europass Curriculum vitae

PERSONAL INFORMATION

Giulia Gemme

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Date of birth 21 January 1999 | Nationality Italian

RESEARCH INTERESTS

My main research area is theoretical condensed matter physics. In particular, I am working in the field of quantum thermodynamics, focusing my study on quantum batteries, namely miniaturized devices exploiting non-classical features to efficiently store, transfer and release energy on-demand. In this context I mainly focused on characterizing the performances of quantum batteries and energy transfer devices, combining theoretical analysis, simulations and execution on real quantum machines accessible in cloud via the IBM Quantum Lab platform. In particular I'm currently investigating two possible kind of devices: i) independent two- and three-level systems coupled to a classical external drive and ii) collections of N two-level systems coupled to photons trapped in a resonant cavity. These studies will allow to determine the more promising platforms for future implementation of quantum batteries.

EDUCATION AND TRAINING

2022-now

PhD Student

Department of Physics, University of Genoa, Genoa, Italy

Supervisor: Dr. Dario Ferraro

2020-2022

Master's Degree in Physics

Department of Physics, University of Genoa, Genoa, Italy

15 June 2022 Thesis on "Characterization of a quantum battery and its simulation on a IBM platform"

I characterized the performances of IBM quantum chips as quantum batteries. I investigated the advantages and limitations of different profiles for classical drives used to charge these miniaturized batteries, establishing the optimal compromise between charging time and stored energy. Moreover, I considered the role played by various possible initial conditions on the functioning of the quantum batteries.

Supervisors: Dr. Dario Ferraro, Dr. Michele Grossi

Co-supervisor: Prof. Riccardo Ferrando

Final mark: 110/110 cum laude

2020-2022

Scuola superiore dell'Università di Genova, IANUA - Livello magistrale

University of Genoa, Genoa, Italy

The aim of the course was to develop managerial and technical-scientific skills oriented towards innovation and multidisciplinary, together with direct contacts with companies. Average mark higher than 28/30 is required.

2018-2020

Scuola superiore dell'Università di Genova, IANUA - Primo livello

University of Genoa, Genoa, Italy

The aim of the course was to develop managerial and technical-scientific skills oriented towards innovation and multidisciplinary, together with direct contacts with companies. Average mark higher than 27/30 is required.

2017-2020

Bachelor's Degree in Physics

Department of Physics, University of Genoa, Genoa, Italy

8 October 2020

Thesis on "Quantum teleportation: simulation and implementation on an IBM quantum computer"

I studied quantum teleportation algorithm theoretically and I used the IBM Quantum Lab platform accessible in cloud to simulate the algorithm and to execute it on real quantum machines.

Final mark: 110/110 cum laude

2012-2017

High school leaving qualification in scientific studies

Liceo scientifico Luigi Lanfranconi, Genoa, Italy

Final mark: 100/100 cum laude

WORK AND TEACHING EXPERIENCE

February 2023

Lecture for high school students

Department of Physics, University of Genoa, Italy

– Tutorial "Calibrating qubits using Qiskit Pulse" on IBM quantum computer for high school students, DIFI, University of Genoa, Italy

July 2022 – now

Didactic Tutor

University of Genoa, Italy

– Tutor of the "Fisica Generale 1" course, DIFI, University of Genoa, Italy

October 2022 – November 2022

Science communicator

Genoa Science Festival, Genoa, Italy

I worked as a science communicator in the laboratories 'Magnetismo in scatola' and 'Escape room: a cavallo di un fotone'.

June 2022

Lecture for bachelors' students

Department of Physics, University of Genoa, Italy

– Tutorial on "Characterization of a quantum battery" for the "Introduzione alle tecnologie quantistiche" course, DIFI, University of Genoa, Italy

September 2021 – July 2022

Didactic Tutor

University of Genoa, Italy

– Tutor of the "Fisica Generale 1" course, DIFI, University of Genoa, Italy
– Tutor of the "Matematica Generale" course, DISTAV, University of Genoa, Italy

October 2021 – November 2021

Science communicator

Genoa Science Festival, Genoa, Italy

I worked as a science communicator in the laboratories 'HEPscape-High Energy Physics Escape Room' and 'Medical physics escape room'.

PRIZES AND SCHOLARSHIPS

2019

IRIS prize 2019

for the best first year students in physics, mathematics and natural sciences.

PUBLICATIONS

[1] **G. Gemme**, M. Grossi, D. Ferraro, S. Vallecorsa, and M. Sassetti. "IBM Quantum Platforms: A Quantum Battery Perspective". In: *Batteries* 8.43 (2022). URL: https://www.mdpi.com/2313-0105/8/5/43.

[2] **G. Gemme**, G. M. Andolina, Francesco M. D. Pellegrino, M. Sassetti, and D. Ferraro. “Off-Resonant Dicke Quantum Battery: Charging by Virtual Photons”. In: *Batteries* 9.4 (2023). URL: https://www.mdpi.com/2313-0105/9/4/197.

[3] **G. Gemme**, M. Grossi, S. Vallecorsa, M. Sassetti, and D. Ferraro. *Qutrit quantum battery: comparing different charging protocols*. 2023. arXiv: 2306.14537 [quant-ph].

SCHOOL AND CONFERENCES

4 - 9 June 2023

School participation

I attended the "Summer School on Open Quantum Systems and Mesoscopic Physics" in Hyytiälä, Finland.

23-25 May 2023

Conference participation

I attended the "Quantum Matter International Conference – QUANTUMatter 2023" in Madrid (Spain).

1-4 November 2022

Conference participation

I attended the "International Conference on Quantum Technologies for High-Energy Physics (QT4HEP22)" at CERN.

12-16 September 2022

Conference participation

I attended the "SIF National Congress".

28 March - 1 April 2022

School participation

I attended the "Topological Quantum Matter: theory and applications" school for young researchers.

PRESENTATIONS

June 2023

Poster

Poster presentation, "Qutrit quantum battery: sequential *vs* simultaneous charging" at "Summer School on Open Quantum Systems and Mesoscopic Physics".

May 2023

Poster

Poster presentation of the article "Qutrit quantum battery: sequential *vs* simultaneous charging" at QUANTUMatter 2023.

May 2023

Oral talk

Online oral presentation of the article "IBM Quantum Platforms: A Quantum Battery Perspective" within the project "CERN QTI lecture series".

November 2022

Poster

Poster presentation of the article "IBM Quantum Platforms: A Quantum Battery Perspective" at QT4HEP22.

September 2022

Oral talk

Oral presentation of the article "IBM Quantum Platforms: A Quantum Battery Perspective" at SIF National Congress.

April 2022

Oral talk

Oral presentation of the article "IBM Quantum Platforms: A Quantum Battery Perspective" at "Topological Quantum Matter: theory and applications" school.

PERSONAL SKILLS

Mother tongue: Italian

Other languages

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken interaction	Spoken production	
English	B2	B2	B2	B2	B2
	Cambridge First Certificate Grade, B2 in 2015				
French	A1	A1	A1	A1	A1

Levels: A1 and A2: Basic user – B1 and B2: Independent user – C1 and C2: Proficient user
Common European Framework of Reference for Languages

Computer skills

- Microsoft Office programs and Latex
- Programming languages: C++, Python, Wolfram Mathematica, MatLab
- Analysis and simulations packages: ROOT, LabView
- Operating systems: Windows, Linux