Elbruz Ozen

Computer Science and Engineering, University of California, San Diego, 9500 Gilman Drive, La Jolla, CA 92093-0404, USA
elozen@eng.ucsd.edu • elbruz.ozen@gmail.com • http://cseweb.ucsd.edu/~elozen

RESEARCH INTERESTS

Fault-Tolerant Architectures, Neural Network Accelerators, Computer Architecture, Digital Design.

EDUCATION

University of California, San Diego, La Jolla, California, USA

- Ph.D. in Computer Engineering (GPA: 3.875 / 4.00) — Sep 2017 – Current

Bilkent University, Ankara, Turkey

- B.Sc. in Electrical and Electronics Engineering (GPA: 3.95 / 4.00) — Sep 2013 – Jun 2017

WORK EXPERIENCE

University of California, San Diego, La Jolla, California, USA

- Graduate Research Assistant - Computer Science and Engineering Department — Sep 2017 – Current
  - **Supervisor:** Prof. Alex Orailoglu
- Teaching Assistant - Computer Science and Engineering Department — Jan 2019 – Mar 2019
  - **Course:** CSE140L: Digital Systems Laboratory

Synopsys Inc, Mountain View, California, USA

- Summer Internship - Solutions Group — Jun 2019 – Sep 2019
  - **Topic:** Research on low-cost BIST (built-in self-test) and fault tolerance solutions.
- Summer Internship - Solutions Group — Jun 2018 – Sep 2018
  - **Topic:** Design and Verilog implementation of custom error correcting codes for memory.

Fraunhofer IIS Research Institute, Erlangen, Germany

- Summer Research Internship - Radio Communication Systems Department — Jun 2016 – Sep 2016
  - **Topic:** Implementation of VLF (Very Low Frequency) broadcast receiver. Signals are captured using a 3-axis loop antenna and sampled by using spectrum analyzer, sound card and software-defined radio. Signal processing steps (filtering, locating transmitter direction, power measurements, logging and visualization) are implemented in software using Python. **Certificate Link:** https://goo.gl/uaUQxv

National Magnetic Resonance Research Center, Ankara, Turkey

- Summer Internship — Aug 2015 – Sep 2015
  - **Topic:** Network (IP) and transport (UDP) layer controller hardware for data link layer chip (ENC28J60). Design of I^2C EEPROM and sensor controllers. Development through VHDL using Xilinx ISE and tested on FPGA.

PUBLICATIONS

- E. Ozen and A. Orailoglu, "The Return of Power Gating: Smart Leakage Energy Reductions in Modern Out-of-Order Processor Architectures," *in Architecture of Computing Systems – ARCS '19*.
  The analysis of two efficient heuristics to perform power gating on out-of-order processor execution units. Experiments and power modeling is conducted with Gem5 computer architecture simulator and custom power modeling.
- E. Ozen and A. Orailoglu, "Sanity-Check: Boosting the Reliability of Safety-Critical Deep Neural Network Applications," *in Asian Test Symposium '19* [Under Review].
  Investigation of linear computation invariants in deep neural network computations. Discovered checksums utilized for low-cost error detection in safety-critical deep neural network applications.
- E. Ozen and A. Orailoglu, "Concurrent Monitoring of Operational Health in Neural Networks Through Balanced Output Partitions," *in Asia-South Pacific Design Automation Conference '20* [Under Review].
  Multi-objective neural network training with custom penalty functions. The proposed approach introduces low-cost error checking invariants for safety-critical applications and improves the generalization capability of deep neural networks.

AWARDS & SCHOLARSHIPS

- **Jacobs School of Engineering Fellowship** by University of California, San Diego — 2017 – 2020
  Awarded for 3 academic years between 2017 and 2020.
- **Academic Excellence Award** by Bilkent University EEE — Jun 2017
  For outstanding academic success in undergraduate education in Bilkent University.
- **High Honor Degree** in all undergraduate semesters by Bilkent University — 2013 – 2017
  For consistently excellent GPA.
- **Comprehensive (100%) Scholarship** by Bilkent University — 2013 – 2017
  For outstanding success in university admission exam.

- **EEE102: Introduction to Digital Design Best Project Award** by Bilkent University EEE 2014
  Project: AngryBot: Sumo and Line Follower Robot on FPGA. Presented in Bilkent Graduate Research Conference.
  Certificate: https://goo.gl/2ziRcv **Project Poster:** https://goo.gl/9zdf4N
- **Invited Participant of National Biology Olympiads Summer Camp** Aug 2011
  by TUBITAK (Scientific and Technological Research Council of Turkey).
  Based on success in National Biology Olympiad Exams (among first 50 in Turkey).

SKILLS

Advanced: Python, C, C++, Verilog, VHDL, Java, MATLAB, Xilinx Vivado & ISE, LTSpice, LaTeX, **Intermediate:** Tensorflow, Keras, LLVM, gem5, Linux, MIPS and 8051 Assembly, Jupyter Notebook, Android Development, Git **Beginner:** Synopsys VCS, Synopsys VC Formal, Synopsys Design Compiler, Synopsys ZOIX, Cadence IC Design Tools, DipTrace, Apache Spark, Tcl

LANGUAGES

Turkish (Native), English (Advanced), German (Beginner).

PERFORMANCE

Graduate Record Examinations (GRE) Sep 2016
Quantitative: 169/170 (97^{th} percentile), Verbal: 156/170 (72^{nd} percentile), Analytical Writing: 4.0/6.0 (59^{th} percentile)

TOEFL iBT Sep 2016
Total Score: 104/120 (Reading: 30, Listening: 27, Speaking: 22, Writing: 25)

OSYS University Admission Exam Jun 2012
Ranked 389^{th} (Medicine Category) and 555^{th} (Engineering Category) out of 506,271 participants in Turkey.

SELECTED PROJECTS

Ongoing Research Projects

- Fault analysis, fault tolerance, and low-cost test methods for deep neural network accelerators.
- Optimization methods for efficient neural networks.

Digital Design

- AngryBot: Sumo and line follower robot on FPGA.
  - **Project Video:** https://youtu.be/7Jn2UqCknNg
- Transport layer (UDP) internet chip on FPGA.
  - **Source Code:** https://github.com/elbruzOzen/enc28j600_ethernet_controller
- 10 MBit UART controller on FPGA.
  - **Source Code:** https://github.com/elbruzOzen/uart_vhdl
- I^2C & SPI controllers on FPGA for EEPROM and sensor devices.
  - **I^2C Source Code:** https://github.com/elbruzOzen/i2c_master_vhdl

Robotics & Embedded Systems

- Remote controlled Android robot car via internet.
- 3D object scanner with infrared distance sensor.

Signal Processing

- Android Sound Filter: Software based sound filters implemented on Android phone.
  - **Source Code:** https://github.com/elbruzOzen/SoundFilter
- VLF signal receiver implemented on signal spectrum analyzer, software defined radio and sound card.

Software Projects

- DNN batch normalization layer accelerator simulated in Python.
- Compiler analysis passes implemented in LLVM.
  - Reaching definitions, may-point-to, liveness, instruction count
- Automated projection mapping system with depth camera.
  - Bilkent GE401-402 Innovative Design and Entrepreneurship I-II Course Project
  - **Startup Website:** http://web2.bilkent.edu.tr/novaluma/
- GShare, Tournament and Perceptron branch predictor implementations on software.
- CoffeeBean IDE: Tutorial based IDE (integrated development environment) for Java.
  - **Source Code:** https://github.com/elbruzOzen/coffeebean-ide

Analog Circuit Design

- Design and simulation of CMOS trans-impedance amplifier IC using Cadence.
- Optical Communication System: Music transmission via laser.
  - **Project Video:** https://youtu.be/_vuXJYViCkU
- TRC-10 Wireless Transceiver: Radio frequency voice transmission system.

[*CV compiled on 2019-08-04*]