D. focused on quantum computing, in particular on quantum machine learning and variational quantum algorithms.

Research interests: Quantum Computation and Information, Quantum Machine Learning, Artificial Intelligence, Computation.

Anagraphics

Nationality Italian
Personal Address Via Roma 25A, Putignano, 70017, Italy
Birth date 20 January 1996
Personal Email ✉ mangini.stfn@gmail.com

Education

Algorithmiq

RESEARCH SCIENTIST

- Research on Quantum Information and Computation.

Helsinki, Finland

Apr. 2023 - ongoing

University of Helsinki

POSTDOCTORAL RESEARCHER

- Research on Quantum Information and Computation.

Helsinki, Finland

Apr. 2023 - ongoing

Quantinuum

QUANTUM MACHINE LEARNING INTERN

- Research Internship position in the Quantum Machine Learning team at Quantinuum (formerly Cambridge Quantum).

London, United Kingdom

Apr. 2022 - Aug. 2022

University of Pavia

PHD IN THEORETICAL PHYSICS

- Research on Quantum Computation, Quantum Machine Learning with Variational Algorithms.

Pavia, Italy

Nov. 2019 - Apr. 2023

Supervisor: Prof. Chiara Macchiavello

University of Trieste

MSC IN THEORETICAL PHYSICS

- Final Grade: 110/110 cum laude.
- Thesis: Continuous Quantum Neuron.

Supervisors: Prof. Fabio Benatti, Prof. Stefano Mancini

Study of a possible model for a Continuous Optical Quantum Neuron. In particular, starting from an optical circuit capable of implementing the dynamics of a Perceptron, various encoding for classical data into quantum states are studied. Ideal and real case with states comprising an energy bound are taken into account. Examples of entangled and superposition states were also considered.

Trieste, Italy

Oct. 2017 - Oct. 2019

University of Trieste

BSC IN PHYSICS

- Final Grade: 110/110 cum laude.
- Thesis: The Ehrenfest model and the dynamics of neutral mutations in evolutionary genetics.

Supervisor: Prof. Edoardo Milotti

Study of the statistical mechanical model first introduced by Ehrenfest, applied to the description of the dynamics of a neutral mutation in a simulation of a group of cells. The research involved both theoretical aspects concerning the study of the statistical and biophysical model, and computational ones related to the programming of the simulation written in C++.

Trieste, Italy

Oct. 2014 - Jul. 2017

High School "Majorana-Laterza"

SCIENTIFIC HIGH SCHOOL

- Final Grade: 100/100.

Putignano, Italy

Sep. 2009 - Jul. 2014

Skills

Quantum Programming	Qiskit, PennyLane, Tensorflow Quantum, PyQuil
ML Programming	Jax, Tensorflow & Keras, PyTorch
Programming	Python, Fortran, C/C++, Bash
Scientific Software	L ^A T _E X, Mathematica
Soft skills	Communicative, Cooperative, Receptive, Versatile, Creative, Autonomous
Language	Italian (<i>mother tongue</i>), English (<i>very fluent</i>)
Video Editing	Final Cut Pro, Manim (Basics, for mathematical animations)

Publications

Refer to links on the right for an up-to-date list of publications!

 [Google Scholar](#)

 [arXiv](#)

[EPJQT](#), 



[IEEE](#), 

[QMI](#), 

[IEEE](#), 

[EPJQT](#), 

[TQE](#), 

[EPL](#), 

[MLST](#), 

[IJQI](#), 

- 2022 **Robustness of quantum reinforcement learning under hardware errors** Skolik, A., Mangini, S., Bäck, T., Macchiavello, C., and Dunjko, V., *EPJ Quantum Technology*, 10(1), 1-43.
- 2022 **Entanglement entropy production in Quantum Neural Networks** Ballarin M., Mangini S., Montangero S., Macchiavello C. and Mengoni R., accepted in *Quantum*.
- 2022 **Quantum variational learning for entanglement witnessing** Scala F., Mangini S., Macchiavello C., Gerace D., Bajoni D., and Gerace D., In *2022 International Joint Conference on Neural Networks (IJCNN)* (pp. 1-8), IEEE.
- 2022 **Quantum neural network autoencoder and classifier applied to an industrial case study** Mangini S., Marruzzo A., Piantanida M., Gerace D., Bajoni D., and Macchiavello C., *Quantum Machine Intelligence*, 4(2), 13.
- 2022 **The Dawn of Quantum Natural Language Processing** Di Sipio R., Huang J. H., Chen S. Y. C., Mangini S. and Worring M., *ICASSP 2022 - IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, 2022, pp. 8612-8616.
- 2021 **Qubit noise deconvolution** Mangini S., Maccone L. and Macchiavello C., *EPJ Quantum Technology*, 9(1), 1-30.
- 2021 **Variational learning for quantum artificial neural networks.** Tacchino F., Mangini S., Barkoutsos P.K., Macchiavello C., Gerace D., Tavernelli I. and Bajoni D., *IEEE Transactions on Quantum Engineering* vol. 2, pp. 1-10, 2021, Art no. 3101110.
- 2021 **Quantum computing models for artificial neural networks.** Mangini S., Tacchino F., Gerace D., Bajoni D. and Macchiavello C., *EPL (Europhysics Letters)*, 134(1), 10002.
- 2020 **Quantum computing model of an artificial neuron with continuously valued input data.** Mangini S., Tacchino F., Macchiavello C., Gerace D. and Bajoni D., *Machine Learning: Science and Technology*, 1(4): 045008.
- 2019 **Continuous variable quantum perceptron.** Benatti F., Mancini S. and Mangini S., *International Journal of Quantum Information* **17**(08): 1941009.

Experience

BeQuantum: the italian community on quantum technologies

[Online community](#)

CO-FOUNDER

Nov. 2022 - Ongoing

Together with two friends, we created BeQuantum, the Italian community on Quantum Technologies, with the goal of creating a networking place for interested students, researchers and institutions and companies. We organize online and in person events, and spread knowledge of quantum technologies to the public through scientific dissemination on social media.

Qiskit Hackathon Europe: Research Study Groups

[Online event organized by IBM](#)

PARTICIPANT

Apr. 2021 - Jun. 2021

- Project description: implement Quantum Reinforcement Learning based both on Grover's speedups and Variational circuits in Qiskit.
- The final version of the project is available on GitHub: <https://github.com/stfnmangini/QRL>.

Quantum Open Source Foundation (QOSF) Mentorship Program

[Mentor: Antal Száva \(Xanadu\)](#)

MENTEE

Oct. 2020 - Jan. 2021

- Project description: Implement the architecture proposed in arXiv:1907.05415 using PennyLane and TensorFlow.
- The final version of the project is featured as a demo on PennyLane's website: <https://pennylane.ai/qml/demos/learning2learn.html>.

University of Trieste

[Trieste, Italy](#)

STAGE

Feb. 2019 - Apr. 2019

- Topic: Continuous Variable quantum computation.
- Acquired the necessary skills and knowledge for an optical quantum generalization of a Perceptron, as discussed in my Master Thesis.

National Institute for Nuclear Physics (INFN)

[Trieste, Italy](#)

INTERNSHIP

Feb. 2017 - Mar. 2017

- Topic: Neural Networks Simulation in Mathematica.
- Deepened my knowledge of Neural Networks and Wolfram's Mathematica, by programming, implementing and optimizing a neural network algorithm (Neural Relax) into Mathematica.

Talks

Summer School: Machine Learning for Quantum Physics and Chemistry

CONTRIBUTED TALK

Talk: *Variational Learning for Quantum Artificial Neural Networks*

Online, Warsaw

Aug. 2021

Young Italian Quantum Information Science (YIQIS) 2020

INVITED SPEAKER

Talk: *Quantum computing models for artificial neurons*

Online event

Sept. 2020

Teaching

Physics 1

TEACHING ASSISTANT

Teaching assistant of Prof. Chiara Macchiavello for the course "Physics 1" in the BSc in Biology.

Pavia, Italy

Mar. - Jun. 2021

General Physics 2

TEACHING ASSISTANT

Assistant of Prof. Lorenzo Maccone for the course "General Physics 2" in the BSc in Mathematics.

Pavia, Italy

Oct. 2020 - Mar. 2021

Extracurricular Activity

Scientific Divulcation

SPEAKER, ORGANIZATION, PROMOTION

I find science outreach events very stimulating and funny, and I always look for opportunities to participate in such events. During the last few years, I took part in various divulgation events both as a speaker and organizer in Pavia (*Physics for Teenagers*, *Pillole di Sienza*) and in Trieste (*Caffè dei Quanti*, *Italian Association of Physics Students* (AISF), *Mini-Maker Faire*, *Notte dei Ricercatori*). I wrote a short essay named *Il Grande Macello* on the importance of plant-based diets to address climate change, freely available for download on my personal website.

Multiple Locations

2014-ongoing

Student Representative

DEPARTMENT OF PHYSICS

- Student Representative for Master of Science in Physics in the University of Trieste.

Trieste

2019

Entrepreneurship

CONTAMINATION LAB

- Attended a School for University students in Trieste for promoting entrepreneurship and soft skills among students.

Trieste

2019