Research Experience for Undergraduates (REUs) Funded by the National Science Foundation (NSF)

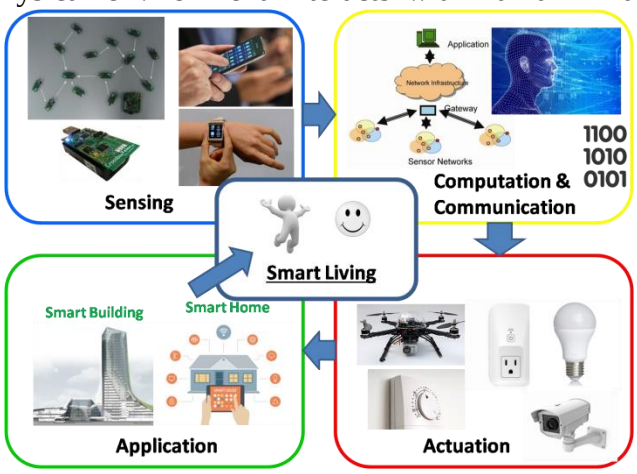
Prof. Sajal K. Das, Chair, Computer Science

The Department of Computer Science has multiple research assistant positions for undergraduate students for fall 2014 semester and beyond. Students will have unique opportunity to actively participate in exciting research projects funded by the NSF, contribute to solving challenging problems in computer science and engineering with cutting-edge applications, gain hands-on experience in building systems and experimenting with them, and above all, expand their creative horizon beyond course work. For this experiential learning and research, the students will receive monthly stipends up to $500 per month. Mentored by passionate faculty, postdoc, and PhD students, the students will also have opportunity to write scholarly articles to publish their research work in reputed conferences and journals. The research will be conducted in the CReWMaN Lab.

About Us: The CReWMaN Research Lab (http://cs.mst.edu/labs/crewman) is involved in a wide range of basic and applied research in interdisciplinary areas that span over Wireless and Sensor Networking, Mobile and Pervasive Computing, Distributed and Cloud Computing, Smart Living and Smart Healthcare, Cyber-Physical Systems (CPS) and Internet of Things (IoT), Privacy and Security, Biological and Social Networks. The goal is to nurture a dynamic learning environment through research, mentoring, teaching, and outreach. The CReWMaN research lab is directed by Prof. Sajal K. Das, Chair of Computer Science Department and Daniel St. Clair Endowed Chair.

1. Smart Living: Cyber-Human Smart Environments Design

Project Overview: Cyber-human smart environments are context-aware systems in which the physical environment interacts with human inhabitants through sensors, mobile devices and actuators. The environment is human-centric because it learns about inhabitants' daily activities and preferences, and mines such information to efficiently predict activity-aware actions and useful notification services. For example, by transforming everyday environments into smart ones, we can make our homes more energy efficient, safe, and secure; improve the quality of life and comfort; as well as provide effective healthcare and well-being services in a timely manner. The design and development of smart environments requires synergistic collaboration among several subareas: wireless sensor networking, smartphone based computing, pervasive and mobile computing, ambient intelligence, and scalable middleware systems, human-to-machine interfaces (HCI) and machine-to-machine communications (M2M). This project aims to address these challenges and create live prototype and testbed of a smart lab and smart building.



Roles and Responsibilities: Undergraduate REUs will be working with faculty, postdoc, and PhD students engaged in this project, and will be involved in the design and development of Smart Living environments. Students will work individually or in small groups in one of these areas.

1. Development of smartphone based innovative applications to interface humans with devices and appliances in smart environments.
2. Integration of embedded devices and low power computing platforms (e.g., sensors and Arduino devices) to smart environments.
3. Development of innovative Web-based interfaces to control sensor networks and visualize large sensory data from smart environments.
4. Design and development of (mobile) cloud computing solutions for big data collection, storage management.
5. Hardware design and prototyping to extend the capabilities of off-the-shelf sensors and appliances (smart power switch, Bluetooth iBeacon) for controlling smart environments.
6. Context-aware activity recognition and privacy issues in smart healthcare application.

For more information, contact Dr. Debraj De (ded@mst.edu)

2. Cloud-based Mobile Phone Sensing

Project overview: The popularity of smartphones has led to the emergence Mobile Phone Sensing (MPS) paradigm, where smartphones are leveraged to capture and send various types of sensory data to a cloud-based system. Although the MPS paradigm is exceptionally promising, sensing apps will be installed and accepted by the vast majority of the population only when the impact on the smartphone's resources (battery, CPU, memory, and bandwidth) are minimized. This project aims to design and implement a Cloud-based MPS system with off-the-shelf Android devices, and evaluate the impacts of various applications on smartphone resources under different system parameters. Designing analytical models to predict and optimize the resource utilization is another goal.

Roles and Responsibilities: There are multiple openings in this project, and students will be working in individual capacity as well as in small groups in one or more of the following topics.

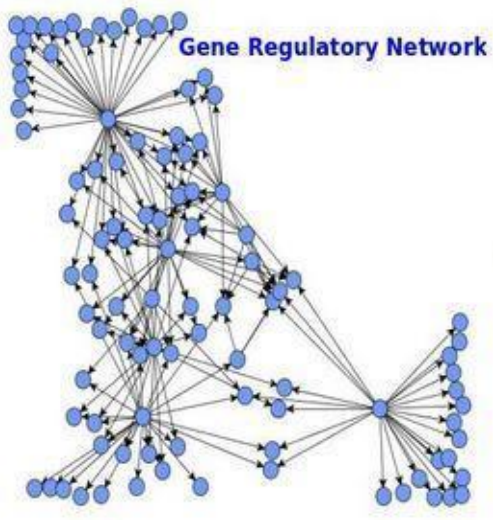
1. Design Mobile Phone Sensing application (app) using Android-based devices. The app should be capable of using the sensing capability of the smartphone, as well as uploading the sensed information to a cloud.
2. Implement a cloud-based system for MPS applications using the CReWMaN servers in the lab. The system should be able to efficiently receive, store, and retrieve sensing information from the MPS app.
3. Analyze the impact of the MPS application on the phone's resources such as energy consumption, computational resources, memory utilization, and connectivity.

4. Develop mathematical models to predict (and optimize) the impact of the MPS application on phone's resources as a function of the app's parameters.
5. Security and privacy issues in mobile cloud computing.

Pre-requisites: Basic skills in Java/C/C++ programming, and optional experience with Android programming or Network programming

For more information, contact Francesco Restuccia (frthf@mst.edu)

3. Bio-inspired Networking: Learning from Nature



Project Overview: Gene Regulatory Networks (GRNs) are a collection of genes in living organisms, which interact with one another to regulate the level of protein. Such interactions have evolved over millions of years to make organisms robust and better suited to their surroundings. Graph representation of these interactions can be studied for structural properties of the GRN networks to understand what makes them robust. This innovative project aims at determining topological properties and also applying them to real-world applications, such as robust design and deployment of sensor and ad-hoc wireless networks.

Role and Responsibilities: REU students working with PhD students engaged in this project, will be actively involved in research in bio-inspired networks including the design and development of visualization tools for analysis of such networks. Students will have opportunity to set up experimental testbed using sensors and conduct experiments to study different topological properties of the GRN graph.

For more information, contact Armita Abedijaberi (aan87@mst.edu)

Common Requirements

Interested applicants must be undergraduate students in Computer Science or related engineering disciplines and should not be graduating before spring 2015 semester. The CGPA must be 3.5 or above. They must be in excellent academic standing, and are eager to learn and work hard to develop research skills. The students must be a **citizen** or a **permanent resident** of the United States, its territories or possessions, as required by the National Science Foundation (NSF).

How to Apply

Interested students satisfying the above requirements should send an application (cover letter and resume) to Dr. Debraj De at ded@mst.edu, with e-mail subject "*REU Application.*" They should specify the broad project topic of interest (Projects 1, 2 or 3 as above). So for example, for Smart Living project the e-mail subject will be "*REU Application: Project 1.*" To apply for multiple projects, the e-mail subject can be "*REU Application: Projects 1 and 3.*"***All application must be received by Monday, September 11, 2014***.

Your application should contain the following information:

1. Current standing – sophomore, junior, or senior.
2. Current CGPA.
3. List of courses already taken and those taking this semester.
4. Current or past research or software development experience, if any.
5. Preferences for the project(s) or tasks within a project.
6. The projects may require you to work with one or more of the following software: C, C++, Java, JavaScript, Python and web technologies. Indicate your proficiencies and/or preferences in these with any relevant course work and experiences (if any).
7. Any other qualifications (e.g., co-ops or internships) that make you suited for any of the above projects and may help us better evaluate your candidacy.
8. The number of hours you would be available per week to work as REU.