

Francesco Scala

PHD STUDENT IN QUANTUM MACHINE LEARNING

Pavia, Italy

☎ (+39) 3406416189 | ✉ francesco.scala01@ateneopv.it | 🏠 Work page: fisica.unipv.it/personale/Persona.php?ID=591 |
🏠 Personal page: fran-scala.github.io/ | 📷 fran-scala | 🌐 fran-scala



Summary

I'm an eager **third-year PhD student in Quantum Machine Learning (QML)** at University of Pavia, focusing on both classical and quantum machine learning. I bring **strong foundations** in state-of-the-art **theoretical aspects of QML** as well as **proficiency in numerical simulations** of quantum computing systems and QML algorithms. Thanks to my collegiate and representative of PhD students experience, I am used to interdisciplinary and challenging environments. Apart from the academic side, I'm an outgoing and active person enjoying sports, gardening and travelling.

Work Experience

FULL-TIME

- Mar - May 2024 | **Visiting PhD** IBM RESEARCH Zurich - Switzerland
Research internship focused on Quantum Machine Learning. My supervisors are Dr. **Ivano Tavernelli** and Dr. **Francesco Tacchino**, I closely work also with Dr. **Christa Zoufal**.
- 2021 - present | **PhD in Quantum Machine Learning** UNIVERSITÀ DEGLI STUDI DI PAVIA Pavia - Italy
My research deals with **QML algorithms**, with special focus on **overparametrization** and **regularization** properties of **Quantum Neural Networks**. Part of my studies are also devoted to simulations of quantum computing platforms. My supervisor is Prof. **Dario Gerace**.

PART-TIME

- Oct 2022-present | **Teaching assistant** UNIVERSITÀ DEGLI STUDI DI PAVIA Pavia - Italy
 - **Lectures on General Physics** at the degree program in Chemistry and Pharmaceutical Technologies
- Jul - Dec 2022 | **Intern** QUANTUM COMPUTING LAB - CINECA Casalecchio di Reno (BO) - Italy
 - Benchmarking of **HPC infrastructures** for quantum computing and **QML applications** (Python)

Education

- 2019 - 2021 | **Master degree in Physics of Quantum Technologies** UNIVERSITÀ DEGLI STUDI DI PAVIA Pavia - Italy
Graduation date: 23-09-2021, Thesis: "Witnessing Entanglement by Quantum Neural Networks".
- 2016 - 2019 | **Bachelor degree in Physics** UNIVERSITÀ DEGLI STUDI DI PAVIA Pavia - Italy
Graduation date: 24-09-2019, Thesis: "Machine learning techniques applied to the quantum many-body problem".

Contributions: conferences, schools

- Nov 2023 | **Quantum Techniques in Machine Learning (QTML) 2023** CERN Geneve - Switzerland
Talk: A General Approach to Dropout in Quantum Neural Networks
- Oct 2023 | **Quantum Computing and Simulation Workshop** ISTITUTO VENETO Venezia - Italy
Poster: A General Approach to Dropout in Quantum Neural Networks
- Aug 2023 | **Superconducting Qubits and Algorithms (SQA) Conference** IQM QUANTUM COMPUTERS Munich - Germany
Poster: Symmetrizing Quantum Machine Learning for Quantum Field Theory
- Jun 2023 | **International Conference on Optics of Excitons in Confined Systems** UNIVERSITÀ DEL SALENTO Lecce - Italy
Talk: Quantum computing platform with polariton integrated circuits

Nov 2022		Quantum Techniques in Machine Learning (QTML) 2022 UNIVERSITY FEDERICO II	Napoli - Italy
		Poster: Quantum variational learning for entanglement witnessing	
Ago - Sept 2022		VCQ & AppQlinfo SummerSchool 2022 UNIVERSITÄT WIEN	Wien - Austria
		Student Talk: Quantum variational learning for entanglement witnessing	
Jul 2022		World Congress On Computational Intelligence 2022 IEEE	Padova - Italy
		Talk: Quantum variational learning for entanglement witnessing	
Jun 2022		Quantum Computing Hard- and Software Summer School 2022 EPFL, ETH ZÜRICH	Lausanne - Switzerland
		Poster: Quantum variational learning for entanglement witnessing	

Extracurricular Activities

Feb 2024		2nd Place QHACK 2024 - XANADU	Online
		<ul style="list-style-type: none"> Topic: Spectral Gap estimation Spectral Gap Superposition States [paper] [Github] 	
Apr 2023 - present		Technical-scientific Committee Member BEQUANTUM	Online - Italy
		<ul style="list-style-type: none"> Production of technical posts. General posts review. 	
May 2023		1st Place ETH QUANTUM HACKATHON 2023 - IQM CHALLENGE	Zurich - Switzerland
		<ul style="list-style-type: none"> Topic: Exploiting symmetries in Quantum Machine Learning Tasks: TicTacToe (given), Schwinger model (our proposal) [Github] 	
Apr 2022 - Jul 2022		Mentee QUANTUM OPEN SOURCE FOUNDATION (QOSF)	Online
		<ul style="list-style-type: none"> Implementation of Krylov module within <code>tequila</code> Python package [Github] Mentor: Prof. Jakob Kottmann 	
2022 - 2023		Phd Student representative UNIVERSITÀ DEGLI STUDI DI PAVIA	Pavia - Italy
Jan 2022		2nd Place MIT IQHACK 2022 - MICROSOFT/IONQ DIVISION	Online
		<ul style="list-style-type: none"> Topic: Quantum game with educational purposes Blackjack-inspired quantum game named QuHackJack [Github] 	

Skills

- Programming: Python, C++(basic)
- Quantum programming: **PennyLane** (in combination with **JAX**), **Qiskit**, **tequila**, **AWS Braket**
- Soft skills: predisposition to interpersonal relationships, teamwork, quick learner, proactive, time management

Languages

Italian: Native **English:** Level C1 **French:** Level A1

Publications

J. Kottmann, F. Scala		JCTC QUANTUM ALGORITHMIC APPROACH TO MULTICONFIGURATIONAL VALENCE BOND THEORY	2024
F. Scala et al.		Commun Phys 7, 118 DETERMINISTIC ENTANGLING GATES WITH NONLINEAR QUANTUM PHOTONIC INTERFEROMETERS	2024
F. Scala et al.		arXiv:2402.17668 SPECTRAL GAP SUPERPOSITION STATES	2024 (Preprint)
F. Scala et al.		Adv. Quantum Technol. 2300220 A GENERAL APPROACH TO DROPOUT IN QUANTUM NEURAL NETWORKS	2023
F. Scala et al.		IEEE - IJCNN 2022 Proceedings QUANTUM VARIATIONAL LEARNING FOR ENTANGLEMENT WITNESSING	2022