

UNIVERSITÀ DEGLI STUDI DI MILANO

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Codice concorso 4445

**CLAUDIA BENEDETTI
CURRICULUM VITAE**

INFORMAZIONI PERSONALI (NON INSERIRE INDIRIZZO PRIVATO E TELEFONO FISSO O CELLULARE)

COGNOME	Benedetti
NOME	Claudia
DATA DI NASCITA	15-03-1986

 Work Experiences

- 06/2017 – now **Research Associate - PostDoc**, *Università degli Studi di Milano*, Physics Department, (Assegnista tipo A - reconfirmed).
- 06/2015 – 05/2017 **Research Associate - PostDoc**, *Università degli Studi di Milano*, Physics Department, (Assegnista tipo B).

 Education

- Jan 2015 **PhD in Physics**, *Università degli Studi di Milano*,
Supervisor: Prof. Matteo Paris.
Thesis title: Decoherence, non-Markovianity and quantum estimation in qubit systems subject to classical noise.
- Apr 2011 **Master in Physics**, *Università degli Studi di Modena e Reggio Emilia*,
110/110 cum laude,
Thesis Supervisor: Prof. Paolo Bordone.
Thesis title: Entanglement dynamics of two non-interacting continuous-time quantum walks.
- Oct 2008 **Bachelor in Physics**, *Università degli Studi di Modena e Reggio Emilia*,
110/110 cum laude,
Thesis supervisor: Prof. Giorgio Rossi.
Thesis title: Measurement of morphological and electronic properties of Cu(332) vicinal surfaces.
- July 2005 **Maturità linguistica**, *Liceo A.F. Formigini, Sassuolo (MO)*,
100/100.

Research activity

- Main interests** Quantum walks, Open quantum systems and classical noise, Quantum non-Markovianity, Quantum estimation theory, Quantum probes, Quantum algorithms, Quantum simulators.
- Brief description** I am currently a postdoc at the 'Quantum Technology Lab', led by Prof. M. Paris, at the University of Milan. My area of research is quantum information theory, with particular focus on the topics of continuous-time quantum walks, quantum probing, quantum algorithms, decoherence and classical noise affecting quantum systems. My activity is mainly theoretical, and I have thorough expertise in both analytical and numerical techniques. During my PhD I got acquainted with the concept of classical noise applied to quantum systems of qubits. In this context, I analyzed different aspects of the model, such as the dynamics of entanglement and quantum non-Markovianity. During my first postdoc, which was funded within the European QuProCS project (Quantum Probes for Complex Systems), I gained expertise on the concepts of quantum estimation theory and quantum probing. I applied these knowledges to characterize classical noise and complex systems exploiting a single qubit as a quantum probe. In my years as a postdoc, I also worked on noisy models of continuous-time quantum walks on graphs, to study their transport properties and to access their capability to enhance the speedup of quantum algorithms. In particular, I brought together the concepts of quantum walks and classical noise and I analyzed the transition from quantum to classical walk and the phenomenon of localization. In recent years I studied how to implement an all-optical quantum simulator of qubit dephasing channels to devise and design optimized working regimes.
- Main results** **Decoherence by classical noise** I studied and characterized the dynamics of two qubits subject to classical noise, with deep focus on the effects on quantum correlations and on the non-Markovianity of the quantum map generated by different kinds of stochastic processes. Two works especially had great resonance in the quantum information community. In the first one, in collaboration with Prof. P. Bordone at the University of Modena and Reggio E., I introduced two different configurations for the environment, both giving rise to $1/f$ noise and I analyzed their different effects on a two-qubit system [5], showing that the spectrum alone is not enough to determine the dynamics of quantum correlations and to engineer non-Gaussian colored environments. In the second paper, in collaboration with Prof. S. Maniscalco of Turku University [6], I characterized the non-Markovianity of the single-qubit dephasing map induced by classical non-Gaussian noise, showing that environments with a spectrum that contains a relevant low-frequency contribution are generally non-Markovian. See also Refs. [2, 3, 8, 10, 23]
- Continuous-time quantum walks** In order to describe realistic implementations of continuous-time quantum walks (QWs), I studied a model for a noisy dynamics that takes into account the effects of defects and noise. I introduced time-dependent fluctuations of the tunneling amplitudes between adjacent sites of a graph where the QW dynamics takes place. I could thus observe the emergence of two different dynamical behaviors: slow noise confines the walker into few lattice nodes, while fast noise induces a transition between quantum and classical diffusion over the lattice [12].

The phase transition between the two dynamical regimes may be controlled by tuning the ratio between the noise autocorrelation time and the coupling between the walker and the external noise. This model was then generalized to include spatially correlated fluctuations [19], showing that time-dependent noise assisted by spatial correlations leads to strong memory effects in the walker dynamics and to robust diffusive behavior against the detrimental action of uncorrelated noise. Moreover, the noisy model was then extended to two indistinguishable interacting particles [16]. We observed that the combined effect of particle interaction and fast noise provides a faster propagation compared to the noiseless case. Computational tools were developed to compute the dynamics of many-particle QW [18]. These works involved collaborations with groups at the University of Turku and Modena and Reggio E.

Very recently, together with colleagues at the University of Milan, I introduced a fidelity-based measure to quantify the differences in the dynamics of a classical and of a quantum walk over a graph [31]. We showed that the difference is entirely due to the emergence of quantum features at short times, while in the long-time limit, quantumness and the different nature of the dynamics generators contribute equally.

Quantum probing I started working in this research field within the QuProCS-project. In this context, I investigated different relevant scenarios studying the maximum amount of information that can be extracted from a complex system using a quantum probe. In this context, I had the chance to work together with different national and international groups (a list of all my collaborators is reported further ahead in this document). My work can be summarized as follows:

- (A) qubits as quantum probes for classical noise [7,9], where I derived analytic bounds to the estimation precision of the noise parameters;
- (B) qubits as quantum probes for quantum structured environments [21,26,27,29,32], where, by using a single and a two-qubit probe, I analyzed the limits in inferring parameters of a bosonic bath, such as cutoff frequency or temperature (thermometry), for different kinds of system-bath interactions and probe preparations;
- (C) quantum walks as quantum probes for complex networks [13,25], in order to estimate key parameters of network, such as the coupling strength. In this context, we introduced a new tool, the Feynman probe, and we showed that the saturation of the quantum Cramér-Rao bound, may be achieved by a two-step scheme employing Feynman probes followed by local measurements.

All-optical quantum simulators Since 2016 I have a collaboration with the experimental group of Prof. Cialdi at the University of Milan, to study and implement simulators of qubit dephasing channels, originating from the interaction with a classical fluctuating field. This single-qubit simulator allowed us to both unveil a novel source of non-Markovianity for the dynamics of quantum systems, that we called 'non-Markovianity by undersampling' and to investigate the different nature of the notion of non-Markovian classical process and non-Markovian quantum dynamics [17,20,28]. In 2020 we presented an all-optical implementation of the whole class of two-qubit dephasing channels. We exploited our simulator to demonstrate the transition from a local-noise scenario to a global noise and we investigated two different mechanisms that lead to this transition [30].

Activity in brief

Publications	Author of 32 publications in peer-reviewed journals
Conferences & Workshops	7 oral presentations as invited speaker, 6 oral presentations as contributed speaker, 5 poster presentations
Teaching	17h in PhD courses; >100h in Bachelor courses
Co-Supervising	Co-supervisor of 3 master thesis and 9 bachelor thesis

Bibliometric parameters

Indices	h-index 15, total citations 531 (Sept 2020, <i>Web of Science</i>) h-index 16, total citations 566 (Sept 2020, <i>Scopus</i>) h-index 18, total citations 781 (Sept 2020, <i>Google Scholar</i>)
IDs	Orcid 0000-0002-8112-4907 ResearcherID: E-3129-2014 Scopus Author ID: 55194651400

Publications

Peer-reviewed journals

32. D. Tamascelli, C. Benedetti, H.-P. Breuer, M. G.A. Paris, *Quantum probing beyond pure dephasing*, New J. Phys. **22**, 083027 (2020).
31. V. Gultieri, C. Benedetti, M. G. A. Paris, *Quantum-classical dynamical distance and quantumness of quantum walks*, Phys. Rev. A **102**, 012201 (2020).
30. C. Benedetti, V. Vento, S. Olivares, M. G. A. Paris, and S. Cialdi, *Experimental realization of a local-to-global noise transition in a two-qubit optical simulator*, Phys. Rev. A **101**, 032348 (2020).
29. F. Gebbia, C. Benedetti, F. Benatti, R. Floreanini, M., Bina, M. G. A. Paris, *Two-qubit quantum probes for the temperature of an Ohmic environment*, Phys. Rev. A **101**, 032112 (2020).
28. S. Cialdi, C. Benedetti, D. Tamascelli, S. Olivares, M. G. A. Paris, B. Vacchini *Experimental investigation of the effect of classical noise on quantum non-Markovian dynamics* Physical Review A **100** (5), 052104 (2019).
27. S. Razavian, C. Benedetti, M. Bina, Y. Akbari-Kourbolagh, M. G. A. Paris *Quantum thermometry by single-qubit dephasing* Eur. Phys. J. Plus **134**, 284 (2019) .
26. F. Salari Sehdaran, M. Bina, C. Benedetti and M. G. A. Paris *Quantum Probes for Ohmic Environments at Thermal Equilibrium* Entropy **21**, 486 (2019).
25. L. Seveso, C. Benedetti, M. G. A. Paris *The walker speaks its graph: global and nearly-local probing of the tunnelling amplitude in continuous-time quantum walks* J. Phys.A: Math. Theo. **52**, 105304 (2019).
24. C. Benedetti, M. A. C. Rossi, M. G. A. Paris *Continuous-time quantum walks on dynamical percolation graphs* EPL, **124**, 60001 (2018).

23. S. Daniotti, C. Benedetti, M. G. A. Paris
Qubit systems subject to unbalanced random telegraph noise: quantum correlations, non-Markovianity and teleportation
Eur. Phys. J. D **72**, 208 (2018).
22. Beggi, I. Siloi, C. Benedetti, E. Piccinini, L. Razzoli, P. Bordone and M. G. A. Paris,
Back and forth from Fock space to Hilbert space: a guide for commuters,
Eur. J. Phys. **39**, 065401 (2018).
21. C. Benedetti, F. S. Sehdaran, M. H. Zandi, M. G. A. Paris,
Quantum probes for the cutoff frequency of Ohmic environments,
Phys. Rev. A **97**, 012126 (2018).
20. M.A.C. Rossi, C. Benedetti, D. Tamascelli, S. Cialdi, S. Olivares, B. Vacchini, M.G.A. Paris,
Non-Markovianity by undersampling in quantum optical simulators,
Int. J. Quantum Inform. **15**, 1740009 (2017).
19. M. A. C. Rossi, C. Benedetti, M. Borrelli, S. Maniscalco, M. G. A. Paris,
Continuous-time quantum walks on spatially correlated noisy lattices,
Phys. Rev. A **96**, 040301(R) (2017).
18. E. Piccinini, C. Benedetti, I. Siloi, M.G.A. Paris, P. Bordone,
GPU-accelerated algorithms for many-particle continuous-time quantum walks,
Comp. Phys. Comm. **215**, 235 (2017).
17. S. Cialdi, M.A.C. Rossi, C. Benedetti, B. Vacchini, D. Tamascelli, S. Olivares, M.G.A. Paris,
All-optical quantum simulator of qubit noisy channels,
Appl. Phys. Lett. **110**, 081107 (2017).
16. I. Siloi, C. Benedetti, E. Piccinini, J. Piilo, S. Maniscalco, M. G. A. Paris, P. Bordone,
Noisy quantum walks of two indistinguishable interacting particles,
Phys. Rev. A **95**, 022106 (2017).
15. F. Galve, A. Mandarino, M. G. A. Paris, C. Benedetti, R. Zambrini,
Microscopic description for the emergence of collective dissipation in extended quantum systems,
Sci. Rep. **7**, 42050 (2017).
14. C. Benedetti, F. Galve, A. Mandarino, M. G. A. Paris, R. Zambrini,
Minimal model for spontaneous quantum synchronization,
Phys. Rev. A **94**, 052118 (2016).
13. D. Tamascelli, C. Benedetti, S. Olivares, M. G. A. Paris,
Estimation of the coupling parameter in a linear lattice by Feynman probes,
Phys. Rev. A **94**, 042129 (2016).
12. C. Benedetti, F. Buscemi, P. Bordone, and M. G. A. Paris,
Non-Markovian continuous-time quantum walks on lattices with dynamical noise,
Phys. Rev. A **93**, 042313 (2016).
11. M. Brunelli, C. Benedetti, S. Olivares, A. Ferraro and M. G. A. Paris,
Single- and two-mode quantumness at a beam splitter,
Phys. Rev. A **91**, 062315 (2015).
10. M. A. C. Rossi, C. Benedetti and M. G. A. Paris,
Engineering decoherence for two-qubit systems interacting with a classical environment,
Int. J. Quantum Inform. **12**, 1560003 (2014).

9. C. Benedetti and M. G. A. Paris,
Characterization of classical Gaussian processes using quantum probes,
Phys. Lett. A **378**, 2495 (2014).
8. C. Benedetti and M. G. A. Paris,
Effective dephasing for a qubit interacting with a transverse classical field,
Int. J. Quantum Inf. **12**, 1461004 (2014).
7. C. Benedetti, F. Buscemi, P. Bordone, M. G. A. Paris,
Quantum probes for the spectral properties of a classical environment,
Phys. Rev. A **89**, 032114 (2014).
6. C. Benedetti, M. G. A. Paris, S. Maniscalco,
Non-Markovianity of colored noisy channels,
Phys. Rev. A **89**, 012114 (2014).
5. C. Benedetti, F. Buscemi, P. Bordone, M. G. A. Paris,
Dynamics of quantum correlations in colored-noise environments,
Phys. Rev. A **87**, 052328 (2013).
4. C. Benedetti, A. P. Shurupov, M. G. A. Paris, G. Brida, M. Genovese,
Experimental estimation of quantum discord for a polarization qubit and the use of fidelity to assess quantum correlations,
Phys. Rev. A **87**, 052136 (2013).
3. C. Benedetti, F. Buscemi, P. Bordone, M. G. A. Paris,
Effects of classical environmental noise on entanglement and quantum discord,
Int. J. Quantum Inform. **10**, 1241005 (2012).
2. P. Bordone, F. Buscemi, C. Benedetti,
Effect of Markov and Non-Markov Classical Noise on Entanglement Dynamics,
Fluctuation and Noise Letters, Vol. **11**, No. 3 (2012) 1242003.
1. C. Benedetti, F. Buscemi, P. Bordone,
Quantum correlations in continuous-time quantum walks of two indistinguishable particles,
Phys. Rev. A **85**, 042314 (2012).

Book chapters

1. C. Benedetti, S. Cialdi, M.A.C. Rossi, B. Vacchini, D. Tamascelli,
S. Olivares, M.G.A. Paris,
Quantum Simulation of Non-Markovian Qubit Dynamics by an All-Optical Setup
In: Bortignon P., Lodato G., Meroni E., Paris M., Perini L., Vicini A. (eds) *Toward a Science Campus in Milan*, CDIP 2017. Springer, Cham. (2018). ISBN 978-3-030-01628-9

Proceedings

2. I. Siloi, C. Benedetti, E. Piccinini, M. G. A. Paris, P. Bordone
Quantum walks of two interacting particles on percolation graphs
in J. Phys.: Conf. Ser. **906** 012017 (2017).
1. C. Benedetti, F. Buscemi, P. Bordone, M. G. A. Paris
Time-evolution of entanglement and quantum discord of bipartite systems subject to $1/f$ noise
in Proc. 22nd Int. Conf. on Noise and Fluctuations (ICNF), 24-28
June 2013 (Montpellier, France), 2013 © IEEE, doi: 10.1109/ICNF.2013.6578952

Peer reviewer activity

I am a referee for the following peer-reviewed journals: *Physical Review X*, *Physical Review A*, *New Journal of Physics*, *Scientific Report*, *Physics Letters A*, *Europhysics Letters*, *European Physical Journal D*,.

Scientific visits

- 08-11 Lugl 2019 **University of Kassel**, (Germany), Visiting Researcher in the group of Prof. C. Koch at the Institute of Physics.
- 01-19 Apr 2019 **KAVLI Institute for Theoretical Physics**, (KITP), Santa Barbara, CA (USA).
I was invited to take part to the Program: 'Open Quantum System Dynamics: Quantum Simulators and Simulations Far from Equilibrium'
- 18-22 July 2016 **Albert-Ludwigs Universitaet Freiburg**, (Germany), at Department for Quantum Optics and Statistics, Visiting Researcher in the group of Prof. A. Buchleitner.
- 29/01 – 25/02 2016 **University of Turku**, (Finland), at the Turku Center for Quantum Physics, Visiting Researcher in the group of Prof. S. Maniscalco.
- 01/05 – 31/10 2014 **IFISC** , Instituto de Fisica Interdisciplinar y Sistemas Complejos - Universitat de les Illes Balears (UIB), Palma de Mallorca (Spain), Visiting Student in the group of Prof. R. Zambrini.
- 22/03 – 22/09 2013 **Heriot-Watt University**, Edinburgh, Scotland (United Kingdom), Visiting Student in the group of Prof. S. Maniscalco.

Conferences, Seminars and Schools

Talks as invited speaker

- 2019 *Non-classicality of quantum walks*
IQIS 2019 - 12th Italian Quantum Information Science Conference, Milano, 9 - 12 Sept. 2019
- 2016 *Characterization of quantum walks by local measurements and Feynman probes*
Quantum Technologies on the Move Workshop, Turku Archipelago 19-23 June 2016
- 2016 *Non-Markovian continuous-time quantum walks on lattices with dynamical noise*
1st QuProCS meeting Milan 8-10 March 2016
- 2016 *Quantum probes for complex classical systems*
Recent Advances in Quantum Metrology Workshop, Warsaw 2-4 March 2016
- 2015 *Dynamics of noisy quantum walks*
NMQD15 - Non Markovian Quantum Dynamics Workshop, Cortona (AR) 24 - 28 August 2015
- 2014 *Decoherence, non-Markovianity and quantum estimation in qubit systems subject to colored noise*
IQIS 2014 - 7th Italian Quantum Information Science Conference, Salerno, 15 - 19 Sept. 2014,
- 2013 *Non-Markovianity of a qubit subject to colored noise*
Twin Workshop on Complex Quantum Systems Ackergill Tower, Wick, Scotland, 27-30 May 2013

Contributed talks

- 2019 *Continuous-time quantum walks on dynamical percolation graphs*
3rd Workshop of Condensed Matter Highlights, Milano, 15 February 2019.

- 2019 *Quantum search on random networks*
Quantum Digital Winter 2019, Milano, 06 February 2019.
- 2018 *Quantum probes for the cutoff frequency of Ohmic environments*
3rd QuProCS meeting, Oxford, UK, 21-23 March 2018.
- 2017 *Characterization of qubit chains by Feynman probes*
IQIS 2017 - 10th Italian Quantum Information Science Conference, Firenze, 12-15 September 2017.
- 2017 *Characterization of qubit chains by Feynman probes*
2nd QuProCS meeting, Palma de Mallorca (Spain), 6-7 April 2017
- 2012 *Time-evolution of quantum correlations under different classical noises*
Quantum Square - Student conference on mathematical and theoretical aspects of Quantum Mechanics, Nottingham UK, 7 - 9 November 2012

Poster contributions

- 2018 *Quantum simulation of qubit noisy channels by an all-optical setup*
IQIS 2018 - 11th Italian Quantum Information Science conference Catania, Italy, 17-20 Sept. 2018
- 2017 *All-optical quantum simulator of qubit noisy channels*
Congresso del Dipartimento di Fisica, Università degli Studi di Milano, Milano 28-29 June 2017.
- 2013 *Non-Markovianity of colored noisy channels*
IQIS 2013 - 6th Italian Quantum Information Science Conference Como Italy, 24 - 26 Sept. 2013
- 2012 *Time evolution of quantum correlations under classical colored noise*
IQIS 2012 - 5th Italian Quantum Information Science Conference, Padova Italy, 26 - 28 Sept. 2012
- 2012 *Effects of classical environmental noise on entanglement dynamics*
Quantum 2012 - Advances in Foundations of Quantum Mechanics and Quantum Information with atoms and photons, I.N.Ri.M. Torino Italy, 22 - 25 May 2012

Seminars as guest speaker

- 2019 *Continuous-time quantum walks on dynamical noisy graphs*
Quantum Dynamics and Control Group, University of Kassel - 9th July 2019
- 2019 *Quantum systems and dynamical classical noise: from environmental engineering to quantum simulators*
KITP (Kavli Institute for Theoretical Physics), Santa Barbara, CA (USA), April 2019.
- 2014 *Decoherence, non-Markovianity and quantum estimation in qubit systems subject to colored noise*
IFISC (Institute for Cross-Disciplinary Physics and Complex Systems), Palma de Mallorca (Spain), June 2014 (Group of Prof. R. Zambrini)

Attended Schools

- 2018 Quantum Complex Systems out of Equilibrium, Lake Como School of Advanced Studies, 29 Lug - 3 August 2018, Villa del Grumello, Como (Italy)
- 2013 QSNOW2013 -Winter School in Quantum Communications, 4 - 8 Feb 2013, Astrophysical Observatory of Asiago, via Osservatorio 8, 36012 Asiago (Italy)
- 2012 21st Summer School of Parallel Computing, 30 - 14 Sept 2012, CINECA supercomputing center, via Magnanelli 6/3, Casalecchio di Reno, Bologna (Italy)

- 2009 JCNS Laboratory Course - Neutron Scattering, 6 - 18 Sep 2009, Forschungszentrum Jülich/ Reactor FRM II Garching, Munich, (Germany)

Academic Honors, Awards and Fundings

- 08/07/2020 **Abilitazione Scientifica Nazionale**, (ASN), MIUR - Italian Ministry of University and research.
Academic Recruitment Field 02/B2 - Fisica Teorica della Materia (Seconda fascia)
Valid from 08/07/2020 to 08/07/2029.
- 2017 **Best Poster Award**, Physics Department congress, 28/29 June 2017, Aula Chiasini, Dipartimento di Matematica, University of Milan.
- 2014 **Erasmus+ Placement LLP Scholarship**, IFISC - Instituto de Fisica Interdisciplinar y Sistemas Complejos- Universitat de les Illes Balears (UIB), Palma de Mallorca (Spain), 4 months.
- 2013 **Erasmus Placement LLP Scholarship**, Heriot-Watt University, Edinburgh, Scotland (UK), 6 months.

Project participation

- 2015-2018 **QuProCS** - Quantum Probes for Complex Systems, EU H2020 FET Proactive 641277.
I participated, as a member, to the scientific research activity of QuProCS in the Milano Unit. UniMI Node Coordinator: Prof. M. Paris.

Main collaborations

I list my main national and international collaborations, outside the University of Milan.

- Since 2019 **Università di Trieste**, (Italy), with the group of **Fabio Benatti**. Our collaboration focused on the temperature estimation for a bosonic bath at equilibrium, comparing the performances of a single and a two-qubit probe [29]. .
- Since 2018 **University of Freiburg**, (Germany), with **Heinz-Peter Breuer**. We studied the precision of the estimation of a quantum bath using a single-qubit probe and going beyond the traditional paradigm of pure dephasing [32]. .
- Since 2018 **Azarbaijan Shahid Madani University**, Tabriz (Iran), with **Sholeh Razavian**. We worked on quantum thermometry by a single qubit, see [27]. .
- Since 2017 **University of Kerman**, (Iran), with **Fahimeh Salari Sehdaran**. We worked on the estimation of the cutoff frequency of Ohmic environments, see [21,26]. .
- Since 2016 **University of Turku**, (Finland), with the group of **Sabrina Maniscalco**. We worked together on a model of noisy two-particle quantum walk [16] and on a single-particle quantum walk in the presence of spatial correlations [19]. .
- Since 2015 **IFISC (UIB-CSIC)**, Palma de Mallorca, (Spain), with the group of **Roberta Zambrini**. We worked together on a model for spontaneous synchronization [14] and on a study on the physical mechanisms responsible for the emergence of collective dissipation [15]. .
- 2014 **Heriot-Watt University**, Edinburgh, (Scotland, UK), with the group of **Sabrina Maniscalco**. We worked together on the non-Markovianity of dephasing map arising from classical noise, see [6].

Since 2011 **Università degli Studi di Modena e Reggio Emilia**, (Italy), with the group of **Paolo Bordone**. We worked together on quantum systems subject to classical noise and quantum walks, see [1,2,3,5,7,12,16,18,22].

I also have ongoing collaborations with: Lincoln Carr at the Colorado School of Mines on a study on many-body systems with classical noise; Christiane Koch at the Freie Universität Berlin on a study on network optimization; Ilaria Siloi at the USC California on the implementation of QW on quantum computers; Andrea Crespi at the Milano Politecnico on an experimental implementation of the spatial search algorithm.

Organizational skills

- 2020 **Co-Chairperson and Organizing Committee** - YIQIS 2020 - Young Italian Quantum Informations Science Conference. Online event - Worldwide. 28 Sept - 2 Oct 2020. <https://agenda.infn.it/e/yiqis2020>
- 2019 **Local Organizing Committee** - IQIS 2019 - 12th Italian Quantum Informations Science Conference. Milano, Italia. 09 - 12 Sept 2019.
- 2018 **Chairperson and Organizing Committee** - QTech Fall Workshop 2018 Dip. di Fisica "Aldo Pontremoli", Università degli studi di Milano, Italia. Series of seminars from 30th Oct to 19th Dec 2018.
- 2016 **Organizing committee** of the 1st QuProCS meeting, Milano, Italia. 8-10 March 2016.

Teaching activity

PhD Courses

- A.A. 2019/2020 **Quantum Coherent Phenomena**
- A.A. 2018/2019 Physics, Astrophysics and Applied Physics PhD School, University of Milan. Lecturer for one module (6 hours). Topics: Discrete- vs Continuous-time Quantum Walks (QWs); Quantum search Algorithms based on QWs; Physical implementations of QWs
- A.A. 2019/2020 **Quantum Computing: Theory, Models and Methods** PhD school in Computer Science, University of Milan. Lecturer for the module 'Quantum Random Walks for Algorithm Design' (5 hours). Topics: QWs on the line; QWs on graphs; Spatial search by QWs.

Teaching assistant

Teaching and tutoring activity done under contract - Art.45: Attività didattica integrativa.

- A.A. 2019/2020 **Fisica generale** - Bachelor in Chemistry (45 hours) , University of Milan. Topics: Classical mechanics, Thermodynamics, Electromagnetism.
- A.A. 2018/2019 **Fisica generale** - Bachelor in Chemistry (40 hours) , University of Milan. Topics: Classical mechanics, Thermodynamics, Electromagnetism.
- A.A. 2017/2018 **General physics** - Bachelor in computer science (16 hours), University of Milan. Topics: Classical mechanics, Thermodynamics.

Tutoring

A.A. 2009/2010 **Physics I**

Teaching assistant/tutoring (24 hours) for the Bachelor in Chemistry, University of Modena and Reggio Emilia. Topics: Classical mechanics.

Invited Lectures

03 June 2019 *EPR paradox and Bell inequalities,*

21 May 2018 Invited lecture at the University of Modena and Reggio Emilia within the course

25 May 2017 'Quantum Mechanics' of the Bachelor in Physics.

Supervising activity

I was co-supervisor (correlatrice) for the following master and bachelor thesis:

Master students

- 2019 Valeria Vento, *Experimental evidence of local-to-common noise transition in entangled two-qubit systems*, Physics Department, University of Milan, Supervisor: Prof. S. Cialdi.
- 2018 Giacomo Serafini, *Quantum walk on a vibrating lattice and its numerical study with a GPU-accelerated algorithm*, Milan Politecnico, Dipartimento di Elettronica, Informazione e Bioingegneria, Supervisor: Prof. R. Osellame.
- 2016 Claudio Sanavio, *Spatial search by quantum walks on irregular random graphs*, Physics Department, University of Milan, Supervisor: Prof. M. Paris.

Bachelor students

- 2020 Francesco Zatelli, *Scattering as a quantum metrology problem: a quantum walk approach*, UniMI, Physics Department, Supervisor: Prof. M. Paris.
- 2019 Luca Bernardi, *Assessing the topology of quantum thermometers*, Physics Department, University of Milan, Supervisor: Prof. M. Paris.
- 2019 Gabriele Bressanini, *Non-classicality of noisy quantum walks*, Physics Department, University of Milan, Supervisor: Prof. M. Paris.
- 2019 Valentina Gualtieri, *A quantitative approach to nonclassicality of quantum walks*, Physics Department, University of Milan, Supervisor: Prof. M. Paris.
- 2018 Stefano Barison, *Quantum state transfer in noisy spin chains*, Physics Department, University of Milan, Supervisor: Prof. M. Paris.
- 2018 Simone Daniotti, *Quantum teleportation in the presence of random telegraph noise*, Physics Department, University of Milan, Supervisor: Prof. M. Paris.
- 2016 Lorenzo Tiberi, *Quantum walks and single-step implementation via linear optics*, Physics Department, University of Milan Supervisor: Dr. S. Olivares.
- 2015 Laura Iacconi, *La Transizione dalla Meccanica Quantistica alla Fisica Classica: Decoerenza e Darwinismo Quantistico*, Physics Department, University of Modena and Reggio Emilia, Supervisor: Dr. P. Bordone.
- 2013 Silvia Cotroneo, *Estimation of relaxation time of classical complex systems by quantum probes*, University of Milan, University of Milan, Supervisor: Prof. M. Paris.

I am currently co-supervising two bachelor students' thesis:

- Matteo Garbellini, Thesis supervisor: Prof. M. Paris;
- Giacomo Riccardo Hvaring, Thesis supervisor: Prof. S. Olivares

Outreach activity

- 07 May 2019 *Il Magico mondo dei quanti*, Public lecture for 4th- and 5th-year high school students at the Levi High School in S.Donato Milanese (Milan).
- 14 Marzo 2017 Public lecture (*Breve*) *Introduzione alla meccanica quantistica ed alle sue applicazioni*, A meeting with Liceo Banfi of Vimercate students, at the physics, Department, University of Milan.
- 29 Nov 2016 Public lecture *The BIG BELL TEST*, Physics department, Milan. This seminar was part of the project "Engage sulla fisica moderna" for high schools.
- Dic 2013 Public lecture *Il magico mondo dei quanti*, Istituto Tecnico Industriale Statale "Fermo Corni" (Modena), within the Science Week.

Other skills

Computer skills

- OS Linux, Mac OS , Windows
- Languages Fortran 90, Python, Bash, C.
- Software Mathematica, XMGrace , LaTeX, Matlab, Microsoft office

Linguistic skills

- Italian Mother tongue
- English Fluent
- Spanish Basic knowledge

Data 14-09-2020

Luogo Reggio Emilia (RE)