Gayane Vardoyan

Last updated: August 1, 2023

QuTech and EEMCS, Delft University of Technology
Lorentzweg 1, 2628 CJ, Delft, The Netherlands
CICS, University of Massachusetts, Amherst
Lederle Graduate Research Center, Amherst, MA 01003

e-mail: g.s.vardoyan@tudelft.nl
web: https://qutech.nl/lab/vardoyangroup/, https://people.cs.umass.edu/~gvardoyan/

Research areas

My research interests include the performance evaluation of classical and quantum communication systems. Previously, I have studied entanglement switching and routing, optimal entanglement distribution methods in quantum networks, and architectural designs for distributed quantum systems. As the vision of a Quantum Internet approaches reality, the development of efficient, deployable algorithms that will facilitate its operation is becoming ever more important.

Education

Doctor of Philosophy (PhD)
Thesis: *Performance Evaluation of Classical and Quantum Communication Systems*
College of Information and Computer Sciences
University of Massachusetts, Amherst, 2017 – 2020
Thesis committee: Don Towsley (chair), Kris Hollot, James Kurose, Arya Mazumdar, Saikat Guha

Master of Science in Computer Sciences
College of Information and Computer Sciences
University of Massachusetts, Amherst, 2014 – 2017

Bachelor of Science in Electrical Engineering and Computer Sciences
Department of Electrical Engineering and Computer Sciences
University of California, Berkeley, 2008 – 2011

Employment

QuTech Advanced Research Centre (Quantum Internet Division) and the Faculty of Electrical Engineering, Mathematics and Computer Science (Quantum Computer Science section), TU Delft, *Assistant Professor*
Delft, the Netherlands - Sept 2022 - current

Manning College of Information & Computer Sciences, University of Massachusetts, Amherst, *Assistant Professor*
Amherst, MA - Sept 2023 - current

College of Information and Computer Sciences, University of Massachusetts, Amherst, *Adjunct Assistant Professor*
Amherst, MA - Nov 2021 - Sept 2023

QuTech Advanced Research Centre, TU Delft, *Postdoc Researcher (under Prof. Stephanie Wehner)*
Delft, The Netherlands - Sept 2020 - Sept 2022

Computation Institute, University of Chicago/Argonne National Laboratory, *Research Assistant*
Chicago/Lemont, IL - Feb 2012 - July 2014

Cisco Systems, *Software Engineering Intern, STBU Network Security*
San Jose, CA - May - August, 2011

Cisco Systems, *Software Engineering Intern, DCSTG Business Unit*
San Jose, CA - May - August, 2010

Awards

Performance 2021 Best Paper Award	Nov 2021
Ada Lovelace Postdoctoral Fellowship	Sept 2020
Rising Stars in EECS 2019 (held at UIUC)	Oct-Nov 2019
INFOCOM 2018 Best-In-Session Presentation Award	April 2018
NSF Graduate Research Fellowship Program Honorable Mention	Spring 2016
Louis and Grace Kurkjian Engineering Scholarship	Fall 2008
Boeing Engineering Scholarship Recipient	Fall 2009
Cisco Scholarship Recipient	Fall 2009

Publications

On the Bipartite Entanglement Capacity of Quantum Networks
Gayane Vardoyan, Emily van Milligen, Saikat Guha, Stephanie Wehner, Don Towsley
arXiv preprint arXiv:2307.04477

Tools for the analysis of quantum protocols requiring state generation within a time window
Bethany Davies, Thomas Beauchamp, Gayane Vardoyan, Stephanie Wehner
arXiv preprint arXiv:2304.12673

Mapping quantum circuits to modular architectures with QUBO
Medina Bandic, Luise Prielinger, Jonas Nüßlein, Anabel Ovide, Santiago Rodrigo, Sergi Abadal, Hans van Someren, Gayane Vardoyan, Eduard Alarcon, Carmen G Almudever, Sebastian Feld
IEEE International Conference on Quantum Computing and Engineering, 2023

Quantum Network Utility Maximization
Gayane Vardoyan, Stephanie Wehner
IEEE International Conference on Quantum Computing and Engineering, 2023

Optimistic Entanglement Purification in Quantum Networks
Mohammad Mobayenjarihani, Gayane Vardoyan, Don Towsley
IEEE International Conference on Quantum Computing and Engineering, 2023

A Control Architecture for Entanglement Generation Switches in Quantum Networks
Scarlett Gauthier, Gayane Vardoyan, Stephanie Wehner
SIGCOMM Workshop on Quantum Networks and Distributed Quantum Computing (QuNet 2023)

Optimal entanglement distribution policies in homogeneous repeater chains with cutoffs
Álvaro. G. Iñesta, Gayane Vardoyan, Lara Scavuzzo, Stephanie Wehner
npj Quantum Information, 2023

On the Quantum Performance Evaluation of Two Distributed Quantum Architectures
Gayane Vardoyan, Matt Skrzypczyk, Stephanie Wehner
Performance 2021 (regular paper); journal version in PEVA

Towards Stability Analysis of Data Transport Mechanisms: a Fluid Model and Its Applications
Gayane Vardoyan, Kris Hollot, Don Towsley

IEEE/ACM Transactions on Networking, 2021

Analysis of a Tripartite Entanglement Distribution Switch
Philippe Nain, Gayane Vardoyan, Saikat Guha, Don Towsley
Queueing Systems: Theory and Applications (QUESTA), 2021

On the Stochastic Analysis of a Quantum Entanglement Distribution Switch
Gayane Vardoyan, Saikat Guha, Philippe Nain, Don Towsley
IEEE Transactions on Quantum Engineering, 2021,
Workshop on MAthematical performance Modeling and Analysis (MAMA 2019)

On the Exact Analysis of an Idealized Quantum Switch
Gayane Vardoyan, Philippe Nain, Saikat Guha, Don Towsley
Performance 2020 (regular paper); journal version in PEVA

On the Capacity Region of Bipartite and Tripartite Entanglement Switching
Gayane Vardoyan, Philippe Nain, Saikat Guha, Don Towsley
Performance 2020 (short paper), journal version to appear in ACM ToMPECS

On the Analysis of a Multipartite Entanglement Distribution Switch
Philippe Nain, Gayane Vardoyan, Saikat Guha, Don Towsley
SIGMETRICS 2020/Proceedings of the ACM on Measurement and Analysis of Computing Systems (POMACS)

On the Capacity Region of Bipartite and Tripartite Entanglement Switching and Key Distribution
(Extended abstract, accepted as an oral presentation)
Gayane Vardoyan, Saikat Guha, Philippe Nain, Don Towsley
9th International Conference on Quantum Cryptography (QCrypt 2019)

The Role of Network Topology for Distributed Machine Learning
Giovanni Neglia, Gianmarco Calbi, Gayane Vardoyan, Don Towsley
IEEE International Conference on Computer Communications (INFOCOM 2019)

Towards Stability Analysis of Data Transport Mechanisms: a Fluid Model and an Application
(Best-In-Session Presentation Award)
Gayane Vardoyan, C.V. Hollot, Don Towsley
IEEE International Conference on Computer Communications (INFOCOM 2018)

Experiments and Analyses of Data Transfers over Wide-Area Dedicated Connections
N. S. V. Rao, Q. Liu, S. Sen, J. Hanley, I. Foster, R. Kettimuthu, C. Q. Wu, D. Yun, G. Vardoyan, D. Towsley
26th International Conference on Computer Communication and Networks (ICCCN 2017)

TCP Throughput Profiles Using Measurements Over Dedicated Connections
Nageswara Rao, Qiang Liu, Satyabrata Sen, Don Towsley, Gayane Vardoyan, Raj Kettimuthu, Ian Foster
Proceedings of the 26th International Symposium on High-Performance Parallel and Distributed Computing (HPDC 2017)

Models of TCP in High-BDP Environments and Their Experimental Validation
Gayane Vardoyan, Nageswara Rao, Don Towsley
24th IEEE International Conference on Network Protocols (ICNP 2016)

High-Performance Data Flows Using Analytical Models and Measurements
Nageswara Rao, Rajkumar Kettimuthu, Ian Foster, Don Towsley, Gayane Vardoyan, Brad Settlemyer and Qiang Liu
Workshop on Modeling & Simulation of Systems and Applications (ModSim 2016)

Sustained Wide-Area TCP Memory Transfers over Dedicated Connections

Nageswara Rao, Don Towsley, Gayane Vardoyan, Bradley Settlemyer, Ian Foster, Rajkumar Kettimuthu
High Performance Computing and Communications (HPCC), 2015

An Elegant Sufficiency: Load-Aware Differentiated Scheduling of Data Transfers
Rajkumar Kettimuthu, Gayane Vardoyan, Gagan Agrawal, P. Sadayappan, and Ian Foster
SC '15 Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis

Modeling and Optimizing Large-Scale Wide-Area Data Transfers
Rajkumar Kettimuthu, Gayane Vardoyan, Gagan Agrawal, and P. Sadayappan
14th IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing, 2014

Characterizing Throughput Bottlenecks for Secure GridFTP Transfers
Gayane Vardoyan, Rajkumar Kettimuthu, Michael Link, Steven Tuecke
International Conference on Computing, Networking and Communications, 2013

Teaching

Introduction to Quantum Computer Science (CSE3130)	Spring 2023 (Q3)

Professional Activities

Quantum Software Consortium (QSC) Executive Board Member	2023-current
Co-organizer of the Quantum Software Consortium (QSC) 8th General Assembly	Delft, Dec. 2022

Service

Reviewer, JSAC Special Issue on the Quantum Internet	2023
TPC Member, ACM SIGCOMM QuNet Workshop	2023
Member, QuTech Quantum Computing Division Hiring Committee	Spring 2023
Interpersonal Integrity Committee (TU Delft EEMCS, QuTech)	Spring 2023
MS Thesis Defense Member (Xiaoyu Liu, Sacha Szkudlarek)	2023
Chair, Quantum CS Hiring Committee	2022-2023
Go/No-Go Committee Member (Julius Fischer)	2022
Reviewer, Transactions on Networking	2021
Reviewer, CoNEXT	2020
Grant Proposal Reviewer, DOE SBIR-STTR, Phase II	Fall 2019
Reviewer, IEEE J-SAC Issue on Advances in Quantum Communications, Computing, Cryptography and Sensing	Fall 2019
Graduate Student Representative	Fall 2017, Spring 2018
Grant Proposal Reviewer, DOE SBIR-STTR, Phase I	Spring 2018, Fall 2018
Outreach Coordinator for CS Women	Fall 2015

Graduate Student Body Treasurer Fall 2014-Summer 2019

Invited talks, lectures, etc.

- *Developing a Framework for Quantum Network Utility Maximization*, Dutch National Mathematical Congress (Nederlands Mathematisch Congres), Utrecht (Apr.12, 2023)
- *Developing a Framework for Quantum Network Utility Maximization*, CQN Quantum Network Science Seminar, UMass Amherst (Jan.12, 2023)
- *Towards a Quantum Internet*, EEMCS Software Technology Faculty Lunch, TU Delft (Nov. 24, 2022)
- *On the Performance Evaluation of Two Distributed Quantum Architectures*, APS March Meeting (invited talk, Session on Recent Advances in Quantum Communication), Chicago (March 2022)
- *On the Performance Evaluation of Two Distributed Quantum Architectures*, Quantum Software Consortium General Assembly in Leiden (Nov. 5, 2021)
- *Quantum Networking in a Noisy World*, Workshop I3S: Quantum Networks, co-organized by Konstantin Avrachenkov, Inria & Côte d'Azur University (Apr. 8, 2021)
- *On the Performance Evaluation of Two Distributed Quantum Architectures*, Quantum Network Science Seminar, University of Massachusetts, Amherst (Jul. 22, 2021)
- *A Lecture on Bell's Theorem and Three Quantum Key Distribution Protocols*, Quantum Information Systems class taught by Don Towsley, University of Massachusetts, Amherst (Nov. 13, 2019)
- *On the Stochastic Analysis of a Quantum Entanglement Switch*, CSE colloquium at University of Connecticut, hosted by Prof. Bing Wang (Sept. 5, 2019)
- *On the Capacity Region of Bipartite and Tripartite Entanglement Switching and Key Distribution*, QCrypt 2019 Contributed Talk, Montreal, Canada, (Aug. 26, 2019)
- *On the Stochastic Analysis of a Quantum Entanglement Switch*, CS Theory Seminar, led by Arya Mazumdar, University of Massachusetts, Amherst (Mar. 27, 2019)
- *Two Lectures on Renewal Theory*, Performance Evaluation (CS655) taught by Philippe Nain, University of Massachusetts, Amherst (Fall 2018)