Uzi Pereg

Technion – Israel Institute of Technology
Electrical and Computer Engineering
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Date: April 13, 2024

Current Position

2022–Present **Chaya Chair Assistant Professor**, *Technion – Israel Institute of Technology*, Viterbi Faculty of Electrical and Computer Engineering and Hellen Diller Quantum Center

Previous

2020–2022 **Postdoctoral Researcher**, *Technical University of Munich (TUM)*, Project: Capacity of Quantum Communication Networks, Quantum Repeater Links (QR.X)
Hosts: Gerhard Kramer and Christian Deppe

Education

2015–2019 **Ph.D. in Electrical Engineering**, *Technion – Israel Institute of Technology*, Title: Single and Multi User Arbitrarily Varying Channels, date of award: 26/12/2019
Advisor: Yossef Steinberg

2012–2015 **M.Sc. in Electrical Engineering**, *Technion – Israel Institute of Technology*, Title: Channel Upgradation for Non-Binary Input Alphabets and MACs, date of award: 01/06/2015
Advisor: Ido Tal

2007–2011 **B.Sc. in Electronics Engineering**, *Azrieli College of Engineering in Jerusalem (JCE)*, (Summa Cum Laude), Minored in Communications and in VLSI, date of award: 01/11/2011.
Project: Applications of Independent Component Analysis in DSP of Audio and Image Signals. Supervisor: Doron Ben Zvi

Honors and Scholarships

2022 **Munich Center for Quantum Science and Technology (MCQST) Fellowship**

2020, 2021 **Israel CHE Postdoctoral Fellowship of Quantum Science and Technology**

2020 **Minerva Postdoc Fellowship (I turned down due to conflict)**

2020 **Viterbi Postdoc Fellowship for Nurturing Future Faculty Members**

2018-2019 **Viterbi Ph.D. Fellowship**

2018 **KLA-Tencor Award for Excellent Conference Paper**

2018 **Perl Award for Research in Communication**

2017, 2019 **IEEE ISIT Student Travel Grant**

2017, 2018, 2019 **IFT Jerusalem Award for Excellence in Studies**

2014, 2015, 2017 **The Technion Outstanding Teaching Assistant Award**

2014 **The Cisco Systems Award for Excellence in studies**

2011 **The Oscar Van Leer Scholarship for Advanced Technology**

2011 **JCE President's Award for Excellence in studies**

2010 **Mellanox Award for Excellence in studies**

Funding

2024-2027 **Israel Science Foundation (ISF) Individual Research Grant**, "Capacity for Quantum Communication Networks with Channel Uncertainty".

2024-2026 **Israel Science Foundation (ISF) New-Faculty Equipment**, "Funding for Cloud Quantum Computing Access To Implement Quantum Error Correction Codes".

2023-2024 **Nevet Quantum Program of the Technion**, "Octopus States: New Type of Hyperentanglement".

2023-2024 **AWS BraKet Quantum Computing Cloud Credit for Research**, "Implementation of Error Correction Codes on Quantum Computers".

2023-2027 **German-Israeli Project Cooperation (DIP)**, "Cognitive Cloud Communications Networks: Theory and Practical Approaches".

2022-2024 **Chaya Career Advancement Chair**

2022-2025 **Israel Council for Higher Education (VATAT) project for Quantum Science and Technology**, "Quantum Broadcast Communication and State Preparation".

2022-Present **Helen Diller Quantum Center at the Technion**

2020-2022 **German federal government (BMBF) projects Q.link.X and Q.R.X for the design and analysis of quantum communication and repeater systems**

2022 **Munich Center for Quantum Science and Technology (MCQST) Project within the Seed Funding Program**, "Transmitter Interaction in Quantum Communication Networks".

Teaching Experience

2023-Present **Lecturer in Quantum Shannon Capacity**, *Technion - Israel Institute of Technology*

2022-Present **Lecturer in Information Theory for Quantum Communication**, *Technion - Israel Institute of Technology*

2020-2021 **Lecturer and Teaching Assistant in Algorithms in Quantum Theory**, *Technical University of Munich (TUM)*

2014, 2015, 2017–2019 **Head Teaching Assistant in Random Signals**, *Technion – Israel Institute of Technology*

2013–2019 **Teaching Assistant in Random Signals**, *Technion – Israel Institute of Technology*

2012 **Teaching Assistant in in Introduction to Probability and Statistics**, *Technion's Civil Engineering Branch in Jerusalem*

2011 **Teaching Assistant in Introduction to Digital Signal Processing**, *Azrieli College of Engineering in Jerusalem (JCE)*

Supervising and Mentoring

2022-Present **Supervisor of Masters and Ph.D. students**, *Technion - Israel Institute of Technology*, Topics: Covert Communication over Quantum Channels, Quantum Network Communication with Cooperation, Post-Shannon Communications, and Optimization of Quantum Machine Learning Algorithms.

2021 **Supervisor of a Masters student**, *Technical University of Munich (TUM)*, Topic: Identification over Compound Broadcast Channels and Fading Channels

2020 **Supervisor of Undergraduate Project**, *Technical University of Munich (TUM)*, Topic: Identification over Broadcast Channels

2019 **Supervisor of Undergraduate Project**, *Technion – Israel Institute of Technology*, Topic: Water Filling Algorithms for Gaussian Channels

2014, 2018 **Beatrice Program**, *Technion – Israel Institute of Technology*

Master's Thesis

Channel Upgradation for Non-Binary Input Alphabets and MACs. U. Pereg, M.Sc. thesis, Technion, IIT, 2015.

Ph.D. Thesis

Single and Multi User Arbitrarily Varying Channels. U. Pereg, Ph.D. dissertation, Technion, IIT, 2019.

Journal Publications

[1] "Channel Upgradation for Non-Binary Input Alphabets and MACs", **U. Pereg** and I. Tal, *IEEE Transactions on Information Theory*, vol. 63, no.3, pp. 1410-1424, March 2017.

[2] "The Arbitrarily Varying Channel under Constraints with Side Information at the Encoder", **U. Pereg** and Y. Steinberg, *IEEE Transactions on Information Theory*, vol. 65, no. 2, pp. 861-887, February 2019.

[3] "The Arbitrarily Varying Relay Channel", **U. Pereg** and Y. Steinberg, *20th Anniversary of Entropy - Recent Advances in Entropy and Information-Theoretic Concepts and Their Applications*, vol. 21, no. 5:516, May 2019.

[4] "The Arbitrarily Varying Broadcast Channel with Causal Side Information at the Encoder", **U. Pereg** and Y. Steinberg, *IEEE Transactions on Information Theory*, vol. 66, no. 2, pp. 757-779, February 2020.

[5] "The Arbitrarily Varying Channel With Colored Gaussian Noise", **U. Pereg** and Y. Steinberg, *IEEE Transactions on Information Theory*, vol. 67, no. 6, pp. 3781-3817, June 2021.

[6] "Quantum Channel State Masking", **U. Pereg**, C. Deppe and H. Boche, *IEEE Transactions on Information Theory*, vol. 67, no. 4, pp. 2245-2268, April 2021.

[7] "Quantum Broadcast Channels with Cooperating Decoders: An Information-Theoretic Perspective on Quantum Repeaters", **U. Pereg**, C. Deppe and H. Boche, *Journal of Mathematical Physics*, 62, 062204, June 2021.

[8] "Deterministic Identification Over Channels With Power Constraints", M. J. Salariseddigh, **U. Pereg**, H. Boche, and C. Deppe, *IEEE Transactions on Information Theory*, vol. 68, no. 1, pp. 1-24, January 2022.

[9] "Communication over Quantum Channels with Parameter Estimation", **U. Pereg**, *IEEE Transactions on Information Theory*, vol. 68, no. 1, pp. 359-383, January 2022.

[10] "Classical State Masking Over a Quantum Channel", **U. Pereg**, C. Deppe and H. Boche, *Physical Review A*, vol. 105, n. 2, p. 022442, February 2022.

[11] "The Quantum Multiple Access Channel with Cribbing Encoders", **U. Pereg**, C. Deppe and H. Boche, *IEEE Transactions on Information Theory*, vol. 68, no. 6, pp. 3965-3988, February 2022.

[12] "Identification over Compound Multiple-Input Multiple-Output Broadcast Channels", J. Rosenberger, **U. Pereg**, and C. Deppe, accepted for publication in *IEEE Transactions on Information Theory*, vol. 69, no. 7, March 2023.

[13] "Communication with Unreliable Entanglement Assistance", **U. Pereg**, C. Deppe and H. Boche, accepted for publication in *IEEE Transactions on Information Theory*, vol. 69, no. 7, March 2023.

[14] (Submitted) "The Multiple-Access Channel with Entangled Transmitters", submitted for publication in *IEEE Transactions on Information Theory*, May 2023.

[15] (Submitted) "Entanglement-Assisted Covert Communication via Qubit Depolarizing Channels", E. Zlotnick, B. Bash, and **U. Pereg**, submitted for publication in *IEEE Transactions on Information Theory*, August 2023.

[16] "Identification Over Quantum Broadcast Channels", J. Rosenberger, **U. Pereg**, and C. Deppe, *Springer Quantum Information Processing*,vol. 22, no. 361, October 2023.

[17] "Deterministic Identification for Molecular Communications Over the Poisson Channel", M. J. Salariseddigh, V. Jamali, **U. Pereg**, H. Boche, C. Deppe and R. Schober, *IEEE Transactions on Molecular, Biological and Multi-Scale Communications*, vol. 9, no. 4, pp. 408-424, October 2023.

[18] "Communication Over Entanglement-Breaking Channel with Unreliable Entanglement Assistance", **U. Pereg**, *Physical Review A*, 108, 042616, October 2023.

[19] (Accepted) "Deterministic K-Identification for MC Poisson Channel With Intersymbol Interference", M. J. Salariseddigh, V. Jamali, **U. Pereg**, H. Boche, C. Deppe, R. Schober, *IEEE Open Journal of the Communications Society*, vol. 5, pp. 1101-1122, January 2024.

[20] (Accepted) "Increasing Communication Rates Using Photonic Hyperentangled States", L. Nemirovsky-Levy, **U. Pereg**, and M. Segev, accepted for publication in *Optica Quantum*, March 2024.

Conference Papers

[21] "Channel Upgradation for Non-Binary Input Alphabets and MACs", **U. Pereg** and I. Tal, *Proceedings of the 2014 IEEE International Symposium on Information Theory (ISIT 2014)*, pp. 411–415, July 2014.

[22] "The Arbitrarily Varying Channel under Constraints with Causal Side Information at the Encoder", **U. Pereg** and Y. Steinberg, *Proceedings of the 2017 IEEE International Symposium on Information Theory (ISIT 2017)*, pp. 2805-2809, June 2017.

[23] "The Arbitrarily Varying Degraded Broadcast Channel with Causal Side Information at the Encoder", **U. Pereg** and Y. Steinberg, *Proceedings of the 2017 IEEE International Symposium on Information Theory (ISIT 2017)*, pp. 1033-1037, June 2017.

[24] "The Arbitrarily Varying Broadcast Channel with Degraded Message Sets with Causal Side Information at the Encoder", **U. Pereg** and Y. Steinberg, *Proceedings of the 2018 International Zürich Seminar on Information and Communication (IZS 2018)*, pp. 20-24, February 2018.

[25] "The Arbitrarily Varying Relay Channel", **U. Pereg** and Y. Steinberg, *Proceedings of the 2018 IEEE International Symposium on Information Theory (ISIT 2018)*, pp. 461-465, June 2018.

[26] "The Arbitrarily Varying Gaussian Relay Channel with Sender Frequency Division", **U. Pereg** and Y. Steinberg, *Proceedings of the 56th Ann. Allerton Conference on Communication, Control and Computing (Allerton 2018)*, pp. 1097-1103, October 2018.

[27] "Entanglement-Assisted Capacity of Quantum Channels with Side Information", **U. Pereg**, *Proceedings of the 2020 International Zürich Seminar on Information and Communication (IZS 2020)*, pp. 106-110, February 2020.

[28] "The Arbitrarily Varying Channel with Colored Gaussian Noise", **U. Pereg** and Y. Steinberg, *Proceedings of the 2020 IEEE International Symposium on Information Theory (ISIT 2020)*, pp. 2097-2102, July 2020.

[29] "Deterministic Identification Over Fading Channels", M. J. Salariseddigh, **U. Pereg**, H. Boche, and C. Deppe, *Proceedings of the IEEE Information Theory Workshop 2020 (ITW 2020)*, September 2020.

[30] "Deterministic Identification Over Channels With Power Constraints", M. J. Salariseddigh, **U. Pereg**, H. Boche, and C. Deppe, *Proceedings of the IEEE International Conference on Communications (ICC 2021)*, June 2021.

[31] "Communication over Quantum Channels with Parameter Estimation", **U. Pereg**, *Proceedings of the 2020 IEEE International Symposium on Information Theory (ISIT 2020)*, pp. 1818-1823, July 2020.

[32] "Quantum Channel State Masking", **U. Pereg**, C. Deppe and H. Boche, *Proceedings of the 2020 IEEE Information Theory Workshop (ITW 2020)*, September 2020.

[33] "Quantum Broadcast Channels with Cooperating Decoders: An Information-Theoretic Perspective on Quantum Repeaters", **U. Pereg**, C. Deppe and H. Boche, *Proceedings of the 2021 IEEE International Symposium on Information Theory (ISIT 2021)*, July 2021.

[34] "Bosonic Dirty Paper Coding", **U. Pereg**, *Proceedings of the 2021 IEEE International Symposium on Information Theory (ISIT 2021)*, July 2021.

[35] "Key Assistance, Key Agreement, and Layered Secrecy for Bosonic Broadcast Channels", **U. Pereg**, R. Ferrara and M. R. Bloch, *Proceedings of the 2021 IEEE Information Theory Workshop (ITW 2021)*, October 2021.

[36] "Deterministic Identification Over Poisson Channels", M. J. Salariseddigh, **U. Pereg**, H. Boche, and C. Deppe, *Proceedings of the 2021 IEEE Global Communications Conference (GLOBECOM 2021)*, December 2021.

[37] "Classical State Masking over a Quantum Channel", **U. Pereg**, C. Deppe, and H. Boche, *Proceedings of the 2022 International Zürich Seminar on Information and Communication (IZS 2022)*, pp. 64-68, March 2022.

[38] "Identification over Quantum Broadcast Channels", **U. Pereg**, J. Rosenberger, and C. Deppe, *Proceedings of the 2022 IEEE International Symposium on Information Theory (ISIT 2022)*, pp. 258-263, June 2022.

[39] "The Quantum Multiple Access Channel with Cribbing Encoders", **U. Pereg**, C. Deppe and H. Boche, *Proceedings of the 2022 IEEE International Symposium on Information Theory (ISIT 2022)*, pp. 1076-1081, June 2022.

[40] "Identification over Compound MIMO Broadcast Channels", J. Rosenberger, **U. Pereg**, and C. Deppe, *Proceedings of the IEEE International Conference on Communications (ICC 2022)*, pp. 781-786, August 2022.

[41] "Increasing Communication Rates Using Photonic Hyperentangled States", L. Nemirovsky-Levy, **U. Pereg**, and M. Segev, *Laser Science*, pp. JTu5A-41, October 2022.

[42] "Communication with Unreliable Entanglement Assistance", **U. Pereg**, C. Deppe and H. Boche, *Proceedings of the 2022 IEEE International Symposium on Information Theory (ISIT 2022)*, pp. 2231-2236, June 2022.

[43] "Joint Quantum Communication and Sensing", S. Y. Wang, T. Erdoğan, **U. Pereg**, and M. R. Bloch, *Proceedings of the 2022 IEEE Information Theory Workshop (ITW 2022)*, pp. 506-511, December 2022.

[44] "Deterministic Identification For MC ISI-Poisson Channel", M. J. Salariseddigh, Vahid Jamali, **U. Pereg**, H. Boche, C. Deppe, and R. Schober, *Proceedings of the IEEE International Conference on Communications (ICC 2023)*, pp. 6108-6113, May 2023.

[45] "The Multiple-Access Channel with Entangled Transmitters", **U. Pereg**, C. Deppe, and H. Boche, accepted for publication in the *Proceedings of the IEEE Global Communications Conference (Globecom 2023)*, pp. 3180-3185, May 2023.

[46] "Capacity Bounds for Identification With Effective Secrecy", J. Rosenberger, A. Ibrahim, B. A. Bash, C. Deppe, R. Ferrara, and **U. Pereg**, *Proceedings of the IEEE International Symposium on Information Theory (ISIT 2023)*, pp. 1202-1207, June 2023.

[47] "Entanglement-Assisted Covert Communication via Qubit Depolarizing Channels", E. Zlotnick, B. Bash, and **U. Pereg**, *Proceedings of the IEEE International Symposium on Information Theory (ISIT 2023)*, pp. 198-203, June 2023.

[48] (Submitted) "Coordination Capacity Region for Classical-Quantum States", H. Nator and **U. Pereg**, *Proceedings of the 2024 IEEE International Symposium on Information Theory (ISIT 2024)*, pp. 2231-2236, January 2024.

[49] (Submitted) "Secure Communication with Unreliable Entanglement Assistance", M. Lederman and **U. Pereg**, *Proceedings of the 2024 IEEE International Symposium on Information Theory (ISIT 2024)*, pp. 2231-2236, January 2024.

[50] (Accepted) "Communication Over Entanglement-Breaking Channels With Unreliable Entanglement Assistance", **U. Pereg**, *Proceedings of the 2024 International Zürich Seminar on Information and Communication (IZS 2024)*, March 2024.

Invited Presentations (Local)

2018 "The Arbitrarily Varying Gaussian Relay Channel with Sender Frequency Division", 2018 Workshop on Coding, Cooperation, and Security in Modern Communication Networks (COCO 2018).

2020 "Quantum Channel State Masking", Workshop on Coding, Cooperation, and Security in Modern Communication Networks (COCO 2020) of TUM and Ben Gurion University.

2021 "An Information-Theoretic Perspective on Quantum Repeaters"

1) Workshop on Entanglement-Assisted Communication Networks (EACN 2021), organized by TUM and the Munich Center of Quantum Science and Technology.

2) Workshop on Coding, Cooperation, and Security in Modern Communication Networks (COCO 2021) of TUM and Ben Gurion University.

2023 "Classical Communication with Entanglement Resources", 2023 Joint DIP & Ollendorff-Minerva Center (OMC) Workshop on Cognitive Cloud Communications Networks of TUM and the Technion.

Invited Presentations (Non-Local)

2019 "The Arbitrarily Varying Broadcast Channel with Causal Side Information at the Encoder", Information: Theory and Applications Workshop in San Diego (ITA 2019).

2021 "An Information-Theoretic Perspective on Quantum Repeaters". IMPRS-ETH Workshop on Quantum Information and Quantum Technologies in Zürich (QWiZ 2021).

Industrial Relations

2021 Invited as panelist, Inside Quantum Technology Conference in New York (IQT 2021), *Panel II: Quantum Repeaters: Commercialization potential*, November 1-5, 2021.

Tutorials

2023 "Introduction to Quantum Shannon Theory", Quantum Winter School on Challenges and Advances in Quantum Computing in Sde Boker, February 26-March 2.

2023 "Quantum Communications and 6G Technology", European Wireless (EW 2023), Rome, Italy, October 2-4.

Seminars

2018, 2019 "Arbitrarily Varying Broadcast and Relay Channels"

1) BLISS Seminar in Berkeley University.
2) IT Forum in Stanford University.
3) EE Systems Seminar in California Institute of Technology (Caltech).
4) Communication Engineering Seminar in TUM.
5) EE-Systems Seminar in Tel Aviv University.

2020 "Communication over Quantum Channels with Parameter Estimation", Signal Processing and Information Theory Seminar in TUM.

2021 "An Information-Theoretic Perspective on Quantum Repeaters"

1) Colloquium in Bar-Ilan University.
2) Helen Diller Quantum Center Seminar at the Technion.
3) Walther-Meißner-Institute, Bavarian Academy of Sciences and Humanities

2022 "Communication with Unreliable Entanglement Assistance"

1) Information Theory Seminar at the Technion.
2) ECE Seminar at Ben-Gurion University.
3) EE-Systems Seminar in Tel Aviv University.
4) Condensed Matter Seminar in the University of Southern California (USC).
5) ECE Seminar at the University of Arizona.

2023 "The Multiple-Access Channel with Entangled Transmitters"

1) CS Coding Theory Seminar at the Technion.
2) Beyond IID Conference (BIID 2023).

Posters

2020 "Quantum Channel State Masking"

1) Munich Conference on Quantum Science and Technology (MCQST 2020), July 2020.

2) Annual Conference on Quantum Information Processing (QIP 2021), February 2021.

2021 "An Information-Theoretic Perspective on Quantum Repeaters".

1) Munich Conference on Quantum Science and Technology (MCQST 2021), July 2021.

2) Q.Link.X Status Seminar II in Bad Honnef, July 2021.

3) Annual Conference on Quantum Information Processing (QIP 2022), March 2022.

2021 "Cooperation in Quantum Networks", Quantum Repeater Links (QRX) Kick-off Meeting in Bad Honnef, October 2021.

2022 "Communication with Unreliable Entanglement Assistance",

1) The 2nd Workshop on Entanglement Assisted Communication Networks (EACN 2022), February 2022.

2) Annual Conference on Quantum Information Processing (QIP 2023), February 2023.

Research Visit

2022 Georgia Institute of Technology, hosted by Matthieu Bloch from February 13th to March 4th, 2022.

Academic Service

Reviewer for the following journals and conferences:

2018-Present IEEE Transactions on Information Theory

2019-Present Proceedings of IEEE Symposium on Information Theory (ISIT)

2020-Present IEEE Transactions on Communications

2019-Present Physical Review A

2021-Present IEEE Transactions on Information, Forensics, and Security

2019 Journal of Mathematical Physics

2020 IEEE Access

2021 IEEE Communications Letters

2021 Proceedings of IEEE Information Theory Workshop (ITW 2021)

Technical Program Committee (TPC)

2023 IEEE Symposium on Information Theory (ISIT 2023)

2024 IEEE Symposium on Information Theory (ISIT 2024)

2024 Beyond IID Conference (BIID 2024)

Session chair for the following conferences:

2019 Information: Theory and Applications Workshop (ITA 2019)

2021 IEEE Information Theory Workshop (ITW 2021)

2021 Workshop on Entanglement Assisted Communication Networks (EACN 2021)

2022 Workshop on Entanglement Assisted Communication Networks (EACN 2022)

Further Activities

2019 Winter School on 'The Mathematics of Quantum Computation', Hebrew University of Jerusalem.

2020 Summer School on 'Quantum Computing Primer', Technion.

2020 Grant Writing Workshop, TUM.

2021 IBM Workshop on Quantum Composer Suite and Qiskit, Walter Schottky Institute, TUM.

2021-2022 Reviewer for Ph.D. and postdoc positions within the *Munich Quantum Valley*, an initiative of the Bavarian Academy of Sciences and Humanities, the Max Planck Society, the Ludwig-Maximilians-Universität München (LMU), and TUM.

2021 Organizer of the 1st Workshop on Entanglement Assisted Communication Networks (EACN 2021), in collaboration with the Munich Center of Quantum Science and Technology.

2022 Organizer of the 2nd Workshop on Entanglement Assisted Communication Networks (EACN 2022), in collaboration with the Munich Quantum Valley (MQV), the National Yang Ming Chiao Tung University (NYCU), and the University of Arizona.

2023 Organizer of the Quantum Winter School on Challenges and Advances in Quantum Computing, Technion - Israel Institute of Technology.

2023 Organizer of the 3rd Workshop on Entanglement Assisted Communication Networks (EACN 2023), in collaboration with the Munich Quantum Valley (MQV), the National Yang Ming Chiao Tung University (NYCU), and the University of Arizona.

2023 Lecturer in the "Quantumba 1900" Summer Camp in Quantum Theory for Outstanding Highschool Students, Technion - Israel Institute of Technology.

2024 Lecturer in the Quantum Information Open Day for Highschool Students in Computer Science and Physics Majors, Technion - Israel Institute of Technology.

2024 Lecturer in "Quantum IL", an Israel Ministry of Defense - Directorate of Defense Research & Development (Maf'at) program.