Stefano **Mangini**

PhD Student · Theoretical Physics

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Climate change is threatening our existence, and what you do makes a difference.
Point is, what kind of difference do you want to make?

Introduction

I am a PhD student in Theoretical Physics in the Quantum Information Theory (QUIT) group at the University of Pavia, under the supervision of Prof. Chiara Macchiavello. I am very interested in the study of Quantum Technologies, and I wish to play an active role in their development. At the moment, my research is focused on Quantum Computation and Quantum Machine Learning for NISQ devices.

Interests: Quantum Computing, Quantum Machine Learning, Artificial Intelligence, Computation, Computer Science

Anagraphics

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

Education

University of Pavia — *Pavia, Italy*

PhD in Theoretical Physics — *Nov. 2019 - Ongoing*

- Currently researching on Quantum Computation and Quantum Machine Learning. — *Supervisor: Prof. Chiara Macchiavello*

University of Trieste — *Trieste, Italy*

MSc in Theoretical Physics — *Oct. 2017 - Oct. 2019*

- 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.

University of Trieste — *Trieste, Italy*

BSc in Physics — *Oct. 2014 - Jul. 2017*

- 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++.

High School "Majorana-Laterza" — *Putignano, Italy*

Scientific High School — *Sep. 2009 - Jul. 2014*

- Final Grade: 100/100.

Skills

Soft skills	Receptive, Communicative, Versatile, Cooperative, Creative, Autonomous
Quantum Programming	Qiskit, PennyLane
ML Programming	Tensorflow & Keras
Programming	Python, Fortran, Bash, C/C++
Scientific Software	Latex, Mathematica, Matlab (Basics)
Language	Italian (*mother tongue*), English (*very fluent*)
Video Editing	Final Cut Pro, Manim (Basics, for mathematical animations)

Publications

2021	**Variational learning for quantum artificial neural networks.** F. Tacchino, S. Mangini, P.K. Barkoutsos, C. Macchiavello, D. Gerace, I. Tavernelli and D. Bajoni, *IEEE Transactions on Quantum Engineering*, vol. 2, pp. 1-10, 2021, Art no. 3101110, DOI: 10.1109/TQE.2021.3062494.	*TQE, arXiv*
2021	**Quantum computing models for artificial neural networks.** S. Mangini, F. Tacchino, D. Gerace, D. Bajoni and C. Macchiavello, *arXiv:2102.03879*	*arXiv*
2020	**Quantum computing model of an artificial neuron with continuously valued input data.** S. Mangini, F. Tacchino, C. Macchiavello, D. Gerace and D. Bajoni, *Machine Learning: Science and Technology*, **1**(4): 045008. DOI: 10.1088/2632-2153/abaf98.	*MLST, arXiv*
2019	**Continuous variable quantum perceptron.** F. Benatti, S. Mancini and S. Mangini, *International Journal of Quantum Information*, **17**(08): 1941009. DOI: 10.1142/S0219749919410090.	*IJQI, arXiv*

Experience

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 a 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.

Invited Talks

Young Italian Quantum Information Science (YIQIS) 2020 *Online event*

Invited Speaker *Sept. 2020*

Talk: **Quantum computing models for artificial neurons**

Conferences

Quantum Techniques in Machine Learning (QTML) 2020 *Online event*

Attendee *Nov. 2020*

Series of seminars on Quantum Machine Learning.

Young Italian Quantum Information Science (YIQIS) 2020 *Online event*

Attendee *Sept. 2020*

Series of seminars on Quantum Information from young Italian scientists.

Hackathon on Cerebellum Modeling *Pavia, Italy*

Attendee *Jan. 2020*

Hackathon on computational neuroscience, dealing with theory and programming of cerebellum models.

Teaching

Physics 1 *Pavia, Italy*

Teaching assistant *Mar. - Jun. 2021*

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

General Physics 2 *Pavia, Italy*

Teaching assistant *Oct. 2020 - Mar. 2021*

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

Extracurricular Activity

Divulgation

Multiple Locations

Organization and Content Creator — *2014-2020*

- *Pillole di Scienza:* Recorded a divulgation video published on Youtube about Bernoulli and Coandă effect, and their action on a ping pong ball suspended in an air flow. The video was created for a Physics divulgation project from University of Pavia.
- *Caffè dei Quanti:* Helped with organization, media communication, and advertisements (photos and short videos of the events), of a series of scientifi divulgation events concieved by Prof. Angelo Bassi.
- *AISF:* Vice President of the local commitee of the Italian Association of Physics Student (AISF). Organization and participation in several scientific divulgation events.
- *Mini-Maker Faire:* As a volunteer, helped with organization and acted as interpreter for english speaking Makers to italian visitors.

Student Representative

Trieste

Department of Physics — *2019*

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

Entrepreneurship

Trieste

Contamination Lab — *2019*

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