

İlke ERCAN

Department of Microelectronics
TU Delft Building 36,
Mekelweg 4, 2628 CD, Delft
The Netherlands

Tel: + 31 15 27 84236
i.ercan@tudelft.nl
ORCID ID: [0000-0003-1339-9703](https://orcid.org/0000-0003-1339-9703)
microelectronics.tudelft.nl/~ilke

Research Interests: Emerging and unconventional computing paradigms; Fundamental energy efficiency limitations in computing; Nanoelectronics; Nanophotonics; Quantum-computing; Physical-information theory; Thermodynamics of computation.

Teaching Interests: Introduction to Electrical Engineering, Physics of Semiconductor Devices, Circuit Theory, Electronics, Physical-Information Theory, Probability and Random Processes, Thermodynamics.

Education

[University of Massachusetts](#), Amherst MA, USA

Ph.D., [Electrical & Computer Engineering](#) (ECE) **Fall 2008 - Spring 2014**

Advisor: [Professor Neal G. Anderson](#)

Area of Study: Heat Dissipation Bounds for Nanocomputing: Methodology and Applications

M.S., [Electrical & Computer Engineering](#) (ECE) **Fall 2006 - Summer 2008**

Advisor: [Professor Neal G. Anderson](#)

Area of Study: Electron Transport Properties and Information Bounds of Nanoscale Conductors by Microcanonical Approach

[Middle East Technical University](#), Ankara, Turkey

B.S., [Physics](#), Solid State Physics **Fall 2002 - Summer 2006**

Minor, [Logic and Philosophy of Science](#) **Spring 2004 - Summer 2006**

Academic Positions

TU Delft [Department of Microelectronics](#)

Associate Professor

Principal Educator

Spring 2023 - present

Spring 2021 - Spring 2023

University College Roosevelt [Engineering Department](#)

Associate Professor

Fall 2019 - Spring 2021

Boğaziçi University [Department of Electrical and Electronics Engineering](#)

Assistant Professor

Fall 2015 - Spring 2020

Massachusetts Institute of Technology [Electronic Materials Research Group \(EMAT\)](#)

Visiting Resercher

Summer 2018

Sabancı University [Foundations Development Program](#)

Part-Time Instructor

Spring 2018

TU Darmstadt [Institute for Semiconductor Technology and Nanoelectronics](#) and [Institute for Philosophy](#)

Postdoctoral Research Fellow

Spring and Summer 2015

Smith College [Picker Engineering Program](#)

Visiting Faculty

Spring and Fall 2014

Research and Teaching Grants

TU Delft Open Education Stimulation Fund (co-PI) **2025**

Quantum Delta NL Centre for Quantum & Society Grant (co-PI) **2024**

TU Delft Education Fellowship (PI) **2023 - 2024**

MIT International Science and Technology Initiatives Seed Fund (co-PI) **2018 - 2020**

TÜBİTAK 3501 Career Development Grant (PI) **2017 - 2019**

Boğaziçi University Start-up Research Grant (PI) **2016 - 2019**

TÜBİTAK 2219 Postdoctoral Research Grant (PI) **2014 - 2015**

Research Awards

Delft Women in Science (DEWIS) Award in Advanced Career Category	2025
IEEE 12 th International Conference on Nanotechnology First Place Best Oral Conference Paper	2012
IEEE 11 th International Conference on Nanotechnology Best Paper Award	2011

Teaching Awards

TU Delft Department of Microelectronics Teacher of the Year	2022
Boğaziçi University Faculty of Engineering Excellence in Teaching Award	2018
UMass Amherst ECE Outstanding Teaching Assistant Award	2012

Teaching Certificates

TU Delft University Teaching Qualification (UTQ) Exemption	2021
Utrecht University Basic University Teaching Qualification (BTQ)	2020

Publications

Book Chapters

1. S. Faletic, P. Bitzenbauer, M. Bondani, M. Chiofalo, S. Goorney, K. Krijtenburg-Lewerissa, O. Mishina, R. Muller, G. Pospiech, **İ. Ercan**, et. al. “Contributions from Pilot Projects in Quantum Technology Education as Support Action to Quantum Flagship,” *Challenges in Physics Education (CPE)*, Springer Nature, p. 219-238 20 p. (Challenges in Physics Education; vol. Part F3953), December 17, 2024. https://doi.org/10.1007/978-3-031-72541-8_15
2. A. Vartanyan, T. Arman, **İ. Ercan**, and A. D. Pinçe, “Boğaziçi Üniversitesi’nde Cinsel Tacizi Önleme Çalışmaları Sürecinde Şemsa Özar’la Yol Arkadaşlığımız (Working with Şemsa Özar in Sexual Harassment Prevention Committee at Bogazici University),” *Feminizm, Ekoloji, Toplumsal Direniş (Feminism, Ecology, Collective Resistance)*, Eds. H. Çağlayan and K. A. Türker, İstanbul, 2022. ISBN: 978-605-260-367-3.
3. **İ. Ercan** and N. Anderson, “Modular Dissipation Analysis for QCA,” *Field-Coupled Nanocomputing, N.G. Anderson and S. Bhanja. Eds. Lecture Notes in Computer Science*, vol. 8280, pp. 357-375, Heidelberg, 2014. doi: [10.1007/978-3-662-43722-3_15](https://doi.org/10.1007/978-3-662-43722-3_15)

Selected Peer-Reviewed Journal Articles

1. Z. C. Seskir, P. Migdal, C. A. Weidner, A. Anupam, N. Case, N. Davis, C. Decaroli, **İ. Ercan**, C. Foti, P. Gora, K. Jankiewicz, B. R. La Cour, J. Y. Malo, A. Naeemi, L. Nita, N. Parvin, F. Scafrimuto, J. Friis Sherson, E. Surer, J. R. Wootton, L. Yeh, O. Zabello and M. Chiofalo. “Quantum Games and Interactive Tools for Quantum Technologies Outreach and Education: A Review and Experiences from the Field,” *Optical Engineering*, 61(8), 081809, 2022. doi.org/10.1117/1.OE.61.8.081809
2. **İ. Ercan**, Z. D. Sütgöl, and F. O. Özhan, “Physical Limitations on Fundamental Efficiency of SET-Based Brownian Circuits,” *Entropy*, vol. 23 no 4, 406, 2021. doi.org/10.3390/e23040406
3. S. Barışık and **İ. Ercan**, “Thermodynamic Cost of Edge Detection in Artificial Neural Network (ANN)-Based Processors,” *International Journal of Parallel, Emergent and Distributed Systems*, Published online: 29 Oct 2020. doi: [10.1080/17445760.2020.1836639](https://doi.org/10.1080/17445760.2020.1836639)
4. F. Dinç, **İ. Ercan** and A. M. Brańczyk, “Exact Markovian and non-Markovian time dynamics in waveguide QED: collective interactions bound states in continuum, superradiance and subradiance,” *Quantum*, vol. 3, p. 213, 9 December, 2019. doi: [10.22331/q-2019-12-09-213](https://doi.org/10.22331/q-2019-12-09-213)
5. **İ. Ercan** and E. Suyabatmaz “Fundamental Energy Limits of SET-Based Brownian NAND and Half-Adder Circuits,” *European Physical Journal B*, vol. 91 p. 113, 2018. doi: [10.1140/epjb/e2018-80619-6](https://doi.org/10.1140/epjb/e2018-80619-6)
6. F. Dinç and **İ. Ercan** “Single Photon Two-Level Atom Interactions in 1-D Dielectric Waveguide: Quantum Mechanical Formalism and Applications” *Optical and Quantum Electronics (OQEL)*, 50: 390, Published Online October 15, 2018. doi: [10.1007/s11082-018-1658-y](https://doi.org/10.1007/s11082-018-1658-y)
7. F. Dinç and **İ. Ercan** “Quantum Mechanical Treatment of Two-Level Atoms Coupled to Continuum with an Ultraviolet Cutoff,” *Journal of Physics A: Mathematical and Theoretical*, vol. 51, no 35, p. 355, 2018. doi: [10.1088/1751-8121/aad165](https://doi.org/10.1088/1751-8121/aad165)

8. **İ. Ercan** and N. Anderson, "Heat Dissipation in Nanocomputing: Lower Bounds from Physical Information Theory," *IEEE Transactions on Nanotechnology*, vol. 12, no. 6, pp. 1047 - 1060, 2013. doi: [10.1109/tnano.2013.2276938](https://doi.org/10.1109/tnano.2013.2276938)
9. N. Anderson, **İ. Ercan** and N. Ganesh, "Toward Nanoprocessor Thermodynamics," *IEEE Transactions on Nanotechnology*, vol. 12, no. 6, pp. 902 - 909, 2013. doi: [10.1109/tnano.2013.2260352](https://doi.org/10.1109/tnano.2013.2260352)
10. **İ. Ercan** and N. Anderson, "Tight-biding Implementation of the Microcanonical Approach to Transport in Nanoscale Conductors: Generalization and Analysis," *Journal of Applied Physics*, vol. 107 no. 12, pp. 124318-13, 2010. doi: [10.1063/1.3388055](https://doi.org/10.1063/1.3388055)
11. **İ. Ercan** and N. Anderson, "Current and Information in the Microcanonical Picture of Nanoscale Transport," *Journal of Computational Electronics*, vol. 7, no 3., pp. 466 - 470, 2008. doi: [10.1007/s10825-008-0234-2](https://doi.org/10.1007/s10825-008-0234-2)
12. **İ. Ercan** and S. Katircioğlu, "The Electronic Structure of Capped and Uncapped CdS Nanoparticles," *Journal of Nanoscience and Nanotechnology* 8, pp. 645 - 649, 2008. doi: [10.1166/jnn.2008.A219](https://doi.org/10.1166/jnn.2008.A219)

Conference Proceedings

1. S. van Rijns, **İ. Ercan**, A. Vladimirescu, and F. Sebastiano, "Single-Electron-Transistor Compact Model for Spin-Qubit Readout," *Proceedings of SMACD'23: International Conference on Synthesis, Modeling, Analysis and Simulation Methods and Applications to Circuit Design*, 3-5 July 2023.
2. M. Chiofalo, A. Anupam, M. Bondani, **İ. Ercan**, S. Goorney, M. Michelini, L. Santi, Z. Seskir, J. F. Sherson, A. Stefanel J. Y. Malo, E. Surer, C. A. Weidner, and O. Zabello, "Cultural Storytellings in Quantum Science and Technology Education," *GIREP Conference 2022: Effective Learning in Physics from Contemporary Physics to Remote Settings*, July, 2022.
3. O. Yakar, Y. Nie, K Wada, A. Agarwal and **İ. Ercan**, "Energy Efficiency Analyses of Microring-Resonator-Based BDD Logic Circuits," *Proceedings of the IEEE International Conference on Rebooting Computing*, 28 November, 2019. doi: [10.1109/ICRC.2019.8914708](https://doi.org/10.1109/ICRC.2019.8914708)
4. **İ. Ercan**, Ö. Susam, M. Altun, and M. H. Cilasun, "Synthesis and Fundamental Energy Analysis of Fault-Tolerant CMOS Circuits," *IEEEExplore Proceedings of SMACD'17: International Conference on Synthesis, Modeling, Analysis and Simulation Methods and Applications to Circuit Design*, 12-15 June 2017. doi: [10.1109/smacd.2017.7981586](https://doi.org/10.1109/smacd.2017.7981586)
5. **İ. Ercan**, "Fundamental Energy Dissipation Limits in Logic Circuits," *ICT Energy Letters*, vol. 12, pp. 3-4, August 2016. (**Invited Paper**)
6. N. Anderson, **İ. Ercan** and N. Ganesh, "Toward Nanoprocessor Thermodynamics," *Proceedings of the 12th IEEE Conference on Nanotechnology (IEEE NANO, 2012)*, 2012. doi: [10.1109/nano.2012.6322186](https://doi.org/10.1109/nano.2012.6322186) (**First Place Best Oral Conference Paper**)
7. **İ. Ercan** and N. Anderson, "Heat Dissipation in Nanocomputing: Theory and QCA Application," *Proceedings of the 11th IEEE Conference on Nanotechnology (IEEE NANO, 2011)*, pp.1289-1294, 2011. doi: [10.1109/nano.2011.6144346](https://doi.org/10.1109/nano.2011.6144346) (**Best Paper Award**)
8. **İ. Ercan**, M. Rahman and N. Anderson, "Determining Fundamental Heat Dissipation Bounds for Transistor-Based Nanocomputing Paradigms," NANOARCH'11: IEEE/ACM Symposium on Nanoscale Architectures, *Proceedings of the 2011 IEEE/ACM International Symposium on Nanoscale Architectures*, pp. 169 - 174, 2011. doi: [10.1109/nanoarch.2011.5941500](https://doi.org/10.1109/nanoarch.2011.5941500)
9. **İ. Ercan** and N. Anderson, "Structure Dependence of Nanoconductor Current in a Tight-Binding Microcanonical Model," *NANO'08: Proc. of the 8th IEEE Conference on Nanotechnology (IEEE NANO, 2008)*, pp. 331 - 334. doi: [10.1109/nano.2008.104](https://doi.org/10.1109/nano.2008.104)
10. **İ. Ercan** and N. Anderson, "Structure Dependence of Nanoconductor Current in a Microcanonical Transport Model," *Proceedings of the 17th Annual Connecticut Symposium on Microelectronics and Optoelectronics*, pp. 39 - 40, April, 2008.

Oral Presentations

1. **İ. Ercan**, “Energy Efficiency of Computing at the Quantum Precipiceg” *Smith College Picker Engineering Program*, Northampton, MA, February 6, 2023. **(Invited Talk)**
2. **İ. Ercan** and B. Kılınç, “Entropy, Information, and Their Relation to Energy: Implications in Science and Engineering” *Philosophy of Science Around the Mediterranean POND 3: Unity/ Disunity of Science*, Lisbon, Portugal, September 21, 2018.
3. **İ. Ercan**, “Energetic Cost of Information Processing at the Quantum Precipice: A Physical-Information-Theoretic Approach,” *KOBIT-2, Quantum Optics and Information Meeting*, İstanbul, Turkey, 1-2 February, 2018. **(Invited Talk)**
4. **İ. Ercan**, “Energy Efficiency Limit in Brownian Circuits,” *Micro Energy*, Gubbio, Italy, 3- 7 July, 2017. **(Invited Talk)**
5. **İ. Ercan**, Ö. Susam, M. Altun, and M. H. Cilasun, “Synthesis and Fundamental Energy Analysis of Fault-Tolerant CMOS Circuits,” *SMACD'17: International Conference on Synthesis, Modeling, Analysis and Simulation Methods and Applications to Circuit Design*, Giardini Naxos, Italy, 12-15 June 2017.
6. **İ. Ercan**, “Fundamental Energy Dissipation Limits in Logic Circuits,” *ICT Energy Science Conference*, Aalborg, Denmark, 16- 19 August, 2016. **(Invited Talk)**
7. **İ. Ercan**, “Making of Measurement on Limits: Examples from Nanoelectronics,” *The Making of Measurement Conference*, University of Cambridge, July 24, 2015.
8. **İ. Ercan**, N. Ganesh, and N. Anderson, “Modular Dissipation Analysis for QCA,” *FCN 13: The Workshop on Field Coupled Nanocomputing*, Tampa, FL, February 7, 2013.
9. **İ. Ercan**, “A Case Study of Actor-Network Theory: The Structure of Scientific Research on Nanoscale Semiconductor Devices,” *ST Global Consortium Science and Technology in Society Conference*, Washington, DC, March 31, 2012.
10. **İ. Ercan** and N. Anderson, “Heat Dissipation in Nanocomputing: Theory and QCA Application,” *IEEE NANO'11: 11th IEEE Conference on Nanotechnology*, Portland OR, August 18, 2011. **(Best Paper Award)**
11. **İ. Ercan**, M. Rahman and N. Anderson, “Determining Fundamental Heat Dissipation Bounds for Transistor-Based Nanocomputing Paradigms,” *NANOARCH '11: IEEE/ACM Symposium on Nanoscale Architectures*, San Diego, CA, June 2011.
12. **İ. Ercan** and N. Anderson, “Structure Dependence of Nanoconductor Current in a Tight-Binding Micro-canonical Model,” *IEEE 8th International Conference on Nanotechnology*, Arlington, TX, August 19, 2008.
13. **İ. Ercan** and N. Anderson, “Structure Dependence of Nanoconductor Current in a Microcanonical Transport Model,” *17th Annual Connecticut Symposium on Microelectronics and Optoelectronics*, Storrs, CT, April 9, 2008.

Selected Invited Public Lectures

1. **İ. Ercan**, “Belonging through Agency: Student Involvement and Community Building in University Education,” *TU Delft Education Day*, November 10, 2022.
2. **İ. Ercan**, “Fiziksel Enformasyon Teorisi: Kavramlar ve Yanlış Anlamalar (Physical Information Theory: Concepts and Misunderstanding),” *5th Systems and Control Engineering Graduate Student Camp, EMO (The Chamber of Electrical Engineers)*, [Nesin Math Village](#) Şirince, Spring 2017.
3. **İ. Ercan**, “Integrative Approach to Education in Turkey,” *Boğaziçi University IEEE Student Branch Science, Technology, Engineering, Arts, and Math (STEAM) Workshop*, October 1, 2016.
4. **İ. Ercan**, “Teknolojilerin Sınırlarınıve Gelişmelerini Etkileyen Faktörler (Factors Affecting the Limits and Evolution of Technologies),” *Sabancı University, Science Canteen*, May 21, 2014.

Courses Taught

TU Delft

Electrical Engineering BSc Programme

EE1G1: Introduction to Electrical Engineering (responsible instructor); EE1C11: Linear Circuits A (responsible co-instructor); EE1C21: Linear Circuits B (responsible co-instructor); EE1P11: Classical and Quantum Mechanics (co-instructor); EE1P21: Electricity and Magnetism (co-instructor); EE1L11: IP1/EPO-1 and EE1L21: EPO-2 (tutor)

Quantum Information Sciences and Technology MSc Programme

QIST4100: Homologation for QIST Electronics Module (responsible instructor)

University College Roosevelt

SCIMATH 101: Calculus for Scientists; ENGPJ102: Sensing Systems for Sustainability; ENGELEC101: Basic Electronics and Circuits

Sabancı University

NS 102: Science of Nature (Brain Module)

Boğaziçi University

EE 101: Orientation to Electrical Engineering; EE 202: Electrical Circuits II; EE 313: Probability for Electrical Engineers; EE 335: Electronics Laboratory; EE 58M: Intro to the Physical-Information-Theory

Smith College

EGR 220: Circuit Theory; EGR 390: Advanced Topics in Engineering: Semiconductor Technologies

University of Massachusetts, Amherst

Engin 112: Introduction to Electrical and Computer Engineering; ECE 211: Circuit Analysis I; ECE 212: Circuit Analysis III ECE 314: Introduction to Probability and Random Processes; ECE 344: Semiconductor Devices and Materials; EE 572: Optoelectronics, PHYS 132: Introductory Physics Laboratory

Professional Service Contribution

Technical Programme Committee Member: Design, Automation and Test in Europe Conference (DATE'23) Applications of Emerging Technologies track

Ad-Hoc Reviewer: Scientific Reports, Journal of Applied Physics, IEEE Transactions on Nanotechnology, IEEE Transactions on Very Large Scale Integration Systems, Journal of Supercomputing, Journal of Computational Electronics

Co-Editor and Ad-Hoc Reviewer: Springer Lecture Notes on Computer Science State-of-the-Art-Survey Series Special Volume on Field-Coupled Nanocomputing

Outreach Activities

TU Delft, EEMCS

IEEE Women in Engineering Affinity Group, Chair **Fall 2021 - present**

University College Roosevelt

Eleanor Green Office, Faculty Advisor **Fall 2019 - Spring 2021**

Sabancı University

Gender Studies Center (SUGender), STEM Education Academic Consultant **Summer 2017 - Fall 2018**

Boğaziçi University

IEEE Women in Engineering Affinity Group, Chair **Fall 2015 - 2019**

Sexual Harassment Prevention Committee, Member **Fall 2015 - 2019**

Smith College

Wearable Electronics Workshop, Facilitator **Fall 2012**

Museum of Art Family Day, Science Education Consultant **Fall 2006**

University of Massachusetts Amherst, Science, Technology and Society Initiative

International Dimensions of Ethics Education in Science and Engineering, Research Member **Fall 2008**

Languages

Turkish (native), English (fluent written and spoken, ITAV: C2), Dutch (intermediate).

Updated: April 1, 2025