

İLKE ERCAN

Electrical & Electronics Engineering Department
North Campus, KB210A, Boğaziçi University
34342 Bebek, İstanbul
Turkey

Tel: +90 212 359 7427
Fax: +90 212 287 2465
ilke.ercan@boun.edu.tr
web.boun.edu.tr/ilke.ercan

RESEARCH INTERESTS:

Physical information theory; fundamental limits in nanoelectronics; emerging computing paradigms; thermodynamics of computation and information processing in nanoscale systems; technology assessment; science and technology studies.

TEACHING INTERESTS:

Physics of Semiconductor Devices, Circuit Theory, Introduction to Electrical and Computer Engineering, Physical Information Theory, Introduction to Probability and Random Processes, Thermodynamics.

Education

[UNIVERSITY OF MASSACHUSETTS](#), Amherst MA, USA

Ph.D., [Electrical & Computer Engineering \(ECE\)](#) **September 2008 — February 2014**
Advisor: [Professor Neal G. Anderson](#)
Area of Study: Heat Dissipation Bounds for Nanocomputing: Methodology and Applications
M.S., [Electrical & Computer Engineering \(ECE\)](#) **September 2006 – August 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 **September 2002 – June 2006**
Minor, [Logic and Philosophy of Science](#) **February 2004 – June 2006**

Academic Experience

Assistant Professor, Boğaziçi University
[Department of Electrical and Electronics Engineering](#) **September 2015 – Present**

Postdoctoral Research Fellow, TU Darmstadt
[Institute for Semiconductor Technology and Nanoelectronics](#) and
[Institute for Philosophy](#) **February – September 2015**

Visiting Faculty, Smith College
[Picker Engineering Program](#) **Spring and Fall 2014**

Graduate Research Assistant, University of Massachusetts Amherst
ECE, [Nanoelectronics Theory and Simulation Laboratory](#) **Jan 2007 – Dec 2013**
ECE, [Wireless Systems Laboratory](#) **June 2008 – May 2009**
PoliSci, [International Dimensions of Ethics Education in Science and Engineering](#) **Summer 2009**

Project Manager, University of Massachusetts Amherst, Department of Political Science
Qualitative Data Analysis Lab, ([QDAP](#)), [eRulemaking research](#) **Summer 2009**
[QDAP](#), [Issue Adoption in Human Rights Advocacy Networks](#) **Spring 2009**

Graduate Teaching Assistant, University of Massachusetts Amherst,
[Department of Physics](#) **Spring 2013**
[Department of Electrical & Computer Engineering](#) **Fall 2006 – Fall 2013**

Awards

First Place Best Oral Conference Paper, IEEE 12th International Conference on Nanotechnology **2012**
Outstanding Teaching Assistant Award, UMass Amhers ECE **2012**
Best Paper Award, IEEE 11th International Conference on Nanotechnology **2011**

Grants and Scholarships

| | |
|------------------------------------------------------------------------------------------------|---------------------|
| MIT-Turkey Boğaziçi University Seed Fund, MIT International Science and Technology Initiatives | 2018 |
| Career Development Grant (3501), TÜBİTAK | 2017 – 2019 |
| Start-up Research Grant, Boğaziçi University | 2016 – 2019 |
| Postdoctoral Research Grant (2219), TÜBİTAK | 2014 |
| Graduate Student Travel Grant, UMass Amherst | 2008, 2011 and 2012 |
| David Navon Scholarship Award, UMass Amherst ECE | 2009 |
| Haluk Derin Scholarship, UMass Amherst ECE | 2007, 2008 and 2009 |

Publications

Preprint

1. F. Dinç and İ. Ercan “Filtering Behaviour of Two Level Atom-Photon System Inside One-dimensional Dielectric Waveguide,” [arXiv:1711.03400](https://arxiv.org/abs/1711.03400)
2. F. Dinç and İ. Ercan “Quantum Mechanical Treatment of Two-Level Atoms Coupled to Continuum with an Ultraviolet Cutoff,” [arXiv:1711.01615](https://arxiv.org/abs/1711.01615)
3. İ. Ercan and E. Suyabatmaz “Fundamental Energy Limits of SET-Based Brownian NAND and Half-Adder Circuits,” Manuscript submitted to European Physical Journal B on 30/10/2017, Accepted on 07/02/2018, Revision submitted on 19/02/2018.

Book Chapter

1. 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. 357Heidelberg, 2014.

Journal Articles

1. 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.
2. N. Anderson, İ. Ercan and N. Ganesh, “Toward Nanoprocessor Thermodynamics,” *IEEE Transactions on Nanotechnology*, vol. 12, no. 6, pp. 902 – 909, 2013.
3. 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.
4. 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.
5. İ. Ercan and S. Katrcoğlu, “The Electronic Structure of Capped and Uncapped CdS Nanoparticles,” *Journal of Nanoscience and Nanotechnology* 8, pp. 645 – 649, 2008.

Conference Proceedings

1. İ. Ercan, Ö. Susam, M. Altun, and M. H. Clasun, “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
2. İ. Ercan, “Fundamental Energy Dissipation Limits in Logic Circuits,” *ICT Energy Letters*, vol. 12, pp. 3-4, August 2016. (Invited Paper)
3. N. Anderson, İ. Ercan and N. Ganesh, “Toward Nanoprocessor Thermodynamics,” *Proceedings of the 12th IEEE Conference on Nanotechnology (IEEE NANO, 2012)*, 2012. (First Place Best Oral Conference Paper)
4. 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. (Best Paper Award)
5. 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.

6. **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.
7. **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**, “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**)
2. **İ. Ercan**, “Fundamental Energy Dissipation Limits in Logic Circuits,” *Micro Energy*, Gubbio, Italy, 3- 7 July, 2017. (**Invited Talk**)
3. **İ. Ercan**, “Fundamental Energy Dissipation Limits in Logic Circuits,” *ICT Energy Science Conference*, Aalborg, Denmark, 16- 19 August, 2016. (**Invited Talk**)
4. **İ. Ercan**, “Making of Measurement on Limits: Examples from Nanoelectronics,” *The Making of Measurement Conference*, University of Cambridge, July 24, 2015.
5. **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.
6. **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.
7. **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**)
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*, San Diego, CA, June 2011.
9. **İ. Ercan** and N. Anderson, “Structure Dependence of Nanoconductor Current in a Tight-Binding Microcanonical Model,” *IEEE 8th International Conference on Nanotechnology*, Arlington, TX, August 19, 2008.
10. **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.

Poster Presentations

1. F. Dinç and **İ. Ercan**, Filtering Behaviour of Two Level Atom-Photon System Inside One-dimensional Dielectric Waveguide, *Poster presented at KOBIT-2, Quantum Optics and Information Meeting* İstanbul, Turkey, 1-2 February 2018.
2. N. G. Anderson, **İ. Ercan**, and N. Ganesh, Revealing Fundamental Efficiency Limits for Complex Computing Structures, *Poster presented at the 4th IEEE Rebooting Computing Summit*, December 2015.
3. **İ. Ercan** and N. Anderson, “Current and Information in the Microcanonical Picture of Nanoscale Transport,” Poster Presentation in *12th International Workshop on Computational Electronics*, Amherst, MA, November 8-10, 2007.
4. **İ. Ercan** and S. Katircioglu, “The Electronic Structure of Capped and Uncapped CdS Nanoparticles,” Poster Presentation in *NANOMAT International Workshop on Nanostructured Materials*, Antalya, Turkey, June 21-23, 2006.

Colloquia and Public Lectures

1. **İ. Ercan**, “Fiziksel Enformasyon Teorisi: Kavramlar ve Yanlış Anlamalar (Physical Information Theory: Concepts and Misunderstanding),” 5th *Systems and Control Engineering Graduate Student Camp, The Chamber of Electrical Engineers (EMO), Nesin Math Village Şirince*, Spring 2017. (**Invited Lecture**)
2. **İ. Ercan**, “From Maxwells Demon to Nanocircuits: A Physical Information Theoretic Approach to Computing,” *Koç University Department of Physics GSSE Seminar Series*, March 4, 2016. (**Invited Talk**)
3. **İ. Ercan**, “Heat Dissipation Bounds for Nanocomputing: Methodology and Applications,” *Institut für Halbleitertechnik und Nanoelektronik Nanoelektronik-Kolloquium*, TU Darmstadt, April 17, 2015.
4. **İ. Ercan**, “Heat Dissipation Bounds for Nanocomputing: Methodology and Applications,” *Smith College Picker Engineering Program*, December 18, 2014. (**Invited Talk**)
5. **İ. Ercan**, “Heat Dissipation Bounds for Nanocomputing: Methodology and Applications,” *Boğaziçi University, Department of Electrical and Electronics Engineering*, May 26, 2014. (**Invited Talk**)
6. **İ. Ercan**, “Teknolojilerin Sınırları ve Gelişmelerini Etkileyen Faktörler (Factors Affecting the Limits and Evolution of Technologies),” *Sabancı University, Bilim Kantini (Science Canteen)*, May 21, 2014. (**Invited Public Lecture**)

Courses Taught

Boğaziçi University

EE 101: Orientation to Electrical Engineering, EE 202: Electrical Circuits II, EE 335: Electronics Laboratory, EE 680: Physical Information Theory

Smith College

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

University of Massachusetts

Engin 112: Introduction to Electrical and Computer Engineering, ECE 211: Circuit Analysis I, ECE 212: Circuit Analysis II, 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

Ad-Hoc Reviewer

IEEE Transactions on Nanotechnology

IEEE Transactions on Very Large Scale Integration Systems

Co-Editor and Ad-Hoc Reviewer

Springer Lecture Notes on Computer Science State-of-the-Art-Survey Series Special Volume on Field-Coupled Nanocomputing

Technical Skills

MATLAB, LabVIEW, Fortran, Gaussian98, Origin Pro, GNU Plot, Mathematica, L^AT_EX, Atlas.ti, CAT, Microsoft Office and other common applications for Microsoft Windows, Apple OS X, and Linux.

Outreach Activities

Boğaziçi University

IEEE Women in Engineering Affinity Group, Faculty Adviser

Fall 2015 – Present

Sexual Harassment Prevention Committee, Member

Fall 2015 – Present

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, Focus Group Member **Fall 2008**

Professional Affiliations

| | |
|---------------------------------------------------------------|-----------------------|
| Institute of Electrical and Electronics Engineers (IEEE) | 2006 – Present |
| International Association of Computing And Philosophy (IACAP) | 2010 – Present |
| The Society of Women Engineers (SWE) | 2011 – Present |
| American Association of University Women (AAUW) | 2011 – 2014 |

Languages

Turkish – native, English – professional, Spanish – intermediate, German – intermediate.

Updated: February 20, 2018