

Mustafa Altun, Ph.D.

TITLES	Associate Professor of Electronics Engineering at Istanbul Technical University Director of the Emerging Circuits and Computation Group (ECC)
CONTACT INFORMATION	Istanbul Technical University <i>E-mail:</i> altunmus@itu.edu.tr Electronics Engineering <i>Phone:</i> +90 532 2206662 Maslak, Istanbul, Turkey 34469 <i>Group Website:</i> http://www.ecc.itu.edu.tr
RESEARCH INTERESTS	Electronic design automation (EDA), circuit design for emerging technologies, new computing paradigms, reliability analysis - fault tolerance
POSITIONS	Istanbul Technical University , Istanbul, Turkey Associate Professor , Electronics and Communication Engineering, 2018 – <ul style="list-style-type: none">• Visiting Professor, University of Massachusetts - Amherst, USA, Host: Prof. Csaba Moritz, July–August, 2018 Assistant Professor , Electronics and Communication Engineering, 2013 – 2018 <ul style="list-style-type: none">• Visiting Professor, University of Virginia, USA, Host: Prof. Mircea Stan, June–August, 2016 Lecturer , Electronics and Communication Engineering, 2012 – 2013 University of Minnesota , Twin Cities, Minnesota, USA Research and Teaching Assistant , Electrical Engineering, 2007 – 2012 Istanbul Technical University , Istanbul, Turkey Research and Teaching Assistant , Electronics Engineering, 2006 – 2007
EDUCATION	University of Minnesota , Twin Cities, Minnesota, USA Ph.D. , Electrical Engineering, 2012 Ph.D. Minor , Mathematics, 2012 <ul style="list-style-type: none">• Dissertation Topic: Logic Synthesis and Circuit Design Techniques for Switching Nanoarrays• Advisor: Marc D. Riedel• Committee Members: Keshab K. Parhi, Sachin S. Sapatnekar, and Victor Reiner Istanbul Technical University , Istanbul, Turkey M.Sc. , Electronics Engineering, 2007 <ul style="list-style-type: none">• Dissertation Topic: Design of Current-mode Operational Amplifiers and Application Areas• Advisor: Hakan Kuntman University at Buffalo , Buffalo, New York, USA Exchange Student, Electrical Engineering, August–December, 2005 Istanbul Technical University , Istanbul, Turkey B.Sc. , Electronics and Communication Engineering, 2004

HONORS AND
AWARDS

- Istanbul Technical University **EU H2020 project coordinator recognition**, 2015
- The Scientific and Technological Research Council of Turkey (**TUBITAK**) **Success Award** for being a coordinator of a EU H2020 project (one of the few coordinators from Turkey), 2015
- **TUBITAK Career Award**: a respected award in support of junior faculty in Turkey, 2014
- The Council of Higher Education of the Republic of Turkey (**YOK**) international **PhD scholarship**, 2007
- **Werner von Siemens Excellence Award** for the best Master's study in the Department of Electronics and Communication Engineering at Istanbul Technical University, 2007
- **Siemens full-time scholarship** for graduate students, 2005
- **Ranked top 0.1%** in the **National University Entrance Exam** in Turkey among over 1 million participants, 1999
- **Silver Medal** at National Mathematics Olympics arranged by **TUBITAK**, 1997

As an Advisor

- **Place first in graduation project competition** launched by the Chamber of Electrical Engineers of Turkey (**EMO**), 2017
- **Invited** to the final exhibition of the **TUBITAK** Industry Oriented Senior **Project Competition** (2241/B) as one of the top 40 out of more than 400 projects, 2015

PROJECTS AS A PI **Internationally Sponsored**

1. Synthesis and Performance Optimization of a Switching Nano-Crossbar Computer, **EU H2020** MSCA Research and Innovation Staff Exchange Program (**RISE**), budget: 724.500 EURO, 2015-2019

Co-PIs:

- Dr. Dan Alexandrescu, IROC Technologies, France
- Prof. Lorena Anghel, TIMA Lab., France
- Prof. Valentina Ciriani, ALOS Lab., University of Milan, Italy
- Prof. Csaba Moritz, Nanoscale Computing Fabrics Lab., University of Massachusetts, USA
- Prof. Kaushik Roy, Nanoelectronics Research Lab., Purdue University, USA
- Prof. Mircea Stan, High-Performance Low-Power Lab., University of Virginia, USA
- Prof. Mehdi Tahoori, Dependable Nano-Computing Group, Karlsruhe Inst. of Tech., Germany

Nationally Sponsored (university-external)

1. Design of Reconfigurable Circuits and Systems that can Perform Approximate Computation and their Use in Image Processing Applications Involving Learning, **TUBITAK** Scientific and Technological Research Projects Funding Program (**1001**), budget: 230.000 TL, 2017-2020
2. Implementation of Accurate Stochastic Circuit Blocks and their Applications for Printed/Flexible Electronic Systems, **TUBITAK** Scientific and Technological Research Projects Funding Program (**1001**), budget: 260.000 TL, 2017-2020
3. Implementation of a Defect-aware 8-bit Reversible Microprocessor, **TUBITAK** Short Term R&D Funding Program (**1002**), budget: 30.000 TL, 2016-2017 – *completed*
4. Synthesis and Reliability Analysis of Nano Switching Arrays, **TUBITAK** Career Program (**3501**), budget: 190.000 TL, 2014-2017 – *completed*
5. A Reliability Methodology for Appliance Electronic Cards, **TUBITAK** University-Industry Collaboration Grant Program (**1505**), cooperated with Arcelik A.S., budget: 210.000 TL, 2013-2015 – *completed*

Co-PI: Ahmet Ferit Cosan, Arcelik A.S., Turkey

Nationally Sponsored (university-internal)

1. Production and Modeling of Printable Organic-Inorganic Field Effect Transistors with Carbon Materials, Istanbul Technical University Research Support Program (**ITU-BAP**), budget: 50.000 TL, 2018-2020

PUBLICATIONS

Journal Papers

*Publications co-authored only by Mustafa Altun's students/scholars marked with **

1. * T. Ayhan and **M. Altun**, Circuit Aware Approximate System Design with Case Studies in Image Processing and Neural Networks, *IEEE Access*, accepted for publication, 2018.
2. * **M. Altun**, S. Parvin, and H. Cilasun, Exploiting Reversible Computing for Latent-Fault-Free Error Detecting/Correcting CMOS Circuits, *IEEE Access*, accepted for publication, 2018.
3. * O. Tunali, M.C. Morgul, and **M. Altun**, Defect Tolerant Logic Synthesis for Memristor Crossbars with Performance Evaluation, *IEEE Micro*, Vol. 38, Issue 5, pp. 22–31, 2018.
4. * M.C. Morgul and **M. Altun**, Optimal and Heuristic Algorithms to Synthesize Lattices of Four-Terminal Switches, *Integration the VLSI Journal*, accepted for publication, 2018.
5. * F. Peker and **M. Altun**, A Fast Hill Climbing Algorithm for Defect and Variation Tolerant Logic Mapping of Nano-Crossbar Arrays, *IEEE Transactions on Multi-Scale Computing Systems*, accepted for publication, 2018.
6. * O. Tunali and **M. Altun**, A Fast Logic Mapping Algorithm for Multiple-type-Defect Tolerance in Reconfigurable Nano-Crossbar Arrays, *IEEE Transactions on Emerging Topics in Computing*, accepted for publication, 2017.
7. * O. Tunali and **M. Altun**, A Survey of Fault Tolerance Algorithms for Reconfigurable Nano-Crossbar Arrays, *ACM Computing Surveys*, Vol. 50, No. 6, Article 79, 2017.
8. D. Gungordu, **M. Altun**, and I. Cevik, Low Input Resistance Current Buffer Stage Using a Controllable Positive Feedback Loop, and Applications of Current Conveyor Based Filters, *AEU – International Journal of Electronics and Communications*, Vol. 82, pp. 58–65, 2017.
9. D. Alexandrescu, **M. Altun**, L. Anghel, A. Bernasconi, V. Ciriani, L. Frontini, and M. Tahoori, Logic Synthesis and Testing Techniques for Switching Nano-Crossbar Arrays, *Microprocessors and Microsystems*, Vol. 54, pp. 14–25, 2017.
10. * H. Yadavari and **M. Altun**, Distinct Degradation Processes in ZnO Varistors: Reliability Analysis and Modeling with Accelerated AC Tests, *Turkish Journal of Electrical Engineering and Computer Sciences*, Vol. 25, No. 4, pp. 3240–3252, 2017.
11. * O. Tunali and **M. Altun**, Permanent and Transient Fault Tolerance for Reconfigurable Nano-Crossbar Arrays, *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems*, Vol. 36, Issue 5, pp. 747–760, 2017.
12. * O. Susam and **M. Altun**, Fast Synthesis of Reversible Circuits using a Sorting Algorithm and Optimization, *the Journal of Multiple-Valued Logic and Soft Computing*, Vol. 29, Issue 1-2, pp. 1–23, 2017.
13. * H. Cilasun and **M. Altun**, A Novel Reversible Fault Tolerant Microprocessor Design in AMS 0.35um Process, *Istanbul University - Journal of Electrical and Electronics Engineering*, Vol. 17, No. 1, pp. 3147–3154, 2017.
14. **M. Altun** and M. D. Riedel, A Study on Monotone Self-dual Boolean Functions, *Acta Mathematicae Applicatae Sinica - English Series*, Vol. 33, Issue 1, pp. 43–52, 2017.
15. * **M. Altun** and V. Comert, A Change-Point based Reliability Prediction Model using Field Return Data, *Reliability Engineering and System Safety*, Vol. 156, pp. 175–184, 2016.

16. E. Alaybeyoglu, A. Guney, **M. Altun**, and H. Kuntman, Design of Positive Feedback Driven Current-Mode Amplifiers Z-Copy CDBA and CDTA, and Filter Applications, *Analog Integrated Circuits and Signal Processing*, Vol. 81, No. 1, pp. 109–120, 2014.
17. **M. Altun** and M. D. Riedel, Logic Synthesis for Switching Lattices, *IEEE Transactions on Computers*, Vol. 61, Issue 11, pp. 1588–1600, 2012.
18. **M. Altun** and M. D. Riedel, Robust Computation through Percolation: Synthesizing Logic with Percolation in Nanoscale Lattices, *International Journal of Nanotechnology and Molecular Computation*, Vol. 3, Issue 2, pp. 12–30, 2011.
19. **M. Altun**, H. Kuntman, S. Minaei, and O. K. Sayin, Realisation of nth-order Current Transfer Function Employing ECCIIs and Application Examples, *International Journal of Electronics*, Vol. 96, Issue 11, pp. 1115–1126, 2009.
20. **M. Altun** and H. Kuntman, Design of a Fully Differential Current Mode Operational Amplifier with Improved Input–output Impedances and Its Filter Applications, *AEU – International Journal of Electronics and Communications*, Vol. 62, Issue 3, pp. 239–244, 2008.

Conference Papers

1. S. Safaltin, O. Gencer, M.C. Morgul, L. Aksoy, S. Gurmen, C.A. Moritz, and **M. Altun**, Realization of Four-Terminal Switching Lattices: Technology Development and Circuit Modeling, *Design, Automation and Test in Europe (DATE)*, Florence, Italy, 2019.
2. L. Aksoy and **M. Altun**, A Satisfiability-Based Approximate Algorithm for Logic Synthesis Using Switching Lattices, *Design, Automation and Test in Europe (DATE)*, Florence, Italy, 2019.
3. M.C. Morgul, L. Frontini, O. Tunalı, I. Vatajelu, V. Ciriani, L. Anghel, C. Moritz, M. Stan, D. Alexandrescu, and **M. Altun**, Integrated Synthesis Methodology for Crossbar Arrays, *IEEE/ACM International Symposium on Nanoscale Architectures (NANOARCH)*, Athens, Greece, 2018.
4. N. Akkan, **M. Altun**, and H. Sedef, Parameter Extraction Method Using Hybrid Artificial Bee Colony Algorithm for an OFET Compact Model, *International Conference on Synthesis, Modeling, Analysis and Simulation Methods and Applications to Circuit Design (SMACD)*, Prague, Czech Republic, 2018.
5. T. Ayhan and **M. Altun**, Approximate Fully Connected Neural Network Generation, *International Conference on Synthesis, Modeling, Analysis and Simulation Methods and Applications to Circuit Design (SMACD)*, Prague, Czech Republic, 2018.
6. O. Tunalı and **M. Altun**, Logic Synthesis and Defect Tolerance for Memristive Crossbar Arrays, *Design, Automation and Test in Europe (DATE)*, Dresden, Germany, 2018.
7. B. Karadeniz and **M. Altun**, Sampling based Random Number Generator for Stochastic Computing, *IEEE International Conference on Electronics Circuits and Systems (ICECS)*, Batumi, Georgia, 2017.
8. O. Tunalı and **M. Altun**, Yield Analysis of Nano-Crossbar Arrays for Uniform and Clustered Defect Distributions, *IEEE International Conference on Electronics Circuits and Systems (ICECS)*, Batumi, Georgia, 2017.
9. T. Ayhan, F. Kula, and **M. Altun**, A Power Efficient System Design Methodology Employing Approximate Arithmetic Units, *IEEE Computer Society Annual Symposium on VLSI (ISVLSI)*, Bochum, Germany, 2017.
10. M. Atasoyu, **M. Altun**, S. Ozoguz, and K. Roy, Spin-Torque Memristor based Offset Cancellation Technique for Sense Amplifiers, *International Conference on Synthesis, Modeling, Analysis and Simulation Methods and Applications to Circuit Design (SMACD)*, Taormina, Italy, 2017.
11. I. Ercan, O. Susam, **M. Altun**, and H. Cilasun, Synthesis and Fundamental Energy Analysis of Fault-tolerant CMOS Circuits, *International Conference on Synthesis, Modeling, Analysis and Simulation Methods and Applications to Circuit Design (SMACD)*, Taormina, Italy, 2017.

12. **M. Altun**, V. Ciriani, and M. Tahoori, Computing with Nano-Crossbar Arrays: Logic Synthesis and Fault Tolerance, *Design, Automation and Test in Europe (DATE)*, Lausanne, Switzerland, 2017.
13. D. Alexandrescu, **M. Altun**, L. Anghel, A. Bernasconi, V. Ciriani, and M. Tahoori, Synthesis and Performance Optimization of a Switching Nano-crossbar Computer, *Euromicro Conference on Digital System Design (DSD)*, Limassol, Cyprus, 2016.
14. E. Vahapoglu and **M. Altun**, Accurate Synthesis of Arithmetic Operations with Stochastic Logic, *IEEE Computer Society Annual Symposium on VLSI (ISVLSI)*, Pittsburgh, PA, USA, 2016.
15. M.C. Morgul, F. Peker, and **M. Altun**, Power-Delay-Area Performance Modeling and Analysis for Nano-Crossbar Arrays, *IEEE Computer Society Annual Symposium on VLSI (ISVLSI)*, Pittsburgh, PA, USA, 2016.
16. H. Yadavari, B. Sal, **M. Altun**, E. Erturk, and B. Ocak, Effects of ZnO Varistor Degradation on the Overvoltage Protection Mechanism of Electronic Boards, *European Safety and Reliability Conference (ESREL)*, Zurich, Switzerland, 2015.
17. B. Sal and **M. Altun**, Extensive Investigation of Calibrated Accelerated Life Testing (CALT) in Comparison with Classical Accelerated Life Testing (ALT), *European Safety and Reliability Conference (ESREL)*, Zurich, Switzerland, 2015.
18. O. Tunali and **M. Altun**, Defect Tolerance in Diode, FET, and Four-terminal Switch based Nano-crossbar Arrays, *IEEE/ACM International Symposium on Nanoscale Architectures (NANOARCH)*, Boston, MA, USA, 2015.
19. M.C. Morgul and **M. Altun**, Synthesis and Optimization of Switching Nanoarrays, *IEEE International Symposium on Design and Diagnostics of Electronic Circuits and System (DDECS)*, Belgrade, Serbia, 2015.
20. V. Comert, **M. Altun**, M. Nadar, and E. Erturk, Warranty Forecasting of Electronic Boards using Short-term Field Data, *Reliability and Maintainability Symposium (RAMS)*, Palm Harbor, FL, 2015.
21. O. Susam and **M. Altun**, An Efficient Algorithm to Synthesize Quantum Circuits and Optimization, *IEEE International Conference on Electronics Circuits and Systems (ICECS)*, Marseille, France, 2014.
22. V. Comert, H. Yadavari, **M. Altun**, and E. Erturk, Reliability Prediction of Electronic Boards by Analyzing Field Return Data, *European Safety and Reliability Conference (ESREL)*, Wroclaw, Poland, 2014.
23. E. Alaybeyoglu, A. Guney, **M. Altun**, and H. Kuntman, Low Input Impedance Current Differencing Unit for Current Mode Active Devices Improved by Positive Feedback and ZC-CDBA Filter Application, *International Conference on Electrical and Electronics Engineering (ELECO)*, Bursa, Turkey, 2013.
24. **M. Altun** and M. D. Riedel, Lattice-Based Computation of Boolean Functions, *ACM/IEEE Design Automation Conference (DAC)*, Anaheim, CA, USA, 2010.
25. **M. Altun**, M. D. Riedel, and C. Neuhauser, Nanoscale Digital Computation Through Percolation, *ACM/IEEE Design Automation Conference (DAC)*, San Francisco, CA, USA, 2009.
26. M. Sayginer, **M. Altun**, and H. Kuntman, A CMOS FTFN Realization with Constant-gm Rail-to-Rail Input Stage, *IEEE Mediterranean Electrotechnical Conference (Melecon)*, Ajaccio, Corsica, France, 2008.
27. **M. Altun** and H. Kuntman, A High-Drive Fully Differential Current Mode Operational Amplifier Providing High Output Impedance and Filter Application, *International Conference on Electrical and Electronics Engineering (ELECO)*, Bursa, Turkey, 2007.
28. **M. Altun** and H. Kuntman, High CMRR Current Mode Operational Amplifier with a Novel Class AB Input Stage, *ACM Great Lakes Symposium on VLSI (GLSVLSI)*, Stresa, Italy, 2007.

29. **M. Altun** and H. Kuntman, A Wideband CMOS Current-mode Operational Amplifier and Its Use for Band-pass Filter Realization, *Applied Electronics (AE)*, Pilsen, Czech Republic, 2006.

Book Chapters

1. M. Atasoyu, **M. Altun**, and S. Ozoguz, "Sensing Schemes: Spintronic Resistive Memories", in *Modelling Methodologies in Analog Integrated Circuit Design*, edited by G. Dundar and M.B. Yelten, *IET*, preprint 2019.
2. **M. Altun**, "Computing with Emerging Nanotechnologies", in *Low-Dimensional and Nanostructured Materials and Devices*, edited by H. Unlu, N. Horing, and J. Dabowski, *Springer*, pp. 635-660, 2016.

TEACHING AND ADVISING

Teaching

- Courses taught at **Istanbul Technical University**, 2012–2018
 - ELE523E: Computational Nanoelectronics
 - EHB322E: Digital Electronic Circuits
 - EHB205E: Introduction to Logic Design
 - BLG231E: Digital Circuits
 - ELE222E: Introduction to Electronics
 - EHB262E: Electronics II
 - EHB 211E: Basics of Electrical Circuits
- Courses taught at **MEF University**, 2015–2016
 - EE206: Analysis of Microelectronic Circuits and Devices
- Courses taught at **University of Minnesota**, 2010–2011
 - EE2301: Introduction to Digital System Design

Advising

- **Current scholars/students**
 - 1 **Research** fellow: Leven Aksoy, Ph.D, previously worked at Dialog Semiconductor and ALGOS research unit of INESC-ID, 2018–
 - 9 **Ph.D.** students
 - 2 **M.Sc.** students
- **Previous PostDoc Scholars**
 1. Tuba Ayhan, **PostDoc**, 2016–2018, Ph.D. from the Katholieke Universiteit (KU) Leuven; Research area: Approximate circuit and system design, Next position: Assistant professor in MEF University
- **M.Sc. Graduates**
 1. Ensar Vahapoglu, **M.Sc.**, Electronics and Communication Engineering, Istanbul Technical University, 2015–2018; Thesis topic: Stochastic and bit stream computing, Next position: Ph.D. student and research assistant in Istanbul Technical University
 2. Furkan Peker, **M.Sc.**, Electronics and Communication Engineering, Istanbul Technical University, 2014–2017; Thesis topic: Variance tolerance for nano-crossbar arrays, Next position: Ph.D. student and research assistant in Istanbul Technical University
 3. M. Ceylan Morgul, **M.Sc.**, Electronics and Communication Engineering, Istanbul Technical University, 2014–2017; Thesis topic: Logic synthesis and performance modeling for nano-crossbar arrays, Next position: Ph.D. student and research assistant in Istanbul Technical University
 4. Hadi Yadavari, **M.Sc.**, Control and Automation Engineering, Istanbul Technical University, 2013–2016; Thesis topic: Electronics reliability, Next position: Ph.D. student and research assistant in University of Maryland - CALCE

5. Vehbi Comert, **M.Sc.**, Electronics and Communication Engineering, Istanbul Technical University, 2013–2016; Thesis topic: Electronics reliability with field return data, Next position: R & D engineer in TUBITAK Bilgem
6. Onur Tunali, **M.Sc.**, Nano Science and Engineering, Istanbul Technical University, 2013–2016; Thesis topic: Defect tolerance for nano-crossbar arrays, Next position: Ph.D. student and research assistant in Istanbul Technical University
7. Omercan Susam, **M.Sc.**, Nano Science and Engineering, Istanbul Technical University, 2013–2015; Thesis topic: Reversible circuit design, Next position: Ph.D. student in Istanbul Technical University and teaching assistant in MEF University
8. Serter Yavuz, **M.Sc.**, Electronics and Communication Engineering, Istanbul Technical University, 2013–2015; Thesis topic: Stochastic circuit design, Next position: R & D engineer in Bilko

PROFESSIONAL ACTIVITIES

Invited Talks

- **In conferences**

- Future and Emerging Computing Paradigms in Electronics, *IEEE International Conference on Electronics Circuits and Systems (ICECS) - flagship conference of IEEE Circuits and Systems Society*, Batumi, Georgia, 2017.
- Circuit Design and Optimization of Nano-Crossbar Arrays, *Nanoscience and Nanotechnology Conference (NANOTR)*, Kocaeli, Turkey, 2016.
- Implementation of a Switching Nano-Crossbar Computer, *International Conference on Applied Computer Science (ACS)*, Istanbul, Turkey, 2016.

- **In seminars/meetings**

- Nanoelectronics and New Computing Paradigms, *Science Unites All (SCI-ALL) - European Researchers' Night Event*, Istanbul, Turkey, 2017.
- Circuit Design Techniques for Nano-Crossbar Arrays and Large-Area Electronics, Host: Mircea Stan, *University of Virginia ECE Department Seminar*, Charlottesville, VA, USA, 2016.
- EU H2020 Success Story, *H2020 MSCA 2016 Istanbul Training and Info Event*, Istanbul, Turkey, 2016.
- Computing with Nano-crossbar Arrays, Host: Gunhan Dunder and Ilke Ercan, *Bogazici University EE Department Seminar*, Istanbul, Turkey, 2015.

Reviewing

- **In journals (selected)**

- IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD)
- ACM Transactions on Design Automation of Electronic Systems (TODAES)
- IEEE Micro
- Reliability Engineering and System Safety (RESS)
- IEEE Access
- Electronics Letters (ELL)
- Microprocessors and Microsystems (MICPRO)
- International Journal of Electronics and Communications (AEU)
- Analog Integrated Circuits and Signal Processing (ALOG)
- Turkish Journal of Electrical Engineering and Computer Sciences

- **In projects**

- The European Cooperation in Science and Technology (COST) projects
- The Scientific and Technological Research Council of Turkey (TUBITAK) projects
- Turkish Ministry of Transport research-development projects
- Istanbul Technical University ARI Techno-park research projects

Miscellaneous (selected)

- **Organizer** of the invited special session “Circuit Design Techniques for Emerging Computing Systems”, IEEE International Conference on Electronics Circuits and Systems (ICECS), 2017
- **Technical committee member**, IEEE/ACM International Symposium on Nanoscale Architectures (NANOARCH), 2017-2018