

Faculty Member Contact Information

Name	Mousam Hossain, PhD
Contact Info	
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Department	Electrical and Computer Engineering

1 Funded, Unfunded URCA Assistant(s)

Are you willing to work with students from outside of your discipline? If yes, which other disciplines?

- No

How many hours per week will your student(s) be required to work in this position?
(Minimum is 6 hours per week; typical is 9)

- 9

Will it be possible for your student(s) to earn course credit?

- No

Location of research/creative activities:

- Engineering Building. Room 2020

Brief description of the nature of the research/creative activity?

- The main effort I pursue in my lab is designing evolvable computing architectures for embedded machine learning (ML) and edge-IoT applications, including reconfigurable hardware, high performance and low-power designs, and emerging technology-based next-generation computing.
- The research can be categorized in two levels. URCA students can be engaged in numerous aspects of these projects, and enhance their skill set in the process.
- At the architecture level, we have a distributed framework that utilizes the emerging spintronic-based devices for energy-efficient and reliable in-memory processing with run-time configurability of neuronal activation function, as per the target application requirements. We have developed an energy-efficient processing-in-memory architecture, SCAPE, for pattern recognition ML applications with adaptable neural activations. We

are working to expand the deep learning models to include other datasets, for evaluation accuracy of the platform.

Brief description of student responsibilities?

- The URCA Assistant will participate in deploying Machine Learning algorithms on different hardware FPGA platforms for various real-time data/image/video processing applications.
- In parallel, the assistant can choose to also work on incorporating new datasets into our existing in-memory computing platform, which is built for data inferencing and handwritten digit recognition. The student will be responsible for conducting necessary developmental changes to our framework (MATLAB, Python and HSPICE-based platform) and validating it in terms of achieving acceptable image recognition accuracy.

URCA Assistant positions are designed to provide students with *research or creative activities* experience. As such, there should be measurable, appropriate outcome goals. What exactly should your student(s) have learned by the end of this experience?

- By the end of the experience, the student will be able to:
 - Acquire hands-on skills and knowledge in machine learning and neural networks, memory systems architecture, ML hardware and post-CMOS emerging device applications, which are an active area of research and employment.
 - Use modern and advanced FPGA boards, such as AMD Ultrascale+ ZCU 102, ZCU 104, PYNQ Z2, etc.

Requirements of Students

If the position(s) require students to be available at certain times each week (as opposed to them being able to set their own hours) please indicate all required days and times:

- There are no set times necessary, and the schedule can accommodate the student, as long as the work effort is totaling the said number of weekly hours.

If the location of the research/creative activities involves off campus work, must students provide their own transportation?

- The research will be conducted on-campus. There may be occasional travel involved to conferences, which will be mostly covered through funds.

Must students have taken any prerequisite classes? Please list classes and preferred grades:

- ECE 282, CS 140

Other requirements or notes to applicants:

- The ideal applicant will have experience with Python or MATLAB, have some knowledge on CMOS designs, and be proficient in coding.