Erfan **Abedi**

Master Student in Quantum Science and Technology

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Research Interests

Quantum Algorithms, Quantum Information Theory, Quantum Machine Learning, Quantum Networks, Quantum Cryptography, Categorical Quantum Mechanics.

Education

University of California, Los Angeles [UCLA] — *Los Angeles, California, USA*

Master of Quantum Science and Technology — *Sept. 2022 - Current*

Amirkabir University of Technology [AUT] — *Tehran, Iran*

Bachelor of Science in Computer Engineering — *Sept. 2017 - Oct. 2021*

Research Experience

QuOne Lab at Phanous Research and Innovation Centre (phanous.ir) — *Under the Supervision of Prof. Salman Beigi*

Research Assistant — *Jun. 2021 - Sept. 2022*

- Working on the theory and numerical simulations of a paper on Quantum Lazy Training.
- Assisting the senior researchers with their ongoing research on QML.
- Reading Papers and giving talks about various QML papers at the research group's weekly meetings.
- Designing assignments and educational material for the Center's 1000qubit workshop.

Institute for Research in Fundamental Sciences [IPM] — *Under the Supervision of Prof. Dara Rahmati*

Research Intern — *Summer of 2020*

- Learning the basics of Quantum Mechanics and Quantum Computing by going through online tutorials and the pivotal papers of the fields.

Publications

2022 **E. Abedi**, S. Beigi and L. Taghavi, *Quantum Lazy Training*, Quantum 7 (2023): 989, Journal Access.

2021 **E. Abedi**, *Maqenta: Generating music with Quantum Machine Learning*, BSc Thesis (in Persian).

2021 B. Bisgin, N. Oruz, J. G. Jarkovský, **E. Abedi** and M. Mauser, *QSVT in Qiskit*, IBM's Qiskit Hackaton Europe 2021 Project Paper.

Notable Projects

QSVT in Qiskit (On Github) — *IBM's Qiskit Hackaton Europe 2021*

Researcher & Developer — *Spring of 2021*

- Quantum Singular Value Transformation (QSVT) is a framework that allows one to apply an arbitrary polynomial transformation to the singular values of a block-encoded unitary transformation.
- QSVT-implemented quantum search was implemented utilizing Fixed-point Amplitude Amplification.
- QSVT in Qiskit was selected as one of the top 3 winning teams of the Hackaton.

Maqenta (On Github)

Researcher & Developer — *Summer of 2021*

- Maqenta is a software for generating music using Quantum Machine Learning.
- Maqenta uses methods such as QLSTM and QGAN for generating music and is built upon Pennylane and PyTorch.
- Maqenta processes digital musical files as input and tries to compose a novel musical piece based on the said input.

Q (On Github)

Researcher *Jul. 2020 - Jan. 2021*

- Q is the progress of my early research experience in quantum computing and quantum mechanics.
- Q contains my solutions to Microsoft's quantum programming exercises in Q#.
- Q contains my solutions to the programming exercises of Prof. Peter Wittek's QML course in Qiskit.
- Q also includes the list of the quantum papers, books and online courses that I have gone through during the specified period of time.

AUT-ICPC Programming Contest's website (ICPC.aut.ac.ir)

Back-End Developer *Summer of 2019*

- AUT-ICPC's website is used by the contest's participants to register in and gather more information about the contest.
- AUT-ICPC's website is built using Django on the back-end and React.JS on the front-end.
- AUT-ICPC's website uses technologies such as Ngnix, PostgreSQL, REST framework and Redis.

Online Courses

- Quantum Machine Learning - University of Toronto (Audited)
- Quantum Physics 1 - MIT (Audited) — Quantum Physics 2 - MIT (Audited) — Quantum Physics 3 - MIT (Audited)
- Differential Equations - MITx on edX (Certificate available on Github)
- Statistics 110: Probability - HarvardX on edX (Certificate available on Github)
- The Fourier Transform and its Applications - Stanford University (Audited)

Teaching Experience

Teaching Assistant, *Signals and Systems*, under the supervision of **Prof. Mehdi Rasti**. *Fall of 2020*
Designing and grading assignments and projects, providing extra educational material.

Teaching Assistant, *Microprocessors and Assembly Language*, under the supervision of **Prof. Hamed Farbeh**. *Fall of 2020*
Designing lab assignments and projects, providing supplementary learning resources.

Teaching Assistant, *Computer Architecture and Organization*, under the supervision of **Prof. Hamed Farbeh**. *Fall of 2020*
Designing and grading assignments and projects.

Teaching Assistant, *Programming Languages*, under the supervision of **Prof. Mehran S. Fallah**. *Spring of 2020*
Designing lab assignments and projects, providing supplementary learning resources.

Teaching Assistant, *Advanced Programming*, under the supervision of **Prof. Amir Kalbasi**. *Spring of 2019, Spring of 2020*
Designing and grading assignments and projects, assisting lab sessions.

Teaching Assistant, *Fundamentals of Computer and Programming*, under the supervision of **Prof. Ehsan Nazerfard**. *Fall of 2019*
Designing and grading assignments and projects, conducting TA sessions.

Honors & Awards

2021 **Top 3 Team**, IBM's Qiskit Hackaton Europe (Certificate on GitHub)
2017 **Top 0.8% place**, The Iranian Nationwide University Entrance Exam for BSc. in Math & Engineering.
2015, 2016 **Acceptance in the 1st stage**, Iran's Chemistry Olympiad.

Extracurricular Activities

Students' Scientific Chapter of AUT's Department of Computer Engineering (CEIT-SSC.ir)

Board Member & Head of Contests *Mar. 2019 - Sept. 2020*

- Organized and provided technical means for the 6th Amirkabir Programming League.
- Organized the 1st Amirkabir Artificial Intelligence Summer Summit. (AAISS.ceit.aut.ac.ir)
- Organized and provided technical means for the 19th Amirkabir ICPC. (ICPC.aut.ac.ir)
- Organized the 11th Amirkabir Linux Festival. (LinuxFest.aut.ac.ir)

Programming Languages and Frameworks

Programming Languages

Python · C/C++ · Rust · Q# · C# · Go · Java · JavaScript/TypeScript · Mathematica

Frameworks and Technologies

Pennylane · Qiskit · Cirq · QuTiP · PyTorch · NumPy · SciPy · Pandas · CUDA · OpenMP
Docker · Django · MongoDB · PostgreSQL · MySQL · Redis · Koa.JS · Express.JS · REST
GraphQL · Arduino

Languages

Persian

Native

English

Bilingual Proficiency

German

Intermediate

References

Richard S. Ross, Program Director, Master of Quantum Science and Technology at UCLA.
Email: richardsross@ucla.edu

Salman Beigi, Associate Professor, School of Mathematics at IPM.
Email: salman.beigi@gmail.com

Hamed Farbeh, Assistant Professor, CE Department at AUT.
Email: farbeh@aut.ac.ir