Omiya Hassan

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EDUCATION

Ph.D. in Electrical Engineering   08/2018 – 05/2023
Department of Electrical Engineering and Computer Science
University of Missouri, Columbia, USA

BSc. Electrical and Electronics Engineering   10/2012 - 01/2017
Department of Electrical and Electronics Engineering
United International University (UIU), Dhaka, Bangladesh

PROFESSIONAL EXPERIENCE

Boise State University   Idaho, USA
Assistant Professor (Tenure-Track)   08/2023-Present

- Participating in scholarly activities such as teaching, research and consistent with Boise State University's mission as a metropolitan research university of distinction.
- Mentoring and supervising undergraduate and graduate students effectively in their scholarship, research, and professional development
- Engaging in meaningful service to the University, the discipline, and the community through participation in summer camps, student chapters and career/club fairs.

University of Missouri   Missouri, USA
Graduate Instructor   08/2020 – 05/2023

- Teaching Real-Time Embedded System Design and Computing
- Teaching Algorithm Design and Programming I

University of Missouri   Missouri, USA
Graduate Mentor   09/2018 – 05/2023

Analog/Mixed-Signal, VLSI and Devices Laboratory, University of Missouri
- Mentoring two undergraduate researchers
- Mentored two undergraduate and two graduate researchers

Presidency University   Dhaka, Bangladesh
Lecturer, Part-Time Faculty   01/2018 - 05/2018

- Taught Semiconductor Device Theory

United International University   Dhaka Bangladesh
Teaching Assistant   02/2017 – 06/2017
- Assisted in Digital Signal Processing Laboratory
- Assisted in Microprocessor and Embedded Systems Laboratory
- Assisted in Renewable Energy Lecture Class

INDUSTRY EXPERIENCE

Meta   Washington, USA
Research Scientist Intern at TED for Biosensors Group   05/2022-08/2022

- Developing Algorithm for Biosensor
- Research and development of health-care devices

RESEARCH EXPERIENCE

Boise State University   Idaho, USA
Principal Investigator at Low-Power Integrated Circuit and Embedded Systems Laboratory   08/2023-Present
(LPiNS-Lab)

- Developing energy-efficient algorithms for machine learning on hardware.
- Developing energy-efficient hardware and computer architecture for AI-workload.
- Designing integrated circuits for a broad range of sensor-based applications.

University of Missouri   Missouri, USA
Research Assistant with Prof. Syed Kamrul Islam   08/2018 – 05/2023

- Developing ML/Artificial-Intelligence Integrated Circuit Design for Biomedical Applications
- Designing Low-Power ML/Artificial-Intelligence on FPGA and ASIC
- Designing and Developing Non-Invasive Biomedical Systems for Healthcare Applications

United International University   Dhaka, Bangladesh
Research Assistant with Prof. Iqbal Bahar Chowdhury   01/2016 - 12/2017

- Implemented NC-FET Characteristics Model in Verilog
  Studied and Analyzed Different Characteristics of NC-FET Model using MATLAB

Other Research Involvement
- Analyzing and Developing Low-Power Digital Hardware Components for ML/AI Models using VHDL
- Measuring Voltage Matching using Machine-Learning in DC-DC Boost Converter
- Developing SPICE Model of Electrical Impedance Analyzer for Detection of Bacteria Proliferation in Food Samples
- Modeling Various Statistical Analysis related to the Education Sector in Bangladesh

FELLOWSHIP

IEEE Instrumentation and Measurement Research Award $15,000 | 2021-2022
Role: Graduate Fellow

HONORS & AWARDS

• **Rising Stars of EECS**	University of Texas, Austin		2022
• **Outstanding Undergraduate Research Mentor of the Year**	The University of Missouri, $500	$500	2022
• **Excellence in Research Award**	Graduate Professional Council of University of Missouri		2022
• **PICO Design Contest 2021 Top Finalist**	IEEE Solid-State Circuits Society Free Fabrication		2021
• **Outstanding Doctoral Student Award**	University of Missouri		2021
• **1907 Women in Engineering Award**	University of Missouri		2020
• **1st Place Research Presentation at Research and Activities forum**	University of Missouri	$,250	2020
• **Scholar at iREDEFINE Workshop**	Electrical and Computer Engineering Department Head Association (ECEDHA)	$1000	2020
• **Champion, I²MTC Student Design Competition**	IEEE Inertial	$2000	2019
• **3rd Place, ShowMe Project Showcase Week**	University of Missouri	$250	2019
• **Student Travel Awards**	IEEE ISSCC 2020	$900	2020
	IEEE NOCS 2019	$900	2019
	IEEE WIE ILC 2017	$1000	2017
• **Best Humanitarian Impact Award**	IEEE WIE-CON		2016
• **Champion WIE Activities Poster Competition**	IEEE Region 10 SYWL Congress 2016		2016
• **IEEE Humanitarian Competition Top Finalist**	IEEE AIYEHUM	$500	2015
• **Best Humanitarian Volunteer**	IEEE Bangladesh Section		2015

CERTIFICATION

• AI for Medical Diagnosis	Coursera	Issued April 2020
• AI for Medical Prognosis	Coursera	Issued May 2020
• Feminism and Social Justice	Coursera	Issued July 2020
• Modern Art & Ideas	Coursera	Issued March 2022
• Cyber Attack Counter Measures	Coursera	Issued July 2023
• Applications of TinyML	EdX	Issued December 2022

University of Missouri
• Online Teaching Certification Seminar: Excellence in Online Teaching   Issued November 2020

PROFESSIONAL AFFILIATIONS AND REVIEW ACTIVITIES

• **Member**	IEEE SSCS, IEEE CAS & IEEE IMS	2018-Present
• **Student Member**	IEEE & IEEE WIE	2015- Present
• **Reviewer**	AMIA Annual Symposium	2022
• **Reviewer**	IEEE Transactions on Instrumentation and Measurements	2022-Present

| • | **Reviewer** | NSF ERI EMS | 2025 |

SERVICE & OUTREACH

•	**Treasurer**	Bangladesh Student Association (BSA) at Mizzou	2021-2022
•	**Secretary**	Graduate Professional Council (GPC)	06/2022- 08/2022
•	**Cultural Secretary**	Bangladesh Student Association (BSA) at Mizzou	2019-2021
•	**Director of Social-Media**	Alternative Career Exploration (ACES) at Mizzou	2019-2020
•	**Designer**	IEEE Academic	2016-2017
•	**Student Body Chair**	IEEE UIU Student Branch: WIE chapter	2016-2017
•	**Student body Secretary**	IEEE UIU Student Branch	2016-2017
•	**Enlisted Singer/Vocalist**	Bangladesh Television & Bangladesh Radio	2016- Present

PUBLICATION

Journal

1. T. Paul, **O. Hassan,** C. S. McCrae, S.K. Islam, and A.S.M. Mosa, "Lightweight and Low-Parametric Network for Hardware Inference of Obstructive Sleep Apnea", *Diagnostics* 14, no. 22 (2024): 2505. (Journal Link)
2. T. Paul, **O. Hassan,** S.K. Islam, and A.S.M. Mosa, "Real-Time Obstructive Sleep Apnea Detection from Raw ECG and SpO2 Signal Using Convolutional Neural Network ", *AMIA Summits on Translational Science Proceedings* 2024, 662. (Journal Link)
3. **O. Hassan,** T. Paul, N. Amin, T. Titirsha, R. Thakker, D. Parvin, A. S. M. Mosa, S. K. Islam, "An Optimized Hardware Inference of SABiNN: Shift-Accumulate Binarized Neural Network for Sleep Apnea Detection," *IEEE Transactions on Instrumentation and Measurement*, vol. 72, pp. 1-11, 2023, Art no. 2516311, (Journal Link)
4. **O. Hassan,** T. Paul, M. M. Hossain Shuvo, D. Parvin, R. Thakker, M. Chen, A. S. M. Mosa and S. K. Islam, "Energy Efficient Deep Learning Inference Embedded on FPGA for Sleep Apnea Detection*", Journal of Signal Processing Systems*, Springer, 2022. (Journal Link)
5. D. Parvin, **O. Hassan**, T. Oh, S. K. Islam, "Design of a Smart Maximum Power Point Tracker (MPPT) for RF Energy Harvester", International Journal of High-Speed electronics and systems. doi:10.1142/S0129156420400066 (Journal Link)
6. T. Oh, D. Parvin, **O. Hassan**, S. Shamsir, S. K. Islam, "Maximum Power Point Tracking (MPPT) Integrated DC-DC Boost Converter for RF Energy Harvester" IET Circuits, Devices and Systems. (Journal link)
7. M. M. S. Hassan and **O. Hassan**, "Higher Education and Creation of Jobs in Bangladesh" European Journal of Teaching and Education. (Journal link)
8. M. M. S. Hassan and **O. Hassan**, "The Importance of Changing the Traditional Mode of Higher Education in Bangladesh: Creating huge Job Opportunities for Home and Abroad", 21st Int. Conf. On Employment, Education and Entrepreneurship (ICEEE), June 2019. (Journal link)

Conference

1. **O. Hassan**, M.M. Hossain, T. Paul, S.A. Pullano, S.K. Islam, "Design of a Power-Efficient Digital Classifier for Neural Network-Based Sleep Apnea Detection System", 2024 IEEE International Symposium on Medical Measurements and Applications (MeMeA), June 26-28.
2. M. G. Bianco, F. Laganà, G. Oliva, M. Menniti, S. K. Islam, **O. Hassan**, M. Greco, A. S. Fiorillo, S. A. Pullano, "Nailfold Video Capillaroscopy Based on Sidestream Dark Field and Stacking Algorithm", 2024 IEEE International Symposium on Medical Measurements and Applications (MeMeA), June 26-28.
3. **O. Hassan**, T. Paul, R. Thakker, D. Parvin, M. M. H. Shuvo, A. S. M. Mosa, S. K. Islam, "A Multi-Sensor Based Automatic Sleep Apnea Detection System for Adults Using Neural Network Inference on FPGA ", The 17th Edition IEEE Medical Measurements and Application Conference 2022 (MeMeA), June 22-24.

4. **O. Hassan**, R. Thakker, T. Paul, D. Parvin, and S. K. Islam, "SABiNN: FPGA Implementation of Shift Accumulate Binary Neural Network Model for Real -Time Automatic Detection of Sleep Apnea", 2022 IEEE International Instrumentation and Measurement Technology Conference (I^{2}MTC).

5. D. Parvin, **O. Hassan**, T. Titirsha and S. K. Islam, "FPGA Implementation of an Energy Efficient Neural Network Model for Maximum Power Point Tracking" National Radio Science Meeting (USNC-URSI) 2022.

6. T. Paul, **O. Hassan**, S. K. Islam, and A. S. M. Mosa, "ECG and SpO2 Signal-Based Real-Time Sleep Apnea Detection Using Feed-Forward Artificial Neural Network", American Medical Informatics Association (AMIA) Symposium, 2022.

7. M. M. Hossain Shuvo, **O. Hassan**, D. Parvin, M. Chen and S. K. Islam, "An Optimized Hardware Implementation of Deep Learning Inference for Diabetes Prediction," 2021 IEEE International Instrumentation and Measurement Technology Conference (I2MTC), 2021, pp. 1-6. (Paper Link)

8. D. Parvin, **O. Hassan**, T. Oh and S. K. Islam, "RF Energy Harvester Integrated Self-Powered Wearable Respiratory Monitoring System," 2021 IEEE International Instrumentation and Measurement Technology Conference (I2MTC), 2021, pp. 1-6, (Paper Link)

9. **O. Hassan**, D. Parvin and S. K. Islam, "Machine Learning Model Based Digital Hardware System Design for Detection of Sleep Apnea Among Neonatal Infants" The 63rd Edition of IEEE International Midwest Symposium on Circuits and Systems 2020. (Paper Link)

10. **O. Hassan**, S. Shamsir and S. K. Islam, "Machine Learning Based Hardware Model for a Biomedical System for Prediction of Respiratory Failure" The 15th Edition of IEEE International Symposium on Medical Measurements and Applications 2020. (Paper link)

11. S. Shamsir, **O. Hassan** and S. K. Islam, "Smart Infant-Monitoring System with Machine Learning Model to Detect Physiological Activities and Ambient Conditions", IEEE International Instrumentation & Measurement Technology Conference 2020. (Paper link)

12. T. Oh, **O. Hassan**, S. Shamsir and S. K. Islam, "DC-DC Boost Converter Design with Maximum Power Point Tracker (MPPT) used in RF- Energy Harvester" IEEE International Symposium on Medical Measurements and Applications, June 2019. (Paper link)

13. T. Oh, **O. Hassan**, S. Shamsir and S. K. Islam, "Low-Power RF Energy Harvester Circuit Design for Wearable Medical Applications" National Radio Science Meeting (USNC-URSI), Jan 2019. (Paper link)

Book-Chapter

1. S. Shamsir, M. S. Hasan, **O. Hassan**, P. S. Paul, M. R. Hossain, M. R. Islam, "Semiconductor Device Modeling and Simulation for Electronic Circuit Design", Modeling and Simulation in Engineering, IntechOpen, April 29 2020. (Chapter link).

PROJECTS

Power Efficient Machine Learning Based Hardware Architectures for Biomedical Applications   August 2018 – Present
                                                                                   (Ph.D. Research)

Inspired by human brain functionality and neuromorphic hardware design techniques, this research focuses on developing power efficient neural network models embedded on digital hardware. The hardware design approach and architectures are called "SABiNN" which is a 2's complement based digital design technique and "DeepSAC" which is a shift-accumulator based deep learning model. Various neural network models were selected to analyze the proposed method and deep compression learning techniques for hardware implementation were applied in transforming the deep network into a compact model. Instead of using matrix multiplication method typically used in hardware accelerators, shifters and 2's complements were used which reduced the power consumption rate by 13x times. Due to shifters being used as the network parameters, there was no need of internal nor external memory devices for storing these parametric values such as its weights and biases. As a result, the processing power was reduced to nearly 5x compared to the commercially available hardware accelerators available in the market and significantly reduced the model size as well.

DeepSAC for Sleep Apnea Device   August 2021- Present
(IEEE SSCS PICO Design Contest: Top 10)   (Project Link)

The project is to design a smart and wearable sleep apnea detection system capable of detecting apnea in real-time. A unique method was developed to embed trained machine learning/AI models into energy efficient hardware components which eliminates the necessity of utilizing large memory for biomedical signal processing. The objective of this project was to design and fabricate the digital signal processing circuit part of the sleep apnea detection system based on a shifter-based trained binarized feedforward neural network model.

Smart, Infant Monitoring System Capable of Detecting Apnea   January 2019 – April 2019
(1st Place, IEEE INERTIAL 2019)

In this project, a smart infant monitoring system was designed that aided in monitoring infants remotely in a hospital or a home-based environment. The system has the capability of detecting apnea and seizure experienced by infants and generate an alarm signal to alert the caregiver or the parents. In addition, it can detect some general activities of the infant such as its movement, crying and sleeping position as well as the body temperature with noninvasive sensor-based system

Smart Device for Visually Impaired People   August 2016 – December 2016
(Best Humanitarian Impact Award, IEEE WIE-CON 2016)

The system is designed to assist visually challenged people with audible information about the object and location. The device takes snapshots of the object and says the exact name as well as the name of the location by taking latitude and longitude from the GPS of user's smartphone/watch. The device is able to help user with navigating places and detecting objects in-front of them. Blind people can use this device when they are walking or riding a vehicle, also they can use the device to determine and verify the correct travel route.