Eliska Greplova

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PROFILE

My main research interests are machine learning, condensed matter physics, metamaterials, and quantum optics. My most important scientific results are a machine learning algorithm for parameter estimation, novel Bayesian estimation algorithm, fidelity improvement of a teleportation protocol and new insights into probability predictions in quantum mechanics.

EXPERIENCE

Postdoctoral Researcher, ETH Zürich, Switzerland 2018 - present

In the group of Prof. Sebastian Huber I work at the boundary between theory and experiment on aspects of metamaterials and machine learning. The main directions of my research are automated search for phase transition in spin systems, non-abelian braiding of acoustic excitations and reservoir computing. I also closely collaborate with experimental groups at ETH Zürich in employing machine learning methods to facilitate efficient readout and sample identification.

PhD Candidate, Aarhus University, Denmark 2014 - 2018

The central subject of my PhD is quantum measurement theory and parameter estimation. I developed novel methods and algorithms that enable more precise and reliable measurements in condensed matter systems like quantum dots and superconducting qubits.

Research Assistant, Max Planck Institute of Quantum Optics, München, Germany 2013 - 2014

Applications of algebraic techniques to tackle the long standing problem of capacities of quantum channels. The result is the clear identification of a class of channels for which quantum capacity can be evaluated.

EDUCATION

Aarhus University, Aarhus, Denmark — PhD, 2018
Thesis: Quantum Measurements: From Bayes Rule to Neural Networks
Supervisor: Prof. Klaus Mølmer

Ludwig-Maximilians-Universität München and
Technische Universität München — MSc, 2013
Program: Elite Graduate Course in Theoretical and Mathematical Physics
Thesis: Quantum Information with Fermionic Systems
Supervisors: Prof. Ignacio Cirac, Prof. Geza Giedke

Czech Technical University in Prague — Bc., 2011
Program: Mathematical Physics
Thesis: Optical Networks with Several Excitations
Supervisor: Prof. Igor Jex

ADDITIONAL INFORMATION

I attended a number of schools and conferences where I presented my research. In August 2016 I worked at the Department of Materials, University of Oxford. I received **Scholarship Grant of Max Planck Society**, **Bakala Foundation Scholarship** and **CTU Scholarship for Excellent Study Results**. I'm proficient in Python, Matlab, Mathematica and have prior experience in C/C++, TensorFlow, ProjectQ and iTensor. I took part in a Conflict Management in Negotiation course and I play cello.

PUBLICATION LIST

Papers

Eliska Greplova, Edward E. Laird, G. Andrew D. Briggs, Klaus Mølmer: **Conditioned Spin and Charge Dynamics of a Single Electron Quantum Dot**, Physical Review A 96, 052104 (2017) (Editors' Suggestion)

Eliska Greplova, Klaus Mølmer, Christian Kraglund Andersen: **Quantum teleportation with continuous measurements**, Physical Review A 94, 042334 (2016)

Qing Xu, Eliska Greplova, Brian Julsgaard, Klaus Mølmer: **Correlation functions and conditioned quantum dynamics in photodetection theory**, Physica Scripta 90, 128004 (2015) (Invited Comment)

Preprints

Eliska Greplova, Christian Kraglund Andersen, Klaus Mølmer: **Quantum parameter estimation with a neural network**, arXiv:1711.05238 (under review in Physical Review Letters)

Eliska Greplova, Geza Giedke: **Degradability of Fermionic Gaussian Channels**, arXiv:160401954 (under review in Physical Review Letters)

Theses

Eliska Greplova: **Quantum Measurements: From Bayes Rule to Neural Networks** (PhD thesis), Aarhus University (2017)

Eliska Greplova: **Past Quantum State: Theory and Applications** (PhD qualifying exam progress report), Aarhus University (2016)

Eliska Greplova: **Quantum Information with Fermionic Gaussian States** (Master's Thesis), Ludwig-Maximillians-Universität München and Technische Universität München (2013)

Eliska Greplova: **Optical Networks with Several Excitations** (Bachelor's Thesis), Czech Technical University in Prague (2011)

CONFERENCES AND TALKS

Upcoming

Machine Learning for Quantum Many-Body Physics,
Kavli Institute, Santa Barbara, USA (January - February 2019),
international research program

Quantum Machine Learning +,
Innsbruck, Austria (September 2018), poster presentation

Past

Quantum Systems and Technology,
Monte Verita, Switzerland (May 2018), poster presentation

Max Planck Institute for the Science of Light,
Erlangen, Germany (December 2017), invited talk

ETH Zurich, Institute for Theoretical Physics,
Zurich, Switzerland (December 2017), invited talk

Donostia International Physics Center,
San Sebastian, Spain (December 2017), invited talk

QUSCOPE, Villum Centre of Excellence,
Aarhus, Denmark (November 2017), invited talk

ETH Zurich (QSIT Seminar),
Zurich, Switzerland (August 2017), invited talk

Central European Workshop on Quantum Information (CEWQO),
Copenhagen, Denmark (July 2017), poster presentation

The Institute of Photonic Sciences (ICFO),
Barcelona, Spain (April 2017), invited talk

University of Oxford,
Oxford, United Kingdom (August 2016), research visit

Nanotechnology meets Quantum Information (NanoQI),
San Sebastian, Spain (July 2016), poster presentation

Saclay-UCL-Oxford-OIST-NSW-Aarhus Spin Meeting,
Billund, Denmark (May 2016), invited talk

Quantum Science: Implementations,
Benasque, Spain (July 2014), discussion-based workshop

ICFO Frontiers of Quantum Physics and Quantum Information,
Barcelona, Spain (July 2013), summer school

ICFO-MPQ Workshop,
Barcelona, Spain (May 2013), collaboration meeting

Kavli-MPQ Workshop,
Delft, Netherlands (April 2013), collaboration meeting

44th IFF Spring School of Quantum Information Processing,
Jülich, Germany (February - March 2013), spring school

International Congress on Mathematical Physics (ICMP 12),
Aalborg, Denmark (August 2012)

Joint Institute for Nuclear Research,
Dubna, Russia (July 2010), summer student practice

TEACHING

Quantum Field Theoretical Methods for Quantum Transport,

Pro-Seminar, ETH Zürich, 2018

(supervision of 3 student projects)

Advanced Classical Mechanics,

Undergraduate course, Aarhus University, 2015, 2016, 2017

(teaching assistant)

Statistical Physics,

Undergraduate course, Aarhus University, 2015, 2016

(teaching assistant)

Solid State Physics,

Undergraduate course, Aarhus University, 2016

(teaching assistant)