

Gayane Vardoyan

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QuTech and EEMCS
Delft University of Technology
Lorentzweg 1, 2628 CJ, Delft, The Netherlands

phone: +31 6 34426613
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

College of Information and Computer Sciences, University of Massachusetts, Amherst, Adjunct Assistant Professor

Amherst, MA - Nov 2021 - current

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

Quantum Network Utility Maximization

Gayane Vardoyan, Stephanie Wehner
arXiv preprint arXiv:2210.08135

Optimal entanglement distribution policies in homogeneous repeater chains with cutoffs

Álvaro. G. Iñesta, Gayane Vardoyan, Lara Scavuzzo, Stephanie Wehner
arXiv preprint arXiv:2207.06533

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

Professional Activities

Co-organizer of the Quantum Software Consortium (QSC) 8th General Assembly

Delft, Dec. 2022

Service

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.

- *Towards a Quantum Internet*, EEMCS Software Technology Faculty Lunch, TU Delft (Nov. 24, 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)