

Aroosa Ijaz

INQUISITIVE SCIENTIST · QUANTUM PHYSICIST · MACHINE LEARNING ENTHUSIAST

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Education

ETH Zürich

Zürich, Switzerland

PHD PHYSICS - LEFT TO CHANGE FIELD OF RESEARCH TO QUANTUM MACHINE LEARNING*

Nov 2016 - Oct 2018

- **Thesis:** Towards realization of Majorana Fermions in 2D Transition Metal Dichalcogenide heterostructures.
 - Explored the quantum transport properties and topological superconductivity in two-dimensional hole gases in Tungsten Diselenide (WSe₂) at cryogenic temperatures.
 - Optimized the fabrication of WSe₂/graphene/HBN/NbSe₂ heterostructure samples and metal contacts using clean room facilities.
- **Supervisors:** Prof. Klaus Ensslin, Prof. Thomas Ihn

Ulm University

Ulm, Germany

M.Sc. PHYSICS (QUANTUM INFORMATION SPECIALIZATION) GPA: 1.1/5.0 (MAX GRADE: 1.0/5.0)

Sep 2014 - Aug 2016

- **Thesis:** Low temperature spectroscopy of single color centers in diamond: Investigations into Germanium vacancy center in diamond.
 - Investigated the orbital and coherence dynamics of the spin of Germanium defect using multi-laser optical experiments.
- **Supervisors:** Prof. Fedor Jelezko, Prof. Alexander Kubanek

Lahore University of Management Sciences

Lahore, Pakistan

B.Sc. PHYSICS & COMPUTER SCIENCE CGPA: 3.27/4.0 (MAX GRADE: 4.0/4.0)

Sep 2009 - Aug 2013

- **Thesis:** Experimental investigations on confined Excitons in quantum wells and quantum Dots embedded in optical microcavities.
 - Set up the optical setup and did spectroscopic measurements on quasi-particles.
- **Supervisor:** Prof. Ata Ul Haq

Work Experience

Xanadu AI

Toronto, Canada

QML SCIENTIST

Sep 2019 - Present

- Working on various Quantum Machine Learning algorithms and their applications in Quantum Computing.

Xanadu AI

Toronto, Canada

QML INTERN

Feb 2019 - Aug 2019

- Contributing to Quantum Machine Learning algorithms and their implementation using PennyLane (a framework for machine learning on quantum computers)

Quantum Photonics Group, ETH Zürich

Zürich, Switzerland

RESEARCH SECONDMENT, PROF. ATAC IMAMOGLU

Nov 2016 - May 2017

- Conducted low temperature transport and optical reflection/transmission measurements on monolayer MoSe₂/graphene/HBN heterostructures to explore exciton properties in dichalcogenides
- Successful experimental contributions resulted in a publication in Physical Review Letters

Institute for Quantum Optics (IQO), Ulm University

Ulm, Germany

RESEARCH ASSISTANT, PROF. FEDOR JELEZKO

Jun 2015 - Dec 2015

- Performed resonant optical extinction measurements on single Silicon Vacancy centers in diamond as an alternative high contrast detection technique.
- Set up a confocal microscope.

Department of Physics, Lahore University of Management Sciences

Lahore, Pakistan

RESEARCH ASSISTANT

Jul 2013 - Jun 2014

- Computational modelling of different open cavity QED systems in MATLAB and solving their Lindblad equations (with Dr. Ata Ul Haq).
- Computational analysis of doping in Graphene by group IV elements executed in Siesta in Linux environment (with Dr. Fakhar Ul Inam)
- Simulating portable Hallbach NMR Spectrometer in ComSol modeling software (with Dr. Sabieh Anwar)
- Development of Quantum Erasure experiment based on Mach Zender Interferometer for Freshman Physics lab (with Dr. Sabieh Anwar)

Department of Computer Science, Lahore University of Management Sciences

Lahore, Pakistan

RESEARCH INTERN

Jun 2012 - Dec 2012

- Proposing new data center topologies with higher efficiency and resilience.
- Statistical analysis of Google cluster data using Python

Skills

Programming Skills	Python, MATLAB, Mathematica, C++, Octave, R
CAD & Modeling	COMSOL Multiphysics, AutoCAD
Machine Learning	PyTorch, TensorFlow, Xanadu-PennyLane, IBM-Qiskit
Languages	English[C2], Urdu[Native], Punjabi[Native], German[A2]

Teaching Experience

Department of Physics, ETH Zurich

Zürich, Switzerland

TEACHING ASSISTANT

Nov 2016 - Dec 2017

- Undergraduate Physics Lab : supervised two experiments and eight students every week
- Undergraduate Physics-I : conducted exercise classes, graded assignments and exams

Department of Physics, Ulm University

Ulm, Germany

STUDENT TUTOR FOR STRUGGLING PEER STUDENTS

Jan 2016 - Mar 2016

- Tutored 2 master students in Quantum Mechanics
- Tutored 1 master student in calculus and differential equations

Lahore University of Management Sciences

Lahore, Pakistan

TEACHING ASSISTANT

Sep 2011 - Jun 2014

- Data Structures
- Quantum Mechanics-I
- Mechanics
- Atomic, Molecular and Laser Physics
- Experimental Physics Lab-I

Publications

2019	Quantum Embeddings for Machine Learning Seth Lloyd, Aroosa Ijaz, Maria Schuld, Josh Izaac, Nathan Killoran, in submission.	In Submission
2018	Realization of an electrically tunable Narrow-Bandwidth atomically thin mirror using monolayer MoSe₂ Patrick Back, Aroosa Ijaz, ... Atac Imamoglu, https://doi.org/10.1103/PhysRevLett.120.037401 .	Physical Review Letters
2017	Optical and microwave control of germanium-vacancy center spins in diamond Petr Siyushev, Mathias Metsch, Aroosa Ijaz, ... Fedor Jelezko, https://doi.org/10.1103/PhysRevB.96.081201 .	Physical Review B

Awards

2016-2018	Marie Curie Young Researcher Fellowship [SpinNano ITN Network],	ETH Zürich
2015	Degree Scholarship [1500Euros], Ulm University	Ulm
2014-2015	Merit scholarship award (not availed) [PKR 219, 000], Lahore University of Management Sciences	Lahore
2007-2009	100% Honor Roll Scholarship , Lahore Grammar School	Lahore

Referees

Prof. Seth Lloyd, MIT

Massachusetts, USA

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Toronto, Canada

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Prof. Klaus Ensslin, ETH Zürich

Zurich, Switzerland

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Prof. Fedor Jelezko, Ulm University

Ulm, Germany

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Prof. Ihsan Ayyub Qazi, Lahore University of Management Sciences

Lahore, Pakistan

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