Francesco Arzani

Researcher in quantum information and quantum optics

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Academic and professional experience

09/2023–current	**Junior professor**, *INRIA Paris and École Normale Supérieure – Paris, France*, QAT team
05/2021–08/2023	**Consultant**, *Xanadu Quantum Technologies – Toronto, Ontario, Canada (remote)*
09/2020–08/2023	**Post-doctoral researcher**, *Freie Universiät Berlin – Quantum information theory, quantum many-body theory, and quantum optics group,* Supervisor: Prof. Jens Eisert
10/2018–10/2019	**Post-doctoral researcher**, *MOCQUA team – Loria, Nancy & Quantum Information group – Laboratory of Informatics of Paris 6,* Supervisors: Dr. Damian Markham, Dr. Simon Pedrix
04/2018–9/2018	**Post-doctoral researcher**, *Université Paris Diderot & Paris center for quantum computing,* Supervisors: Dr. Damian Markham, Dr. Iordanis Kerenidis

Education

01/2015–03/2018	**PhD in Physics**, *École Normale Supérieure, Paris; Kastler Brossel Laboratory,* Thesis: "Measurement-based quantum information with optical frequency combs", Supervisors: Prof. Nicolas Treps & Prof. Claude Fabre Funding: Paris Sciences Lettres Research University
10/2012–12/2014	**Master's degree in Theoretical Physics**, *Università degli Studi di Pavia,* Master's thesis: "Measurement-based quantum information with optical frequency combs", Supervisor: Prof. Chiara Macchiavello; Co-supervisors Prof. Nicolas Treps & Dr. Giulia Ferrini Grade: 110/110 cum laude (with honours)
02/2014–08/2014	**Master's internship**, *Quantum Optics group – Kastler Brossel Laboratory, Université Paris 6 Pierre et Marie Curie*
09/2013–07/2014	**ERASMUS exchange period**, *Université Paris 6 Pierre et Marie Curie*
09/2009–10/2012	**Bachelor's Degree in Physics**, *Università degli Studi di Pavia,* Bachelor's thesis: "An informational approach to quantum thermodynamics beyond the von Neumann Regime", Supervisor: Dr. Paolo Perinotti Grade: 110/110
2009	**High school diploma**, *Liceo scientifico tecnologico, IIS "Guglielmo Marconi"*, Tortona Grade: 100/100 cum Laude (with honours)

Awards and fellowships

09/2020–08/2022	**Humboldt postdoctoral fellowship**, *Freie Universität Berlin*
09/2009–07/2015	**Student at IUSS**, *Istituto Universitario di Studi Superiori, Pavia*
09/2009–07/2014	**Student at Collegio Ghislieri**, *Pavia*, Residence for university students with merit based admission

Teaching and outreach

10/2023–02/2024	**Instructor**, *École Normale Supérieure – Paris Sciences Lettres ,* Quantum computing (M2), Quantum engineering master
10/2023–02/2024	**Instructor**, *École Normale Supérieure – Paris Sciences Lettres,* Quantum programming (M2), Quantum engineering master

11/2021–03/2022	**Teaching assistant**, *Freie Universitat Berlin*, Quantum information (Master's level)
11/2019	**Fête de la Science**, *Sorbonne Univérsité*, Presentation of quantum information to high school students
09/2018–12/2018	**Teaching assistant and lab demonstrator (Vacataire)**, *Univérsité d'Évry val d'Essonne*, Introduction to experimental physics (Bachelor's level)

Academic reviewing

Phys. Rev. Lett., Phys. Rev. A, Quantum Journal, JOSA B, Eur. Phys. J. D, Optics Express, QIP (conference)

Languages

Native	Italian
Fluent	English, French
Basic	German

Computer Skills

Operating systems	Unix/Linux, Windows
Programming languages	Mathematica, Python, Julia, C++

Publications

Journal articles (peer reviewed)

○ *Exploiting symmetry in variational quantum machine learning.*
J. J. Meyer, M. Mularski, E. Gil-Fuster, A. A. Mele, **F. Arzani**, A. Wilms, J. Eisert
Physical Review X Quantum 4, 010328 (2023). (arxiv:2205.06217).

○ *Gottesman-Kitaev-Preskill codes: A lattice perspective.*
J. Conrad, J. Eisert, **F. Arzani**
Quantum 6, 648 (2022). (arxiv:2109.14645)

○ *Random coding for sharing bosonic quantum secrets.*
F. Arzani, G. Ferrini, F. Grosshans, D. Markham
Physical Review A 100 (2), 022303 (2019). (arXiv:1808.06870)

○ *Bloch-Messiah reduction for twin beams of light.*
D. B. Horoshko, L. La Volpe, **F. Arzani**, N. Treps, C. Fabre, M. I. Kolobov
Physical Review A 100 (1), 013837(2019). (arXiv:1903.06578)

○ *High-dimensional quantum encoding via photon-subtracted squeezed states.*
F. Arzani, A. Ferraro, V. Parigi
Physical Review A 99 (2), 022342 (2019). (arXiv:1811.09263)

○ *Violating Bell inequalities with entangled optical frequency combs and multi-pixel homodyne detection.*
W. N. Plick, **F. Arzani**, N. Treps, E. Diamanti, D. Markham
Physical Review A 98 (6), 062101 (2018). (arXiv:1805.06059)

○ *Reconfigurable optical implementation of quantum complex networks.*
J. Nokkala, **F. Arzani**, F. Galve, R. Zambrini, S. Maniscalco, J. Piilo, N. Treps, V. Parigi.
New Journal of Physics 20 (5), 053024 (2018). (arXiv:1708.08726)

○ *Versatile engineering of multimode squeezed states by optimizing the pump spectral profile in spontaneous parametric down-conversion.*
F. Arzani, C. Fabre, N. Treps.
Physical Review A 97 (3), 033808 (2018). (arXiv:1709.10055)

○ *Polynomial approximation of non-Gaussian unitaries by counting one photon at a time.*
F. Arzani, N. Treps, G. Ferrini
Physical Review A 95 (5), 052352 (2017). (arXiv:1703.06693)

○ *Multimode entanglement in reconfigurable graph states using optical frequency combs.*
Y. Cai, J. Roslund, G. Ferrini, **F. Arzani**, X. Xu, C. Fabre, N. Treps.
Nature Communications 8, 15645 (2017). (arXiv:1605.02303)

○ *A direct approach to Gaussian measurement based quantum computation.*

G. Ferrini, J. Roslund, **F. Arzani**, C. Fabre, N. Treps.
Physical Review A 94 (6), 062332 (2016). (arXiv:1605.03350)

○ *Optimization of networks for measurement-based quantum computation.*
G. Ferrini, J. Roslund, **F. Arzani**, Y. Cai, C. Fabre, N. Treps.
Physical Review A 91 (3), 032314 (2015). (arXiv:1407.5318)

Other

○ *Harmonizing continuous noise to build a modular photonic quantum computer.*
F. Arzani
Quantum Views 5, 51 (2021).

○ *Measurement based quantum information with optical frequency combs.*
F. Arzani
PhD Thesis, Paris Sciences Lettres and École Normale Supérieure de Paris (2018)

Talks, conferences, workshops, schools

09/2022
Contributed talk
CQIQC IX,
Conference on quantum information and quantunm control, Fields Institute, Toronto, Canada,
"Gottesman-Kitaev-Preskill bosonic error correcting codes: a lattice perspective"

09/2021
Invited talk
Xanadu,
Xanadu Quantum Technologies, Toronto ON, Canada,
"Gottesman-Kitaev-Preskill bosonic error correcting codes: a lattice perspective"

09/2021
Invited talk
IPP,
Télécom Paris - Institut Polytechnique de Paris, Palaiseau, France,
"Continuous-variable quantum information, multi-mode quantum optics and bosonic error correcting codes "

09/2021
Contributed talk
SAMOP21,
Virtual DPG-Meeting of the Atomic, Molecular, Plasma Physics and Quantum Optics Section (SAMOP),
"Gottesman-Kitaev-Preskill bosonic error correcting codes: a lattice perspective"

08/2019
Contributed talk
CQIQC VIII,
Conference on quantum information and quantunm control, Fields Institute, Toronto, Canada,
"Random coding for sharing bosonic quantum secrets"

11/2018
Contributed talk
Q-Turn 2018,
Workshop on changing paradigms in quantum science, Universidade Federal de Santa Catarina, Florianópolis, Brazil,
"Quantum secret sharing using squeezing and almost any passive interferometer"

11/2018
Contributed talk
JIQ 2018,
Journées d'Informatique Quantique, Laboratoire Lorrain de rechèrce en informatique et ses applications, Nancy, France,
"Quantum secret sharing using squeezing and almost any passive interferometer"

09/2018
Contributed talk
QuTech 2018,
Quantum technology international conference, 1st edition, Kastler Brossel laboratory, Paris, France,
"Versatile engineering of multimode squeezed states by optimizing the pump spectral profile in spontaneous parametric down-conversion"

09/2017
Contributed talk
Workshop on quantum science and technologies,
International Center for Theoretical Physics, Trieste, Italy,
"Polynomial approximation of non-Gaussian unitaries by counting one photon at a time"

05/2017
Invited talk
Photons beyond qubits 2017,
Palacký University, Olomouc, Czech Republic,
"Measurement-based quantum information protocols with optical frequency combs"

04/2017 Contributed talk	**Quantum information and measurement 2017**, *4th edition, Université Pierre et Marie Curie, Paris, France,* "Shaping the Pump of a Synchronously Pumped Optical Parametric Oscillator for Continous - Variable Quantum Information"
11/2016 Poster	**GDR Quantum Information 2016**, *7th colloquium of the CNRS research network on Quantum information, foundations and applications, Télécom ParisTech, Paris, France,* "Shaping the Pump of a Synchronously Pumped Optical Parametric Oscillator for Continous - Variable Quantum Information"
06/2016 Poster	**CEWQO 2016**, *23rd central european workshop on quantum optics,Orthodox Academy of Crete, in Kolymbari, Crete, Greece,* "Quantum Computing with Optical Frequency Combs"
04/2015 Attendance	**International School on Parametric Nonlinear Optics**, *Les Houches School of Physics, Les Houches, France*