Alexey Melnikov

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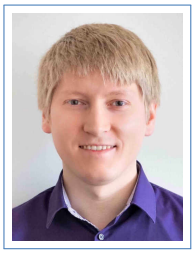

Personal Data

Name	Alexey A. Melnikov
Date of Birth	December 7, 1989
Place of Birth	City of Vladimir, Russia
Citizenship	Russian Federation

Current Areas of Research

Quantum machine learning, reinforcement learning, quantum information and computation, quantum walks

Employment

2018– present	Postdoctoral Research Scientist, Institute for Theoretical Physics, University of Innsbruck.
2013–2018	Ph.D. Researcher and Lecturer, Institute for Theoretical Physics, University of Innsbruck; Institute for Quantum Optics and Quantum Information, Austrian Academy of Sciences.
2012–2013	Graduate Student Researcher, Moscow Institute of Physics and Technology.
2011– present	Research Fellow, Institute of Physics and Technology, Russian Academy of Sciences.
2009	Quantitative Analyst, VTB Capital.

Education

2013–2018	Ph.D. in Physics, University of Innsbruck, Dissertation project: A physics approach to classical and quantum machine learning with applications in quantum experiment, Supervisor: Hans J. Briegel, Co-supervisors: Justus Piater and Gerhard Kirchmair.
2013– present	Cand.Sci. in Physics and Mathematics, Institute of Physics and Technology, Russian Academy of Sciences, Dissertation project: Quantum walks in nanostructures, Supervisor: Leonid E. Fedichkin.

2011–2013 M.Sci. in Applied Mathematics and Physics,
Moscow Institute of Physics and Technology, Graduated with honours,
Dissertation project: Evolution of solid-state quantum system states in noisy environment (passed at A-level),
Supervisor: Leonid E. Fedichkin.

2007–2011 B.Sci. in Applied Mathematics and Physics,
Moscow Institute of Physics and Technology,
Dissertation project: The influence of an interaction with an environment on a quantum computer (passed at A-level),
Supervisor: Leonid E. Fedichkin.

Fellowships and Awards

2018 Performance-based Scholarship at the University of Innsbruck.

2013 Award of the Ministry of Education and Science of the Russian Federation: Best Master's Thesis.

2013 The Dynasty Foundation Scholarship.

2012–2013 The Enhanced State Academic Scholarship.

2011 Financial support from Universität Würzburg.

2010 The Second International Olympiad in Mathematical Physics, III Prize.

2010 All-Russian Student Olympiad in Mechanics and Mathematical Modeling, III Prize.

Peer-reviewed Journal Publications

[1] A.A. Melnikov, A. Makmal, and H.J. Briegel. Benchmarking projective simulation in navigation problems. IEEE Access, 6:64639–64648, 2018.

[2] A.A. Melnikov, H. Poulsen Nautrup, M. Krenn, V. Dunjko, M. Tiersch, A. Zeilinger, and H.J. Briegel. Active learning machine learns to create new quantum experiments. Proc. Natl. Acad. Sci. U.S.A., 115(6):1221–1226, 2018.

[3] A.A. Melnikov, A. Makmal, V. Dunjko, and H.J. Briegel. Projective simulation with generalization. Sci. Rep., 7:14430, 2017.

[4] A.A. Melnikov and L.E. Fedichkin. Quantum walks of interacting fermions on a cycle graph. Sci. Rep., 6:34226, 2016.

[5] A. Makmal, A.A. Melnikov, V. Dunjko, and H.J. Briegel. Meta-learning within projective simulation. IEEE Access, 4:2110–2122, 2016.

[6] N. Friis, A.A. Melnikov, G. Kirchmair, and H.J. Briegel. Coherent controlization using superconducting qubits. Sci. Rep., 5:18036, 2015.

[7] L.V. Nefedova, A.I. Afanasyeva, I.V. Aksenova, and A.A. Melnikov. Influence of sustainability indicator on planned volume of company sales. Design and Technology, 44(86):103–110, 2014. In Russian.

[8] A.A. Melnikov, A. Makmal, and H.J. Briegel. Projective simulation applied to the grid-world and the mountain-car problem. Artif. Intell. Res., 3(3):24–34, 2014.

[9] S.N. Filippov, A.A. Melnikov, and M. Ziman. Dissociation and annihilation of multipartite entanglement structure in dissipative quantum dynamics. Phys. Rev. A, 88(6):062328, 2013.

[10] A.A. Melnikov and L.E. Fedichkin. Quantum error correction in silicon charge qubits. Russ. Microelectron., 42(3):148–154, 2013.

Peer-reviewed Conference Proceedings Publications

[11] A.A. Melnikov and L.E. Fedichkin. Fermionic entanglement via quantum walks in quantum dots. In AIP Conference Proc., volume 1936, page 020025, 2018.

[12] A.A. Melnikov and L.E. Fedichkin. Entanglement dynamics of two electrons in noisy quantum walks. In Proc. IEEE, Progress In Electromagnetics Research Symposium - Spring, pages 2900–2903, 2017.

[13] A.A. Melnikov and L.E. Fedichkin. Continuous-time quantum walk of two interacting fermions on a cycle graph. In Proc. SPIE 10224, International Conference on Micro- and Nano-Electronics 2016, page 102242L, 2016.

[14] A.A. Melnikov and L.E. Fedichkin. Quantum walks of identical particles. In Proc. of Institute of Physics and Technology of RAS, volume 24, pages 37–47. Nauka, 2014. In Russian.

[15] A.A. Melnikov and L.E. Fedichkin. Measure of decoherence in quantum error correction for solid-state quantum computing. In Proc. SPIE 8700, International Conference Micro- and Nano-Electronics 2012, page 87001H, 2013.

Teaching

2018 Summer School of the International Max Planck Research School for Quantum Science and Technology (IMPRS-QST),
Invited lecture "Machine Learning Experiments in Quantum Optics",
Oetz, Tyrol, Austria.

2018 Proseminar Linear Algebra and Analytic Geometry (in German),
Department of Mathematics, University of Innsbruck, Innsbruck, Austria.

2016–2017 Proseminar Theoretical Physics 3 - Electrodynamics,
Institute for Theoretical Physics, University of Innsbruck, Innsbruck, Austria.

Other Research Activities

Code development: Leading role in the development of a website and code repository that makes projective simulation and reinforcement learning more easily accessible to the public (projectivesimulation.org)

Refereeing activities: Quantum Science and Technology, IEEE Access, Plos One, Journal of Physics A, Minimally Invasive Therapy & Allied Technologies, IEEE Transactions on Biomedical Engineering, Advanced Quantum Technologies

Computational Science Skills

Programming: Python, C++, Java, Cluster and high-performance computing

Software: Wolfram Mathematica, LaTeX, MATLAB

Machine learning: Reinforcement learning

Research Interests

Quantum machine learning, reinforcement learning, quantum computers and computing, quantum information theory, quantum walks, entanglement and separability, quantum systems modelling, superconducting qubits, photonic quantum experiments, quantum dots

Research Visits

February 2018	Skolkovo Institute of Science and Technology, Moscow Region, Russia.
July 2017	Research Center for Quantum Information, Bratislava, Slovakia.
May 2017	ITMO University, Saint Petersburg, Russia.
March 2013	Research Center for Quantum Information, Bratislava, Slovakia.
March 2013	Institute for Quantum Optics and Quantum Information, Innsbruck, Austria.

Conferences: Invited Talks

September 2018	Quantum Machine Learning Plus, Innsbruck, Austria, Invited talk "Machine learning for designing new quantum experiments".
May 2018	Mini-Workshop of the Centre of Deep Learning and Bayesian Methods, Moscow, Russia, Invited talk "Quantum machine learning".
May 2018	Cognitive Technologies and Quantum Intelligence, Saint Petersburg, Russia, Invited talk "Quantum reinforcement learning".
April 2018	Quantum UnConference 2018: Quantum Machine Learning, Barcelona, Spain, Invited participant.
December 2017	Workshop on Artificial Intelligence and Quantum Physics, Nanjing, China, Invited talk "Learning to create quantum experiments with reinforcement learning".
June 2014	17th International Conference on Problems of Theoretical Cybernetics, Kazan, Russia, Invited talk "Projective simulation agent in real-world tasks", Invited talk "Effect of noise on the quantum walks on graphs".
April 2013	7th International Workshop "Functional Nanomaterials and Devices for Electronics, Sensors, Energy Harvesting", Kyiv, Ukraine, Invited talk "Silicon quantum dot qubits error correction".

Conferences: Contributed Talks

March 2018	Quantum Machine Learning & Biomimetic Quantum Technologies, Bilbao, Spain, Talk "Reinforcement learning agent learns to create quantum experiments".
March 2018	82nd Annual Conference of the DPG and DPG Spring Meeting, Erlangen, Germany, Talk "Projective simulation memory network for solving toy and complex problems".

August 2017 Joint annual meeting of Swiss and Austrian Physical Societies 2017,
Geneva, Switzerland,
Talk “Memory network dynamics in projective simulation model”.

July 2016 33rd SFB Meeting,
Innsbruck, Austria,
Talk “Meta-learning within projective simulation”.

April 2016 32nd SFB Meeting,
Vienna, Austria,
Talk “Coherent controlization using transmon qubits”.

November 2012 55th Scientific Conference of Moscow Institute of Physics and Technology “Problems of Fundamental and Applied Sciences”,
Dolgoprudny, Moscow Region, Russia,
Talk “Three-qubit entanglement-annihilating channels”.

June 2011 All-Russian Youth Conference "Prospects for the Development of Fundamental Research",
Dolgoprudny, Moscow Region, Russia,
Talk “Effect of interaction with environment on quantum information processing”.

Conferences: Poster Presentations

July 2018 Superconducting Quantum Technologies Conference,
Moscow, Russia,
Poster “Quantum walks and their implementation using superconducting circuits”.

July 2018 42nd SFB Meeting,
Innsbruck, Austria,
Poster “Machine learning agent learns to create quantum experiments”.

July 2018 4th Seefeld workshop on Quantum Information,
Seefeld, Tyrol, Austria,
Poster “Machine learning agent learns to create quantum experiments”.

February 2018 International Conference on Quantum Optics 2018,
Obergurgl, Tyrol, Austria,
Poster “Machine learning agent learns to create quantum optics experiments”.

October 2017 38th SFB Meeting,
Vienna, Austria,
Poster “Projective simulation for design of new quantum experiments”.

July 2017 The 4th International Conference on Quantum Technologies,
Moscow, Russia,
Poster “Entanglement dynamics of two fermions in quantum walks”,
Poster “Designing new photonic quantum experiments via reinforcement learning”.

May 2017 The 38th Progress in Electromagnetics Research Symposium (PIERS),
Saint Petersburg, Russia,
Talk “Coherent controlization in a quantum register via cavity QED”,
Poster “Entanglement dynamics of two electrons in noisy quantum walks”.

November 2016 Workshop of Quantum Simulation and Quantum Walks 2016,
Prague, Czech Republic,
Poster “Quantum walks using superconducting circuit via coherent controlization”.

June 2016 3rd Seefeld workshop on Quantum Information,
Seefeld, Tyrol, Austria,
Poster "Coherent controlization using superconducting qubits".

February 2016 International Conference on Quantum Optics 2016,
Obergurgl, Tyrol, Austria,
Poster "Coherent controlization using transmon qubits".

December 2015 31st SFB Meeting,
Vienna, Austria,
Poster "Coherent controlization using transmon qubits".

November 2015 6th IQFA's Colloquium (Quantum Information, Foundations and Applications),
Palaiseau, Paris, France,
Poster "Coherent controlization using transmon qubits".

July 2015 Third International Conference on Quantum Technologies (ICQT 2015),
Moscow, Russia,
Poster "Coherent controlization using superconducting qubits".

July 2015 30th SFB Meeting,
Innsbruck, Austria,
Poster "Generalization mechanism within projective simulation".

May 2015 Quantum Physics of Nature (QUPON 2015),
Vienna, Austria,
Poster "Projective simulation with generalization".

December 2014 28th SFB Meeting,
Vienna, Austria,
Poster "Projective simulation applied to the grid-world and the mountain-car problem".

October 2014 The International Conference "Micro- and Nanoelectronics" (ICMNE-2014) with the Extended Session "Quantum Informatics" (QI-2014),
Zvenigorod, Moscow Region, Russia,
Poster "Continuous-time fermionic quantum walks".

October 2013 22nd SFB Meeting,
Innsbruck, Austria,
Poster "Multipartite entanglement dynamics".

June 2013 Third Russian-Taiwan School-Seminar on Nonlinear Optics and Photonics,
Vladimir, Russia,
Poster "Multipartite entanglement in local depolarizing channels".

April 2013 All-Russian Conference "Young Russian Scientists",
Moscow, Russia,
Poster "Quantum walks of electrons in nanostructures".

October 2012 The International Conference "Micro- and Nanoelectronics" (ICMNE-2012) with the Extended Session "Quantum Informatics" (QI-2012),
Zvenigorod, Moscow Region, Russia,
Poster "Quantum error correction in Si double dot charge qubits".

Additional Education

July 2017 Summer School "Atoms, Light, and Molecules",
Achensee, Tyrol, Austria,
Poster "Learning to design new quantum experiments".

April 2017 Winter School on Complex Networks: From Classical to Quantum, Theory and Experimental Implementation,
Obergurgl, Tyrol, Austria,
Poster "Learning to design new quantum experiments",
Poster "Memory network dynamics in projective simulation".

June 2015 QUTE-EUROPE Summer School 2015 - Quantum Simulation and Computation,
Gothenburg, Sweden,
Poster "Projective simulation applied to navigation tasks".

July 2013 Summer School of the Russian Quantum Center,
Moscow Region, Russia.

March 2013 Spring School of the Russian Quantum Center,
Moscow, Russia,
Poster "Entanglement annihilation in multipartite system".

July 2011 Summer School on Quantum Control and Quantum Information Theory,
Universität Würzburg, Germany.

Languages

English, German, Russian