

ZHENG LI

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OBJECTIVE

A full-time position in areas of hardware-software co-design, custom architectural hardware acceleration, sensor-enabled smart system

EDUCATION

University of Maryland, Baltimore County

Ph.D. Candidate in Computer Engineering, GPA: 3.97/4.00

Anticipated: Oct 2018

Baltimore, MD

Thesis: "An on-line partially-reconfigurable platform for applications of embedded computer vision, brain-computer interaction, and wearable assistive device"

Under advisement of *Prof. Ryan Robucci* and *Prof. Nilanjan Banerjee*

Beihang University

B.S. in Electrical Engineering, GPA: 3.58/4.00

Graduated: Jun 2011

Beijing, China

TECHNICAL SKILLS

• Hardware Acceleration and IoT System Design:

Hardware-software cross-layer optimization, Deep learning acceleration,

Custom embedded design and system debug, Sensors and calibration/synchronization

Languages Verilog, HLS/OpenCL, Scripting (Python, Matlab), Emulation/Simulation (C/C++)

Tools/Platforms FPGA, SoC (FPGA+ARM), Altera(Quartus, HLS/OpenCL, Qsys, Nios/HPS, EDS), Xilinx(Vivado, MicroBlaze), ModelSim, Cadence(Virtuoso, Spectre, Allegro)

• Signal Processing and Data Analysis: Image processing, Gesture recognition,

Physiological/EEG signal processing, Realtime embedded implementation

Languages Python, MATLAB, C/C++, Java

Tools/Platforms OpenCV, Caffe/TF, Android, Micro-controller(MSP430, AVR, ARM), Uboot, Yocto

SELECTED COURSES

Hardware

- Embedded Systems and FPGA:
Hardware Software Co-design
- Machine Vision
- Advanced Computer Architecture
- Custom VLSI Design
- Ultra Low Power Bioelectronics

Signal Processing

- Detection and Estimation Theory
- Signal Processing Approaches for
Big Data Analytics
- Information Theory
- Random Process
- Digital Signal Processing

EXPERIENCE

System Architect Researcher

Black Sesame Technologies Inc.

Jun 2018 - Present

Santa Clara, CA

- Develop a Caffe-like reference model for emulation and evaluation of fixed-point arithmetic, quantization, and compression targeting in our custom DL acceleration SoC
- Participate in architecture model development and SoC design

Microsoft Research Intern

Applied Sciences Lab, Microsoft Corporation

Jun 2017 - Sep 2017

Redmond, WA

- Researched and prototyped on Surface Pen related interaction technology
- Built an air-mouse using Surface Pen, include PCB design, firmware design, and IMU signal processing
- The prototype is demoed to Bill Gate as MS advanced interaction technology
- Synchronized Pen and Surface digitizer through a BLE channel to reduce latency

Research Assistant

Eclipse Research Cluster in UMBC; U.S. Army Research Lab

Jun 2014 - Present

Baltimore/Adelphi, MD

- Real-time human state estimation using EEG, and accelerated with FPGA [1],[2]
 - Built a VR-based multi-sensor data collection system, hardware-synchronized HDMI and sensor streams
 - Analyzed brain dynamic using DNN, ICA, and non-linear network connectivity analysis
 - Accelerated DNN and aforementioned algorithms in FPGA using verilog and HLS

- Designed a heterogeneous hardware architecture that dynamically partially reconfigures FPGA fabric to switch between different state estimators
- Instruction sequence identification using power supply side-channel analysis [3]
 - Measured power signature of MSP430 ISA
 - Analyzed both FPGA (softcore) and MSP430 (hardcore) power profile to infer the execution sequence of instructions using both deeplearning and model-based approaches
- Accurate bus stop localization for blind riders using computer vision and sensor fusion [6]
 - Developed algorithm for detection, pose estimation, projection, and mapping
 - Fused IMU for gravity calibration, and GPS for coarse-grained processing
 - Implemented in Android smartphone using OpenCV and JNI
- A framework to accelerate embedded computer vision for accessibility issues detection [4]
 - Designed preprocessing algorithm to incorporate human’s prior for accelerating object detection
 - Implemented in ARM-based processor with image sensor, GPS, and accelerometer
- Non-contact tongue gesture recognition with wearable micro Doppler radar [7],[5]
 - Designed analog frontend with filter, amplifier, and ADC
 - Designed frequency-modulated signal processing algorithm
 - Implemented algorithm and gesture classifier efficiently in 8-bit micro-controller
 - Refined system performance from gesture set design to hardware-software system to sensors
- Continuous respiration pattern monitoring for asthma evaluation using RF sensor
 - Prototyped system with different sensors, integrating and profiling

Research Intern

Center of Advanced Sensor Technology, UMBC

Dec 2013 - Feb 2014

Baltimore, MD

- Designed Android-based driver and App to interface with a custom fluorescence sensor node

Teaching Assistant

CSEE Department, UMBC

Aug 2013 - May 2014

Baltimore, MD

- Assisted in “Introductory Circuit Theory”; Top in annual TA evaluation

Wireless Network Optimization Engineer

Center of Wireless Network Optimization, China Mobile Ltd.

Jul 2011 - Jun 2013

Shenzhen, China

- Analyzed network usage and alarm pattern; Optimized configuration and deployment of base stations

PUBLICATIONS

- [1] **Zheng Li**, R.Robucci, N.Banerjee, and C.Patel. DeepreS: Dynamic Energy-Efficient Partially-Reconfigurable Engine for Single-Session DCNN acceleration. In *IEEE Transactions on VLSI. (TVLSI’18)*. Under Submission.
- [2] **Zheng Li**, R.Robucci, and N.Banerjee. Implementation of Structural Synchrony and Linear Measures of Brain Network Connectivity for Real-Time State Estimation. In *IEEE Intl. Symp. on Circuits and Systems (ISCAS’18)*.
- [3] D. Krishnankutty, **Zheng Li**, R.Robucci, N.Banerjee, and C.Patel. Reliable Instruction Sequence Identification Using Power Supply Side-Channel Analysis. *IEEE Transactions on Emerging Topics in Computing. (TETC’18)*. Under Review. **Impact Factor: 3.8**
- [4] **Zheng Li**, M.Rahman, R.Robucci, and N.Banerjee. PreSight: Enabling Real-time Detection of Accessibility Problems on Sidewalks. *IEEE Intl. Conf. on Sensing, Communication, and Networking (SECON’17)*. **Acceptance Rate: 26%**
- [5] E.Miller, **Zheng Li**, R.Robucci, and N.Banerjee. Sensing Finger Gestures For Surgical Image Interaction Using Continuous Wave Doppler Radars. *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT’18)*. Under Review.
- [6] **Zheng Li**, M.Rahman, R.Robucci, and N.Banerjee. LastStep: Vision-based Bus Stop Localization and Mapping for Improving Accessibility for Blind Riders. *ACM Intl. Conf. on Systems for Energy-Efficient Built Environments (BuildSys’16)*.
- [7] **Zheng Li**, R.Robucci, N.Banerjee, and C.Patel. Tongue-n-cheek: non-contact tongue gesture recognition. *IEEE/ACM Intl. Conf. on Information Processing in Sensor Networks (IPSN’15)*. **Acceptance Rate: 24%**

TALKS AND SERVICES

Conference Presentation: IPSN’2015, GRC’2015, Sensors’2016, BuildSys’2016, SECON’2017, ISCAS’2018

Guest Lecturer: Cyber Physical System, Digital Signal Processing

Reviewer: AJSE (2015, 2016, 2017), ChinaVis’2018

President: Chinese Student and Scholar Association (CSSA) in UMBC

Sep 2015 - Present