

Francesco Tacchino

 [linkedin.com/in/francescotacchino](https://www.linkedin.com/in/francescotacchino) |  Francesco Tacchino (Scholar)

Professional & Research Experience

IBM Research GmbH, IBM Quantum & IBM Research Europe – Zurich

Rüschlikon, Switzerland

Research Scientist

May 2021 – present

- Permanent Research Staff Member in the Quantum Computational Science group.

Ministero dell'Università e della Ricerca

Italy

National Scientific Qualification (Abilitazione Scientifica Nazionale)

04.11.2024 – present

- Qualification as associate professor (professore di seconda fascia).
- Disciplinary field (sette concorsuale): 02/B2 – Theoretical Condensed Matter Physics (Fisica Teorica della Materia)

IBM Research GmbH, IBM Quantum & IBM Research Europe – Zurich

Rüschlikon, Switzerland

Post-doctoral researcher

March 2020 – April 2021

- Supported by the European Union's Horizon 2020 research and innovation programme through FET-OPEN grant 862893 FATMOLS

University of Pavia, Department of Physics

Pavia, Italy

Research Fellow

Oct 2019 – Feb 2020

- Borsa di Studio per attività di ricerca, art. 5 comma 3 dello Statuto dell'Università degli Studi di Pavia e D.R. 86-2011
- Funded by the Italian Ministry of Education and Research (MIUR) through the PRIN project INPhoPOL
- Research topic: *Quantum simulations and machine learning with exciton-polaritons*.

University of Pavia

Pavia, Italy

Tutor/Teaching Assistant

2015–2020

- Teaching Assistant for the General Physics course (Prof. Dario Gerace) offered to the first year students of the B.Sc. programme in Chemistry and Pharmaceutical Sciences (Department of Pharmaceutical Sciences).
- Teaching Assistant for the Structure of Matter course (lecturer Prof. Pietro Carretta) offered to the third year students of the B.Sc. programme in Physics (Department of Physics).
- Teaching Assistant for the General Physics course (lecturer Prof. Gianluigi Boca) offered to the first year students of the B.Sc. programme in Pharmacy (Department of Pharmaceutical Sciences).

Princeton University, Department of Electrical Engineering

Princeton, NJ, USA

Visiting Student Research Collaborator (VSRC)

Oct – Dec 2017

- Research visit in the group of Prof. H. E. Türeci.

Heinrich Heine Universität, Institute of Quantitative and Theoretical Biology

Düsseldorf, Germany

Research Internship Trainee

Mar – Jul 2016

- International research traineeship within the EU Erasmus+ programme.

Education

University of Pavia

Pavia, Italy

Doctor of Philosophy (Dottorato di Ricerca) in Physics

2016–2020

- Doctoral title awarded *con lode* (summa cum laude)
- **Thesis:** *Digital quantum simulations and machine learning on near-term quantum processors*.
- **Research Topics:** Quantum Computing and Quantum Simulations, Quantum Machine Learning and Quantum Neural Networks, Open Quantum Systems, Quantum Thermodynamics and Quantum Optics.
- Representative of Graduate Students in the Department of Physics Council for the years 2018-2020.

IUSS – Istituto Universitario di Studi Superiori Pavia

Pavia, Italy

Second level Diploma (Diploma di licenza biennale di secondo livello)

2014–2017

- **Grade:** Excellent (Eccellente)
- **Thesis:** *The thermodynamics of out of equilibrium driven-dissipative quantum systems*.

University of Pavia

Pavia, Italy

M.Sc. (Laurea Magistrale) in Theoretical Physics

2014–2016

- **Score:** 110/110 e *lode* (summa cum laude)
- **Thesis:** *Open quantum systems modelling of the cytochrome b_6f complex in the photosynthetic electron transport chain*.

Almo Collegio Borromeo

Pavia, Italy

Student Fellow

2012–2016

- College for selected students at the University of Pavia, position subject to annual reconfirmation.

- **Score:** 110/110 *e lode* (summa cum laude)
- **Thesis:** *Effetti Quantistici in Sistemi Biologici* (Quantum Effects in Biological Systems).

Scientific interests

Main Focus

- **Quantum Computational Science:** Theory and implementation of quantum algorithms and quantum simulations for fundamental (condensed matter and high energy physics, strongly correlated systems, quantum chemistry) and applied research.
- **Machine Learning & Quantum Machine Learning:** algorithms development and analysis, integration into scientific research workflows and industrial solutions.
- **Quantum Technologies:** full stack design of architectures (e.g., solid state, molecular and photonic devices) and protocols for quantum information processing.

Other Interests

- Open quantum systems & quantum optics, quantum thermodynamics.
- Quantitative and theoretical biology.
- Foundations of quantum theory and quantum information.

Publications

METRICS

- **Total number of indexed publications:** 49
- **Total number of citations:** 1269
- **H-index:** 21

The metrics are reported according to Scopus (Author ID 57200595870), updated on 03/04/2025.

In all publications listed below, the symbol * denotes equal contribution.

JOURNAL ARTICLES

- [1] **Y. Chai, A. Crippa, K. Jansen, S. Kühn, V. R. Pascuzzi, F. Tacchino and I. Tavernelli**, *Fermionic wave packet scattering: a quantum computing approach*, Quantum **9**, 1638 (2025).
- [2] **I. N. M. Le, O. Kiss, J. Schuhmacher, I. Tavernelli and F. Tacchino**, *Symmetry-invariant quantum machine learning force fields*, New Journal of Physics **27**, 023015 (2025).
- [3] **J. Schuhmacher, M. Ballarin, A. Baiardi, G. Magnifico, F. Tacchino, S. Montangero and I. Tavernelli**, *Hybrid Tree Tensor Networks for quantum simulation*, PRX Quantum **6**, 010320 (2025).
- [4] **G. Agliardi, C. O'Meara, K. Yogaraj, K. Ghosh, P. Sabino, M. Fernández-Campoamor, G. Cortiana, J. Bernabé-Moreno, F. Tacchino, A. Mezzacapo and O. Shehab**, *Conditions for a quadratic quantum speedup in nonlinear transforms with applications to energy contract pricing*, Quantum Science and Technology **10**, 025005 (2025).
- [5] **M. Chizzini, F. Tacchino, A. Chiesa, I. Tavernelli, S. Carretta, P. Santini**, *Qudit-based quantum simulation of fermionic systems*, Physical Review A **110**, 062602 (2024).
- [6] **A. Sannia, F. Tacchino, I. Tavernelli, G. L. Giorgi and R. Zambrini**, *Engineered dissipation to mitigate barren plateaus*, npj Quantum Information **10**, 81 (2024).
- [7] **A. Di Meglio, K. Jansen, I. Tavernelli, et al.**, *Quantum computing for high-energy physics: state of the art and challenges*, PRX Quantum **5**, 037001 (2024).
- [8] **L. E. Fischer, T. Dao, I. Tavernelli and F. Tacchino**, *Dual frame optimization for informationally complete quantum measurements*, Physical Review A **109**, 062415 (2024).
- [9] **L. Cappelli, F. Tacchino, G. Murante, S. Borgani and I. Tavernelli**, *From Vlasov-Poisson to Schrödinger-Poisson: Dark matter simulation with a quantum variational time evolution algorithm*, Physical Review Research **6**, 013282 (2024).
- [10] **L. Nagano, A. Miessen, T. Onodera, I. Tavernelli, F. Tacchino and K. Terashi**, *Quantum data learning for quantum simulations in high-energy physics*, Physical Review Research **5**, 043250 (2023).
- [11] **J. Schuhmacher, L. Boggia, V. Belis, E. Puljak, M. Grossi, M. Pierini, S. Vallecorsa, F. Tacchino, P. Barkoutsos and I. Tavernelli**, *Unravelling physics beyond the standard model with classical and quantum anomaly detection*, Machine Learning: Science and Technology **4**, 045031 (2023).

- [12] **P. J. Ollitrault, S. Jandura, A. Miessen, I. Burghardt, R. Martinazzo, F. Tacchino and I. Tavernelli**, *Quantum algorithms for grid-based variational time evolution*, *Quantum* **7**, 1139 (2023).
- [13] **A. Melo, N. Earnest-Noble and F. Tacchino**, *Pulse-efficient quantum machine learning*, *Quantum* **7**, 1130 (2023).
- [14] **L. E. Fischer, A. Chiesa, F. Tacchino, D. J. Egger, S. Carretta and I. Tavernelli**, *Universal Qudit Gate Synthesis for Transmons*, *PRX Quantum* **4**, 030327 (2023).
- [15] **L. Laneve, F. Tacchino and I. Tavernelli**, *On Hitting Times for General Quantum Markov Processes*, *Quantum* **7**, 1056 (2023).
- [16] **M. John, J. Schuhmacher, P. Barkoutsos, I. Tavernelli and F. Tacchino**, *Optimizing Quantum Classification Algorithms on Classical Benchmark Datasets*, *Entropy* **25**, 860 (2023).
- [17] **J. Liu, K. Najafi, K. Sharma, F. Tacchino, L. Jiang and A. Mezzacapo**, *Analytic theory for the dynamics of wide quantum neural networks*, *Physical Review Letters* **130**, 150601 (2023).
- [18] **S. Mensa, E. Sahin, F. Tacchino, P. Kl. Barkoutsos and I. Tavernelli**, *Quantum Machine Learning Framework for Virtual Screening in Drug Discovery: a Prospective Quantum Advantage*, *Machine Learning: Science and Technology* **4**, 015023 (2023).
- [19] **A. Miessen*, P. J. Ollitrault*, F. Tacchino* and I. Tavernelli**, *Quantum algorithms for quantum dynamics*, *Nature Computational Science* **3**, 25–37 (2023).
- [20] **M. Chizzini, L. Crippa, A. Chiesa, F. Tacchino, F. Petiziol, I. Tavernelli, P. Santini and S. Carretta**, *Molecular nanomagnets with competing interactions as optimal units for qudit-based quantum computation*, *Physical Review Research* **4**, 043135 (2022).
- [21] **J. Schuhmacher, G. Mazzola, F. Tacchino, O. Dmitriyeva, T. Bui, S. Huang and I. Tavernelli**, *Extending the reach of quantum computing for materials science with machine learning potentials*, *AIP Advances* **12**, 115321 (2022).
- [22] **F. Libbi, J. Rizzo, F. Tacchino, N. Marzari and I. Tavernelli**, *Effective calculation of the Green's function in the time domain on near-term quantum processors*, *Physical Review Research* **4**, 043038 (2022).
- [23] **J. Rizzo, F. Libbi, F. Tacchino, P. J. Ollitrault, N. Marzari and I. Tavernelli**, *One-particle Green's functions from the quantum equation of motion algorithm*, *Physical Review Research* **4**, 043011 (2022).
- [24] **J. Liu, F. Tacchino, J. R. Glick, L. Jiang and A. Mezzacapo**, *Representation Learning via Quantum Neural Tangent Kernels*, *PRX Quantum* **3**, 030323 (2022).
- [25] **O. Kiss, F. Tacchino, S. Vallecorsa and I. Tavernelli**, *Quantum neural networks force fields generation*, *Machine Learning: Science and Technology* **3**, 035004 (2022).
- [26] **L. E. Fischer, D. Miller, F. Tacchino, P. Kl. Barkoutsos, D. J. Egger and I. Tavernelli**, *Ancilla-free implementation of generalized measurements for qubits embedded in a qudit space*, *Physical Review Research* **4**, 033027 (2022).
- [27] **J. M. Günther, F. Tacchino, J. R. Wootton, I. Tavernelli and P. Kl. Barkoutsos**, *Improving readout in quantum simulations with repetition codes*, *Quantum Science and Technology* **7**, 015009 (2022).
- [28] **G. García-Pérez, M. A.C. Rossi, B. Sokolov, F. Tacchino, P. Kl. Barkoutsos, G. Mazzola, I. Tavernelli and S. Maniscalco**, *Learning to Measure: Adaptive Informationally Complete Generalized Measurements for Quantum Algorithms*, *PRX Quantum* **2**, 040342 (2021).
- [29] **L. Crippa, F. Tacchino, M. Chizzini, A. Aita, M. Grossi, A. Chiesa, P. Santini, I. Tavernelli and S. Carretta**, *Simulating Static and Dynamic Properties of Magnetic Molecules with Prototype Quantum Computers*, *Magnetochemistry* **7**, 117 (2021).
- [30] **F. Tacchino, A. Chiesa, R. Sessoli, I. Tavernelli and S. Carretta**, *A proposal for using molecular spin qudits as quantum simulators of light-matter interactions*, *Journal of Materials Chemistry C* **9**, 10266-10275 (2021).
- [31] **A. Chiesa, M. Chizzini, E. Garlatti, E. Salvadori, F. Tacchino, P. Santini, I. Tavernelli, R. Bittl, M. Chiesa, R. Sessoli and S. Carretta**, *Assessing the nature of chiral-induced spin-selectivity by magnetic resonance*, *The Journal of Physical Chemistry Letters* **12**, 6341-6347 (2021).
- [32] **P. Suchsland, F. Tacchino, M. H. Fischer, T. Neupert, P. Kl. Barkoutsos and I. Tavernelli**, *Algorithmic Error Mitigation Scheme for Current Quantum Processors*, *Quantum* **5**, 492 (2021).
- [33] **T. F. F. Santos, F. Tacchino, D. Gerace, M. Campisi and M. F. Santos**, *Maximally efficient quantum thermal machines fuelled by nonequilibrium steady states*, *Physical Review A* **103**, 062225 (2021).
- [34] **S. Mangini, F. Tacchino, D. Gerace, D. Bajoni and C. Macchiavello**, *Quantum computing models for artificial neural networks*, *EPL (Europhysics Letters)* **134**, 10002 (2021).
- [35] **F. Tacchino*, S. Mangini*, P. Kl. Barkoutsos, C. Macchiavello, D. Gerace, I. Tavernelli and D. Bajoni**, *Variational Learning for Quantum Artificial Neural Networks*, *IEEE Transactions on Quantum Engineering* **2**, 3101110 (2021).
- [36] **F. Tacchino, T. F. F. Santos, D. Gerace, M. Campisi and M. F. Santos**, *Charging a quantum battery via nonequi-*

librium heat current, *Physical Review E* **102**, 062133 (2020).

- [37] **F. Tacchino, P. Barkoutsos, C. Macchiavello, I. Tavernelli, D. Gerace and D. Bajoni**, *Quantum implementation of an artificial feed-forward neural network*, *Quantum Science and Technology* **5**, 044010 (2020).
- [38] **S. Mangini, F. Tacchino, D. Gerace, C. Macchiavello and D. Bajoni**, *Quantum computing model of an artificial neuron with continuously valued input data*, *Machine Learning: Science and Technology* **1**, 045008 (2020).
- [39] **F. Tacchino, A. Chiesa, S. Carretta and D. Gerace**, *Quantum computers as universal quantum simulators: state-of-the-art and perspectives*, *Advanced Quantum Technologies* **3**, 1900052 (2020). Featured **on the cover** of the March 2020 issue.
- [40] **F. Tacchino, A. Succurro, O. Ebenhöh and D. Gerace**, *Optimal efficiency of the Q-cycle mechanism around physiological temperatures from an open quantum systems approach*, *Scientific Reports* **9**, 16657 (2019).
- [41] **A. Chiesa*, F. Tacchino*, M. Grossi, P. Santini, I. Tavernelli, D. Gerace and S. Carretta**, *Quantum hardware simulating four-dimensional inelastic neutron scattering*, *Nature Physics* **15**, 455 (2019).
- [42] **F. Tacchino, C. Macchiavello, D. Gerace and D. Bajoni**, *An artificial neuron implemented on an actual quantum processor*, *npj Quantum Information* **5**, 26 (2019).
- [43] **F. Tacchino*, A. Chiesa*, M. D. LaHaye, S. Carretta and D. Gerace**, *Electromechanical quantum simulators*, *Physical Review B* **97**, 214302 (2018).
- [44] **F. Tacchino, A. Auffèves, M. F. Santos and D. Gerace**, *Steady state entanglement beyond thermal limits*, *Physical Review Letters* **120**, 063604 (2018).

ARTICLES ON PRE-PRINT ARCHIVES

- [45] **F. Scala, C. Zoufal, D. Gerace and F. Tacchino**, *Towards Practical Quantum Neural Network Diagnostics with Neural Tangent Kernels*, arXiv:2503.01966 (2025).
- [46] **L. E. Fischer, M. Leahy, et al.**, *Dynamical simulations of many-body quantum chaos on a quantum computer*, arXiv:2411.00765 (2024).
- [47] **T. A. Bernalova, K. Delič, G. Pupillo, F. Tacchino and I. Tavernelli**, *Simulating the Fermi-Hubbard model with long-range hopping on a quantum computer*, arXiv:2410.07789 (2024).
- [48] **J. Selisko, M. Amsler, C. Wever, Y. Kawashima, G. Samsonidze, R. Ul Haq, F. Tacchino, I. Tavernelli and T. Eckl**, *Dynamical Mean Field Theory for Real Materials on a Quantum Computer*, arXiv:2404.09527 (2024).

CONFERENCE PROCEEDINGS

- [49] **N. Mariella, A. Akhriev, F. Tacchino, et al.**, *Quantum Theory and Application of Contextual Optimal Transport*, *Proceedings of the 41st International Conference on Machine Learning*, PMLR 235:34822-34845 (2024).
- [50] **E. Bermot, C. Zoufal, M. Grossi, J. Schuhmacher, F. Tacchino, S. Vallecorsa and I. Tavernelli**, *Quantum Generative Adversarial Networks For Anomaly Detection In High Energy Physics*, 2023 IEEE International Conference on Quantum Computing and Engineering (QCE), 331-341 (2023).
- [51] **F. Tacchino, P. Barkoutsos, C. Macchiavello, D. Gerace, I. Tavernelli and D. Bajoni**, *Variational learning for quantum artificial neural networks*, 2020 IEEE International Conference on Quantum Computing and Engineering (QCE), 130-136 (2020).
- [52] **F. Tacchino, A. Chiesa, M. D. LaHaye, I. Tavernelli, S. Carretta and D. Gerace**, *Digital Quantum Simulations of Spin Models on Hybrid Platform and Near-Term Quantum Processors*, *Proceedings* **12**, 24 (2019).
- [53] **F. Tacchino, M. Grossi, D. Gerace, A. Chiesa, P. Santini, S. Carretta and I. Tavernelli**, *Efficient Quantum Simulation of Dynamic Correlations on Superconducting Quantum Computers*, *Conference on Lasers and Electro-Optics*, OSA Technical Digest (Optical Society of America, 2019), paper JTh5C.3.

BOOK CHAPTERS

- [54] **F. Tacchino and D. Gerace**, *L'alba dei calcolatori quantistici: tecnologie e applicazioni*, *Quaderni Borromaici* **8**, 183-211 (2021).

PATENTS

- [55] **G. F. M. Agliardi, K. H. Yogaraj, F. Tacchino, A. Mezzacapo, et al.**, *Portfolio value evaluation through quantum polynomial approximation*, US Patent App. 18/298,445 (2024).
- [56] **D. Miller, L. E. Fischer, P. Barkoutsos, F. Tacchino, D. J. Egger and I. Tavernelli**, *Measuring a n-dimensional quantum system*, US Patent App. 18/159,523 (2024).
- [57] **P. Barkoutsos, J. M. Günther, F. Tacchino, J. R. Wootton and I. Tavernelli**, *Mitigation of readout error in a quantum computation*, US Patent 11,966,813 (2024).

Conferences & Workshops

MolSQIT Workshop (Molecular Spins for Quantum Information Technologies)

Parma, Italy

Invited talk

20-21.02.2025

- *Quantum Computational Science.*

QT4HEP 2025, Intern. Conference on Quantum Technology for High-Energy Physics

CERN, Geneva, Switzerland

Contributed talk

20-24.01.2025

- *Efficient calculation of Green's functions on quantum computers via simultaneous circuit perturbation.*

QTML 2024, Quantum Techniques in Machine Learning

Melbourne, Australia

Invited tutorial, contributed talk & posters

24-29.11.2024

- Invited tutorial: *Of ladders and frames: informationally complete measurements for quantum algorithms.*
- Contributed talk: *Quantum Neural Networks Diagnostics with Neural Tangent Kernels.*
- Poster: *Dual-frame optimization for informationally complete quantum measurements.*
- Poster: *Hybrid Tree Tensor Networks for Quantum Simulation.*

Bridging the Gap between Classical & Quantum Simulation workshop

Lorentz Center, Leiden, NL

Invited talk

06-08.05.2024

- *Informationally complete tools for quantum computation.*

Pulses, Qudits and Quantum Simulations workshop

IQuS, Seattle, USA

Invited talk

24.04.2024

- *Quantum computational physics: Quantum simulations & machine learning on noisy quantum processors.*

Astroinformatics 2023

Naples, Italy (online attendance)

Invited talk

01-06.10.2023

- *Quantum computing for natural sciences and machine learning applications.*

IEEE QCE 2023, IEEE International Conference on Quantum Computing and Engineering

Bellevue, WA, USA

Workshop organiser & contributed talk

17-22.09.2023

- Workshop: *Quantum Computing for Natural Sciences: Technology and Applications.*
Co-organised with M. Motta, S. Mensa, S. Knecht and E. Sahin.
- Technical paper: *Quantum Generative Adversarial Networks For Anomaly Detection In High Energy Physics.*

Frontiers of near-term quantum computing workshop

Gothenburg, Sweden

Invited talk

29.08-01.09.2023

- *Quantum machine learning and the natural sciences: technology and applications.*

ACS Fall 2023

San Francisco, CA, USA

Contributed talk

13-17.08.2023

- *Quantum machine learning force fields.*
- Part of the symposium *Quantum Computing for Tackling Challenges in Quantum Chemistry.*

QAI 2023, Workshop on Quantum artificial Intelligence

Naples, Italy

Keynote talk

27-28.07.2023

- *Quantum machine learning: technology and applications in the natural sciences and beyond.*

2nd Quantum and Hybrid Quantum-Classical Computing Approaches Workshop

Hamburg, Germany

Keynote talk

25.05.2023

- *Quantum computing for natural sciences and machine learning applications.*
- Part of ISC High Performance 2023.

Quantum Computing Applications in Chemical and Biochemical Engineering Workshop

Copenhagen, Denmark

Invited talk

10-12.05.2023

- *Quantum computing: technology and applications in the natural sciences.*

Les Rencontres de Physique de la Vallée d'Aoste

La Thuile, Italy

Invited talk

05-11.03.2023

- *Quantum computing: roadmap & applications.*

IEEE QCE 2022, IEEE International Conference on Quantum Computing and Engineering

Online attendance

Invited panelist

21.09.2022

- Birds-of-a-Feather session *Challenges of Quantum Software Engineering: building workforce, technical skills, best practices and getting the job done.*

MLQC4Dyn Workshop

Contributed talk

Institut Pascal, Paris, France

19-23.09.2022

- *Quantum algorithms for dynamics: from quantum simulations to quantum machine learning.*

ACS Spring 2022

Contributed talk

San Diego, CA, USA

20-24.03.2022

- *Proposal for using molecular spin qubits as quantum simulators of light-matter interactions.*

APS March Meeting 2022

Contributed talk

Chicago, IL, USA

14-18.03.2022

- *Ancilla-free implementation of POVM measurements for near-term quantum algorithms.*

EQTC 2021, 2nd European Quantum Technologies Virtual Conference

Contributed talk

Online conference

29.11-1.12.2021

- *Learning to measure: adaptive informationally complete POVMs for near-term quantum algorithms.*

QTML 2021, Quantum Techniques in Machine Learning

Invited panelist

Online conference

08-12.11.2021

- Industry session, with a talk on *Quantum Machine Learning: towards industry applications.*

International advanced research workshop on High Performance Computing (HPC 2021)

Contributed talk

Cetraro, Italy

26-30.07.2021

- *Quantum computing for natural sciences and machine learning applications.*

APS March Meeting 2021

Contributed talk

Online conference

15-19.03.2021

- *Algorithmic Error Mitigation Scheme for Current Quantum Processors.*

IEEE QCE 2020, IEEE International Conference on Quantum Computing and Engineering

Contributed talk

Online conference

12-16.10.2020

- *Variational learning for quantum artificial neural networks.*

QTML 2019, Quantum Techniques in Machine Learning

Poster

Daejeon, South Korea

20-24.10.2019

- *A model for artificial neurons based on quantum hypergraph states.*

12th Italian Quantum Information Science conference (IQIS)

Poster

Milan, Italy

9-12.09.2019

- *Trainable artificial neuron efficiently implemented on near-term quantum processors.*

QTD 2019, Quantum ThermoDynamics Conference

Poster

Espoo, Finland

23-28.06.2019

- *Steady State Entanglement beyond Thermal Limits.*

CLEO 2019

Contributed talk (postdeadline)

San Jose, CA, USA

5-10.05.2019

- *Efficient Quantum Simulation of Dynamical Correlations on Superconducting Quantum Computers.*

Wivace 2018, XIII Workshop on Artificial Life and Evolutionary Computation

Contributed talk

Parma, Italy

10-12.09.2018

- *Quantum simulators in hybrid nanocircuits.*

QTech 2018, Quantum Technology International Conference

Contributed talk & poster

Paris, France

05-07.09.2018

- Talk: *Steady State Entanglement beyond Thermal Limits.*
- Poster: *Quantum simulators in hybrid nanocircuits.*

QuEBS 2018, Workshop on Quantum Effects in Biological Systems

Contributed talk

Vilnius, Lithuania

10-13.07.2018

- *Open quantum system approach to the Q-cycle mechanism of electron and proton energy transport through cellular membranes.*

COST Action MP1403 Nanoscale Quantum Optics Meeting

Posters

Prague, Czech Republic

13-16.02.2018

- Poster: *Steady State Entanglement beyond Thermal Limits.*
- Poster: *Electromechanical Quantum Simulators.*

Italian National Conference on the Physics of Matter (FisMat)

Trieste, Italy

Contributed talk

01-05.10.2017

- *Autonomous quantum machine for steady state entanglement generation via bath engineering.*

10th Italian Quantum Information Science conference (IQIS)

Florence, Italy

Contributed talk (Young IQIS)

11-15.09.2017

- *Autonomous quantum machine for steady state entanglement generation via bath engineering.*

VI Paraty Quantum Information School and Workshop

Paraty, Brazil

Contributed talk

14-25.08.2017

- *An open quantum systems theory of the Q-cycle mechanism in cellular membranes.*

17th International Congress on Photosynthesis Research

Maastricht, The Netherlands

Poster

07-12.08.2016

- *A quantum and stochastic model of the Q-Cycle in the photosynthetic electron transport chain.*

Lectures & Seminars

University of Pavia, Graduate School in Physics

Pavia, IT

Lectures (10 hrs) and course co-coordinator

23.05-03.06.2024

- Lectures on *Kernel Methods and Quantum Neural Networks*, with a tutorial on Qiskit Machine Learning.
- Part of the course *Quantum Machine Learning and Applications in Physics*.

QuSoft, University of Amsterdam and Centrum Wiskunde & Informatica

Amsterdam, NL

Invited seminar

03.03.2024

- *Of ladders and frames: informationally complete tools for quantum computation.*

MOQS (“Molecular Quantum Simulations” European Training Network) Training Week

Bologna, Italy

Invited lecture

09.11.2023

- *Quantum Error Mitigation*

Maxwell Institute Graduate School, Edinburgh University and Heriot-Watt University

Edinburgh, UK

Invited guest lectures & seminar (MAC-MIGS Deep Dive)

05-06.06.2023

- *Introduction to Quantum Machine Learning* (lectures).
- *Quantum Computing: Technology and Applications in the Natural Sciences* (seminar).
- Hosted by Prof. L. Banjari.

Princeton University, Department of Electrical and Computer Engineering

Online

Invited guest lectures

28-30.11.2022

- *Introduction to Quantum Machine Learning.*
- Hosted by Prof. H. E. Türeci.

Quantum Computing Hard- and Software Summer School 2022, EPFL

Lausanne, Switzerland

Invited lecture

17.06.2022

- *Quantum computing applications for quantum chemistry.*

Loyola University Maryland and Brookhaven National Lab

Online

Invited seminar

01.06.2022

- *Quantum Neural Networks and their application to generative learning* (with Dr. C. Zoufal).
- Workshop on Quantum Computing and Quantum Machine Learning Algorithms for High Energy Physics, hosted by Dr. K. Benslama.

Friedrich-Alexander University Erlangen-Nuremberg

Online

Invited seminar

23.02.2022

- *Learning to measure: adaptive informationally complete generalized measurements for quantum algorithms.*
- Hosted by Prof. M. Hartmann's group.

University of Insubria

Online

Invited lecture

04.06.2021

- *Quantum Machine Learning* lecture for the course “Introduction to Quantum Technologies” issued by the PhD program in Physics and Astrophysics in collaboration with the European Project QTedu.
- Hosted by Prof. G. Benenti.

Qiskit Global Summer School 2021 on Quantum Machine Learning

Online

Lectures

12-23.07.2021

- Materials and recordings available at <https://www.qiskit.org/learn/summer-school/quantum-computing-and-quantum-learning-2021/>.
- 5000+ registered participants.

University of Pavia, Department of Physics

Pavia, Italy

Lecture notes and interactive Jupyter notebooks

January 2019

- PhD Course on Quantum Computing and Quantum Simulations (Lecturers Prof. C. Macchiavello and Prof. D. Gerace).
- Materials available at <https://github.com/quantumofme/pavia-qiskit-tutorials>.

Syracuse University, College of Arts and Sciences – Physics

Syracuse, NY, USA

Invited seminar

12.10.2017

- *Electromechanical Quantum Simulators*.
- Hosted by Prof. M. D. LaHaye.

Outreach & media coverage

Nature Portfolio

Online

Cross-journal collection

08.10.2024

- The work “An Artificial Neuron Implemented on an Actual Quantum Processor” (with Chiara Macchiavello, Dario Gerace and Daniele Bajoni) was included in the Nature Portfolio’s Nobel Prize in Physics 2024 cross-journal collection, see <https://www.nature.com/collections/ehbjaiifcgc>.

Open Data Science Conference meetup, IBM Think Summit

IBM Studios, Milan, Italy

Invited public speech

21.06.2019

- *Quantum Machine Learning, Algoritmi e Tecnologie*.

University of Pavia, Department of Physics

Pavia, Italy

Seminar

14.06.2019

- *La fisica del calcolo: dalla macchina di Turing al computer quantistico* (with Dr. A. Bisio).
- Part of an internship program for high school students.

University of Pavia, Department of Physics

Pavia, Italy

Seminar

30.10.2018

- *L'alba dei processori quantistici: fisica, tecnologie, e applicazioni* (with Prof. D. Gerace).
- Part of the seminar series “Incontri del Martedì”.

MIT Technology Review

Online

Article

16.11.2018

- The arXiv:1811.02266 pre-print version of the work “An Artificial Neuron Implemented on an Actual Quantum Processor” (with Chiara Macchiavello, Dario Gerace and Daniele Bajoni) was highlighted in the MIT Technology Review, see website <https://www.technologyreview.com/s/612435/machine-learning-meet-quantum-computing/>.

Peer review & conference committees

Reviewer

Nature Publishing Group, American Physical Society, IEEE and others

2020 – present

- Regular reviewer for Nature Communications, npj Quantum Information, Physical Review Letters, PRX Quantum, Physical Review X, Physical Review Applied, Physical Review A, Quantum, Scientific Reports, IEEE Transactions on Quantum Engineering and others.
- Reviewer of conference abstracts for QIP (Quantum Information Processing) and TQC (Theory of Quantum Computation, Communication and Cryptography).

IEEE QCE (International Conference on Quantum Computing and Engineering) 2025

Albuquerque, NM, USA

Program committee member

- Conference program committee member for the Quantum Algorithms (QALG) track.

QTML (Quantum Techniques in Machine Learning) 2024

Melbourne, Australia

Program committee member

- Conference program committee member.

IEEE QCE (International Conference on Quantum Computing and Engineering) 2024

Montréal, Canada

Program committee member

- Conference program committee member for the Quantum Algorithms (QALG) track.

ISC High Performance 2024

Hamburg, Germany

Program committee member

- Conference program committee member for the Quantum Computing track.

IEEE QCE (International Conference on Quantum Computing and Engineering) 2023

Bellevue, WA, USA

Program committee member

- Conference program committee member for the Quantum Applications (QAPP) track.

Program committee member

- Conference program committee member.

Languages

Italian Native proficiency

English Professional proficiency

French Intermediate proficiency