ZIAD YOUSSFI, PHD

Associate Teaching Professor, Electrical & Computer Engineering
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SUMMARY

My expertise includes deep learning, embedded systems, integrated circuits, computer architecture, and parallel processing. I teach by getting to know my students, providing feedback, connecting concepts to the real world, and emphasizing a multidisciplinary perspective. I am constantly fascinated by the power of technological innovations to address critical societal needs.

Throughout my career in industry and academia, I have promoted innovation. At Intel, I developed new techniques to validate transistor operations in the Pentium Pro. For my Ph.D. at Michigan State University, I created an algorithm to throttle processor power consumption based on instruction data dependencies. While at Michigan State, I developed an enterprise application to streamline the University's accounting. At Ohio Northern University, I led curricular reform for the Department of Electrical and Computer Engineering and Computer Science. I also created three new courses: Deep Learning, Maker Engineering, and Embedded Systems for Robotics. In my research, I devised new parallel algorithms on GPUs for image processing. At Carnegie Mellon University, I have developed several original courses: Embedded Deep Learning and a two-part course sequence for Autonomous Robotics.

EDUCATION

Ph.D., Michigan State University, Electrical & Computer Engineering, 2011, East Lansing, Michigan
Dissertation topic: *"Reduced Occupancy for Processor Efficiency through Downsized Out-of-Order Engine and Reduced Traffic Bursts"*

M.S., Michigan State University, Electrical & Computer Engineering, East Lansing, Michigan
Concentrated on computer architecture, VLSI systems, and software algorithms

B.S., Michigan State University, Electrical & Computer Engineering, East Lansing, Michigan
Concentrated on digital and analog circuits and solid-state devices

CERTIFICATIONS

NVIDIA Deep Learning Institute Ambassador
Certified to teach Fundamentals of Deep Learning and CUDA with C/C++

Deep learning in AI

- Deep Learning, Coursera five-course specialization taught by Andrew Ng, 2018-2019
- Fundamentals of Deep Learning for Computer Vision, NVIDIA Deep Learning Institute, San Jose, CA, 2017
- Deep Learning for Intelligent Video Analytics, NVIDIA Deep Learning Institute, San Jose, CA, 2019

Parallel processing
Fundamentals of Accelerated Computing with CUDA C/C++, NVIDIA Deep Learning Institute, San Jose, CA, 2018

RESEARCH EXPERIENCE

Ohio Northern University, Ada, Ohio 2013 – 2022
Associate Professor
Accelerating parallel image processing

- Created novel GPU/CUDA algorithms to accelerate capturing and tone mapping high dynamic range images
- Acquired seed grant from NVIDIA Inc. and matching internal grant to build a server infrastructure for parallel image processing
- Involved undergraduate students in research through the ONU Evans Scholarship

Reducing microprocessor power consumption

- Modeled chip hotspots dynamically to predict and mitigate their occurrence
- Dynamically estimated data dependence in the instruction stream to adapt process resources to reduce power consumption
- Involved undergraduate students in multidisciplinary research through the ONU Evans Scholarship

Michigan State University, East Lansing, Michigan 2005 – 2012 (part-time)

Ph.D. Student

Reducing microprocessor power consumption

Developed new algorithms to dynamically estimate data dependence in the instruction stream to reduce processor power consumption

TEACHING EXPERIENCE

Carnegie Mellon University, Pittsburgh, Pennsylvania 2022 – 2024

Courses Developed & Taught

- Embedded Deep Learning: Developed a new course to bring the emerging field of embedded machine learning (or TinyML) to undergraduate and graduate students at CMU. The course covers application techniques such as feature extraction, quantization, and pruning to deploy neural network models to low-power and low-cost microcontrollers. The course allows students to create projects drawing from fields such as agriculture, environment, conservation, health, manufacturing, and home automation. (see project listing here).
- Autonomous Robotics: This pilot two-part course combines machine learning and robotics in a fun, hands-on way that encourages discovery. Topics include learning the robot operating system (ROS2), convolutional neural networks for object detection, computer vision techniques, and software acceleration using NVIDIA Isaac ROS. Students build miniature self-driving robots using the NVIDIA Jetson Orin Nano platform and the Intel RealSense camera.

Courses Taught

- Structure and Design of Digital Systems is a core foundation course in the ECE curriculum that builds a solid foundation in digital logic. It covers combination and sequential logic, hardware thread design (unique to this course), processor organization, and instruction-set design.
- Fundamentals of Computer Systems from a Programmer's Perspective is a core foundation course in the ECE curriculum. It equips graduate and undergraduate students with a solid foundation in computing systems. Topics include data representations, machine-level representation of programs, memory hierarchy, virtual memory, input/output techniques, performance optimization, networking, and concurrent programming.

Service Activities

- Curriculum Committee: Discussion and approval of course changes and the addition of new courses.

- Undergraduate Studies Committee: Discussion and approval of students' petitions for program changes and overload cases.
- Participated in events for research collaboration, invited speakers, and faculty candidate seminars.

Ohio Northern University, Ada, Ohio 2013 – 2022

Associate Professor (with tenure, effective teacher rating by students: 4.9/5.0)

New Courses or Modules Developed (2019-2020)

- Deep Learning: Developed a new course to teach the fundamentals of deep neural networks, including convolutional neural networks, and how to train them to classify images and recognize objects.
- Maker Engineering: Proposed and developed a new hands-on PCB prototyping and practical design course for ECE students at the sophomore level. The course was designed to increase student confidence and capabilities in the innovation cycle.
- Real-Time Embedded System Design: Created new course material for ECE students to emphasize real-time embedded systems in the context of robotics. Students designed and implemented a robotic tracking system and participated in a final robotic competition.
- Multi-Threading Programming: I developed a new course module that allows students to program multi-core processors for their Operating Systems course. The module makes the CS program compliant with future ABET accreditation and ACM/IEEE curricula guidelines.

Workshops

- Fundamentals of Deep Learning. As an NVIDIA DLI Ambassador, I taught a free workshop at Ohio Northern University for university students in northwest Ohio.
- Quantified Self, in collaboration with biomedical engineering faculty from Lawrence Technological University through the KEEN network

Courses Developed & Taught

- Computer Architecture: Emphasized contemporary issues such as the power challenge and parallel architectures. Developed labs so students could design and test a complete 32-bit MIPS microprocessor logic model using SystemVerilog.
- Operating Systems**:** Addressed current challenges such as parallel processing and multithreaded programming**.** Assigned multithreading projects on the Raspberry Pi to take advantage of its multicore.
- Digital Integrated Circuits (Very Large-Scale Integration or VLSI)**:** Explored the two big challenges of delay and power consumption in system design**.** Developed labs to design and test a complete 8-bit MIPS microprocessor at the physical layout level.
- Intro to Microprocessors: Employed real-world examples to motivate students on topics such as interrupts and communication in embedded system design. Developed labs using the ARM Cortex M4 that engage students in practical activities such as music generation, motor control, and IoT (Internet of Things).
- C++ Programming: Introduced freshmen to C++ programming through real-world examples.

Curriculum Committee

- Proposed four-year curriculum for the Computer Engineering program
- Participated in decision-making regarding course development, retiring, naming, and scheduling

Capstone Senior Design Proposals

- Strawberry Picker Robot (a.k.a. Object Finder Robot): An agricultural application for an autonomous robot to find and pick ripe strawberries. Five students.

- Real-Time Parking Violation Monitor: A traffic and safety computer vision application that can track parking violations in temporary parking areas such as airports, urban areas, and loading zones. Four students.
- Human Queue Monitoring: This is a service application that can track the movement of spontaneous and unstructured human queues, such as those in transportation, border crossings, and hospitality settings. Two students.
- Introduction to AI and robotics for K-12 students through a robot using the NVIDIA Jetson Nano platform.
- Chicken coop automation to protect farm chickens from predators at night and remotely monitor their well-being.

Undergraduate Research & Mentoring

- Research Advisor for Independent Study, two undergraduate students, Bryce Gray and John Merkel, as a continuation of the ONU Evans Scholarship. Work on image processing led to the paper publication Electronic Imaging, 2019.
- Honors Capstone Enhancement Advisor, Miranda Huddle, *"Deep Learning and Security Applications,"* 2018
- Honors Contract Course Advisor, Dan Musci, *"Mesh Networking over Bluetooth Low Energy for a Disaster Relief Application,"* 2018
- Research Advisor for Independent Study, Matthew Schweinefuss, "*Real-Time Signal Processing on the Raspberry Pi*," Spring 2019
- Research Collaboration, along with Dr. Jim Seliya, between Wilson Sporting Goods and the Ada Wilson Factory, the ONU Football Team, and ECCS students, using data from sensors integrated into Wilson football.

Review Panel

Review panel member for Carnegie Mellon University Engineering and Public Policy project course. Project: Drone Delivery, 2019.

NIVIDA Deep Learning Institute Ambassador 2019-present
Certified for teaching workshops on Deep Learning and Parallel Processing

University of Western Ontario, London, Ontario 2012 – 2013
Lecturer

Digital Integrated Circuit Design: Designed syllabus and taught senior- and junior-level classes in VLSI

Michigan State University, East Lansing, Michigan 2005 – 2012
Graduate Assistant

Microprocessor and Digital Systems. Periodically lectured junior-level classes on microprocessor architecture and interfacing.

Michigan State University, East Lansing, Michigan 2005 – 2012
Outreach Volunteer

Science Theatre: Elected as Engineering Director to build and present creative science and engineering demonstrations. Science Theatre at MSU is a volunteer student organization that engages children and adults in the community in science and the applications of technology.

PUBLICATIONS

Shanmuga Venkatachalam, Harideep Nair, Prabhu Vellaisamy, Yongqi Zhou, Ziad Youssfi, and John Paul Shen, "Realtime Person Identification via Gait Analysis", 2024, arXiv:2404.15312 [eess.SP] https://doi.org/10.48550/arXiv.2404.15312

Ziad Youssfi and Firas Hassan, Bryce Gray, and John Merkel, *"Fast Restoring of High Dynamic Range Image Appearance for Multi-Partial Reset Sensor,"* Electronic Imaging Conference, San Jose, CA, January 2019

Ziad Youssfi and Firas Hassan, *"Speeding Up Tone Mapping Operators, Exploiting Parallelism for Real-Time, High Dynamic Range Video,"* IEEE International Midwest Symposium on Circuits and Systems (MWSCAS), Boston, MA, 2017

Jim Seliya, Heath LeBlanc, James Hilton, and **Ziad Youssfi**, "*Detection of Student Curiosity through Machine Learning,"* ASEE National Conference, 2019

Wayne Campbell, Miranda Huddle, Bryce Gray, Hayden Schenefield, and **Ziad Youssfi**, *"Real-Time Parking Violation Monitor Using Deep Learning,"* ASEE Northern Central Section, 2018

Ziad Youssfi, *"Making Operating Systems More Appetizing with the Raspberry Pi,"* IEEE Frontiers in Education (FiE) National Conference, Indianapolis, IN, 2017

Shawn Dooley, Skye VanAtta, Tyler Bailey, Jaden Castle, and **Ziad Youssfi**, "*Strawberry Picker Robot using Deep Learning*," IEEE Student Activity Conference, 2017

Ziad Youssfi, *"Striking a Balance Between Low-Level Theory, High-Level System Design, and Typical Industry Challenges*,**"** presentation, American Society of Engineering Education (ASEE), North Central Section, Mount Pleasant, MI, 2016

Ziad Youssfi, *"Learning from the Past in Teaching Microprocessors,"* American Society of Engineering Education (ASEE) Illinois-Indiana, Fort Wayne, IN, 2015

Ziad Youssfi, Jed Marquart, and Eric Holodnak, *"Thermal Aware Computing,"* 40th Dayton-Cincinnati Aerospace Sciences Symposium (DCAS), Dayton, OH, 2015

Ziad Youssfi and Ken Reid, *"Work in Progress: Retooling a Microprocessor Course for a Real-World Example Project,"* American Society of Engineering Education (ASEE), North Central Section, Rochester, MI, April 2014

Ziad Youssfi and Michael Shanblatt, *"Instruction-Window Power Reduction Using Data Dependence Metric,"* Workshop on Introspective Architecture in conjunction with the 12th International Symposium on High-Performance Computer Architecture (HPCA-12), Austin, TX, 2006

Ziad Youssfi and Michael Shanblatt, *"A New Technique to Exploit Instruction-Level Parallelism for Reducing Microprocessor Power Consumption,"* 6th IEEE International Conference on Electro/Information Technology, East Lansing, Michigan, 2006

Ziad Youssfi and Michael Shanblatt, "*Data Dependence Measurement for Power Efficient High-Performance Microprocessors*," Elsevier Journal System Architecture (JSA), 2003

FUNDING

- NVIDIA Grant of Jetson Orin Nano development kits worth $5000 to implement my Autonomous Robotics course sequence.

- Summer Research Stipend 2018, collaboration with Drs. Jim Seliya, Heath LeBlanc, and James Hilton. Topic: Detection of Student Curiosity through Machine Learning, Summer 2018.
- Summer Research Stipend 2017, collaboration with Dr. Firas Hassan. Topic: Real-time, High-Dynamic Range Video.
- NVIDIA Seed Grant, donation of NVIDIA Titan Xp GPU, with Pascal Architecture for AI and image processing, value: $5000
- Summer Research Stipend 2017, collaboration with Dr. Firas Hassan. Topic: Real-time High-Dynamic Range Video.
- Summer Research Stipend 2016, collaboration with Dr. Jed Marquart. Topic: Heat Dissipation for High-Performance Computer Architecture.

UNIVERSITY & COMMUNITY SERVICE

Ohio Northern University, Ada, Ohio
Associate Professor

- Program Review Committee: Created guidelines for internal university program reviews
- Center for Advancement of Faculty Excellence Advisory Board: Advised the director on direction and procedures for the Center
- International Affairs Committee: Advised on issues relating to recruitment of international students, international scholarships, and ONU students studying abroad
- Information Technology Operational Committee: Advised on issues related to policies for Wi-Fi guest access and security issues related to FERPA
- IEEE Lima Section Officer: Served as Chair and Secretary for four consecutive years. Helped set up technical and professional talks, social events, site visits, and collaboration with professionals in the Lima Section.
- Prospective Student Visits: Met with many prospective students and their parents on visitation days and weekends
- Engineering Pathways**:** Engaged high-school students in computing concepts and motivated them to learn about computing in this ONU summer program for four consecutive years
- Kern Family Foundation network: Attended KEEN Fall Conference on innovation in engineering.
- Outreach Service
  - Competition Judge for Robotics and Rocketry, 4H Hardin County Fair, Ohio, 2018
  - Competition Judge for Lima Maker Fest, Lima, OH, 2018
  - Competition Judge for TEAMS annual competition that allows high school students to discover engineering and how it can make a difference in the world, ONU, 2018

INDUSTRY EXPERIENCE

Michigan State University, East Lansing, Michigan 1997 – 2011 (full-time)
Software Developer

- Led a team to create an enterprise financial transaction application that supported thousands of departmental accounts. Built the application using Java EE 6 architecture, JavaServer Faces 2.0 user interface components, and the relational database backend. Created a new scheme to transport Java objects between web clients and the database backend over the HTTP protocol to accelerate user input response.
- Developed a Windows-UNIX cross-platform user authentication application.

Intel Corporation, Folsom California 1994 – 1996 (full time)
Development Engineer, Pentium Pro Group and Peripheral Components Divisions

- Developed new techniques to automate microprocessor chip fault detection and provide higher device fault coverage for microprocessor chips
- Was the first engineer to reach the fault grading coverage target for the Pentium Pro chip. I also performed silicon debugging on the initial Pentium Pro chip.
- Implemented logic functions for a PCI interface chipset.

IBM Corporation, Poughkeepsie, New York**,** 1993
Development Engineer

- Designed and implemented a monitoring utility for an intelligent computer-controlled manufacturing project.

OTHER TECHNICAL ABILITIES

- Experience in Verilog, SystemVerilog, VHDL, FPGA, custom layout, wafer fabrication, and circuit simulation
- Programming in Java, C, C++, assembly, Perl, PHP, SQL, HTML, UML, Java EE 6, JavaServer Faces 2.0, awk, and csh
- Operating systems knowledge in FreeBSD, Linux, Solaris, Windows, and Mac OS

PROFESSIONAL AWARDS

- Ohio Northern University, Professor Henry Horldt Outstanding Teacher Award, T.J. Smull College of Engineering, 2018-2019
- Ohio Northern University, Endowed Alter Chair Award, Department of Electrical & Computer Engineering and Computer Science, 2018-2019
- Ohio Magazine Recognition for Outstanding Achievements in Teaching, 2019
- University of Western Ontario, Teaching Honor Roll for Excellence in Teaching, University Students' Council, 2012-2013
- Intel Corporation, Spontaneous Recognition Award
- Motorola University Design Competition Recognition Award, Michigan State University

REVIEWER

- IEEE International Midwest Symposium on Circuits and Systems
- IEEE International Conference on Electro/Information Technology
- Integration, The VLSI Journal, Elsevier

LANGUAGES

- English–speak fluently and read and write with excellent proficiency
- Arabic–speak fluently and read and write with excellent proficiency
- French–speak fluently and read and write with good proficiency

CITIZENSHIP

United States of America

EXTRA-CURRICULAR INTERESTS

- First Place, Global Focus Photography Contest, Michigan State University
- Grand Prize, Horticultural Gardens Photography Contest, Michigan State University
- Outstanding Service, Alternative Spring Break, Michigan State University

REFERENCES:

Available upon request