Prof. Samantha Foley
Research Interests

- Scientific Computing
- High Performance Computing
- Cloud Computing
- Computer Science Education
- Promoting Diversity in Computing
Past Projects

• Past/Current MSE Projects
  – DSLEUTH – parallelize an urban growth modeling program to run on multicore machines
  – KSLEUTH – using the same approach as DSLEUTH, but using Kubernetes and Docker containers
  – PySLEUTH – reimplement the SLEUTH code in a modern language
  – OnRamp – a web portal for running parallel programs for education
  – Concurrency Visualizer – a web application that demonstrates classic synchronization programs with a backend written in Go
  – Suite of GPU applications for learning about parallel computing
Current and Future Projects

• **Concurrency Visualizer**
  – extend the work with more applications and more powerful visualization of the results

• **PySLEUTH (high-performance and Python versions of SLEUTH)**
  – Current work:
    • reimplement in Python
    • use DSLEUTH on larger datasets in the meantime
  – Future work:
    • understand the performance when working with much larger data sets
    • Automate calibration steps

• **Other projects dealing with parallelism**
Dr. Mao Zheng
Nov. 2023

https://www.cs.uwlax.edu/~mzheng
Research Interest

• Software Engineering
  – Software Testing
    • Specification-based testing (formal model, automation)
    • UML testing (informal model, scenario-based)
  – Software Model & Software Design
    • Context-aware computing
      – Context models
      – Design and implementation based on the model
      – Context-aware applications: mobile apps.
<table>
<thead>
<tr>
<th><strong>Machine Learning</strong></th>
<th><strong>Mobile App Development</strong></th>
<th><strong>Software Engineering</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Building a Stock Machine Learning Model using Numerai Dataset</td>
<td>Workout Track &amp; Plan App</td>
<td>Launch Web Tool Document Generator from Legacy tool Spectrum to Generate Equipment Submittals</td>
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<tr>
<td>A Detection Tool for Traffic Objects</td>
<td>An Android App for Detecting Sleep and Pausing Media</td>
<td>Test Case Generation from UML Models</td>
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<tr>
<td>Tongue Diagnosis in Diabetes by Deep Learning</td>
<td>An Android UWL Campus Guide App (kotlin)</td>
<td>A Web-based Testing Tool</td>
</tr>
<tr>
<td>Developing an Autonomous Driving Model Based on Raspberry Pi</td>
<td>A Ride Sharing Application: UberLite</td>
<td>A Design of the Test Engine</td>
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<tr>
<td>Using Machine Learning to Play the Game Super Mario Kart</td>
<td>Context-based Mobile User Interface</td>
<td></td>
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<tr>
<td>A Web Application for Restaurant Recommendations</td>
<td>A Mobile Application for Collecting Plant Observation Data</td>
<td></td>
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<tr>
<td>A Web-based Application for Optimal Inventory Redistribution</td>
<td>An Android UWL Campus Guide App (Java)</td>
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</tbody>
</table>
Current Projects & Future Ideas

• A Design of Low-cost Indoor Tracking and Navigation System

Looking for Students:

• Mobile App Development

• Software Models, Design, or Testing

• Machine Learning (with Dr. Song Chen @ UWL Mathematics & Statistics Department)
Research Activity & Future Projects

by
Dr. Rig Das
Assistant Professor
Department of CS & CE
University of Wisconsin, La Crosse (UWL)
02-Nov-2023
My Research Area

Biometrics
- Palm Vein
- Finger Vein
- Face
- Brain Signal/EEG

BCI
- 19 channels EEG Signal

Authentication/Recognition

Typical BCI Setup & Overview

Medical Applications
- Environmental Control
- Communication
- Locomotion

Entertainment (non-medical) Applications
- Computer Games (Tetris, Pinball, Car racing etc.)
- Media Applications/ Web browsing, etc.
Brain Computer Interface
A BCI system provides a direct interaction pathway/channel between the brain and a peripheral device by translating the electrical activities (e.g., the electroencephalogram (EEG)) of the brain into control/command signals.

BCI application includes:

- Rehabilitation of patients suffering from neural injuries and neuromuscular diseases, such motor disabilities, spinal cord injuries (SCI), or stroke, etc.
- Controlling external devices e.g. computer, wheelchair, neural orthosis/prosthesis, home appliances etc.
Drone Control Application (SSVEP)

BCI For Drone Control

https://www.youtube.com/watch?v=Tjv2P1_h_CU
What is Biometrics?

- Automated method for recognizing/authenticating individuals based on measurable biological and behavioral characteristics.

- **Why Biometrics:** Next-generation technological solution to strengthen the social and national security.

- **Two types** of Biometric Identifiers/Traits

<table>
<thead>
<tr>
<th>Physiological</th>
<th>Behavioural</th>
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<tbody>
<tr>
<td>Face</td>
<td>Signature</td>
</tr>
<tr>
<td>Fingerprint</td>
<td>Voice</td>
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<tr>
<td>Vein Pattern</td>
<td>Gait</td>
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<tr>
<td>Ear Shape</td>
<td>Keystroke</td>
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<tr>
<td>Oder</td>
<td>Lip Motion</td>
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<tr>
<td>Iris</td>
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<tr>
<td>Retina</td>
<td></td>
</tr>
<tr>
<td>EEG (electrophysiological)</td>
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</table>
EEG Biometrics using Resting State EEG
EEG Biometrics Using rsEEG

- EEG signals, elicited when the subject is in resting state condition [3].
- Two protocol, with Open Eyes and Closed Eyes,
- The database will be acquired in UWL
- This experiments will consists of EEG signals collected from 2 distinct sessions, spanned over a period of 2 weeks.
- One session for training/enrolment of the subjects and other session for testing/authentication.

Table 3: EEG Database

<table>
<thead>
<tr>
<th>No. of Subjects</th>
<th>No. of Channels</th>
<th>Sessions</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>16</td>
<td>2</td>
</tr>
</tbody>
</table>

(Separated by 2 weeks)

EEG Acquisition Device

- Expected to Arrive at UWL by Dec 2023

g.Nautilus by g.tec System
Preprocessing & Channel Selection of EEG Signals

- Signal Processing for EEG signals pre-processing in order to increase their signal-to-noise ratio.
- Channel Selection; to reduce the no of channels without compromising on the performance.
Brain Signals/EEG for Early Prediction of Parkinson’s Disease
Objective

- Primary objective: Acquire and analyze electroencephalogram (EEG) data from healthy control subjects during a resting state condition.
- Early-stage Parkinson's patients' (PD) EEG data collected from the Mayo Clinic in Rochester.
- Comparison between Healthy Control and PD patients' resting state EEG data
- To gain valuable insights into the alterations in brain activity exhibited by PD.
- To early predict the progression of Parkinson's disease.
Thank you!
Lightning Talks

Computer Science Department

University of Wisconsin–La Crosse

As of November 2, 2023
Prof. Petullo: Recent Projects

- **SimpleFlow**: Modification to Linux kernel; implemented information-flow access control model [https://www.flyn.org/projects/SimpleFlow/](https://www.flyn.org/projects/SimpleFlow/)


- **Industrial Age**: Building teams around a hacking assembly line model

- **Aquinas**: Adding more check types and linters [https://www.flyn.org/publications/](https://www.flyn.org/publications/)
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Prof. Petullo: Interests

- Cybersecurity (and insecurity)
- Software systems
- Open-Source Software

https://www.flyn.org/proposals/
Prof. Petullo: Interests

- Cybersecurity (and insecurity)
  - CS356, Software Exploitation
  - CS455, Fundamentals of Information Security
  - CS456, Secure Software Development
- Software systems
- Open-Source Software

https://www.flyn.org/proposals/
Prof. Petullo: Interests

- Cybersecurity (and insecurity)
  - https://flyn.org & https://aquinas.dev
- Software systems
  - Fedora packaging
  - OpenWrt packaging
  - SELinux policy work
- Open-Source Software

https://www.flyn.org/proposals/
Prof. Petullo: Interests

- Cybersecurity (and insecurity)
- Software systems
- Open-Source Software — CS410, Open Source Development

https://www.flyn.org/proposals/
Dr. Dipankar Mitra
Assistant Professor
Dept. of Computer Science & Computer Engineering
University of Wisconsin-La Crosse
Research Background

- CMOS Integrated Beamformer for Phased Array antenna
- 3D-Printed Flexible and Wearable Electronics
- Transformation Electromagnetics/Optics
Current and Future Research

(1) Real Environment Antenna Simulation using COMSOL Multiphysics

(2) Near-Field Sensing for various Biomedical Applications

(3) ML-based Optimization of IoT Communication
Scope and Potential Opportunities:

- Learn Industry scale CAD Tools: COMSOL, CST, ADS
- Internship Opportunities @ Mayo Clinic, Patfoci Technologies Inc., Rochester, MN, NASA WSGC

AI Applications of Microwaves in medicines for Better Health Care
Student Success

- Two UG Students went to Grad School (ASU and UBC)

- 2 Dean’s Distinguished Fellowship (DDF) in Summer, 2023

- 3 went for Internships in Top Companies (Summer 22 and 23)

- Currently, 4 students working on different Projects

- Students Published in IEEE Papers

- One Student Co-authored a Book Chapter With me
Research Sponsors

- NASA Wisconsin Space Grant Consortium (WSGC)
- UWL FRG
- Gundersen Health Care
- WiSys
- Microwave and Imaging Lab (MEIL), Department of Medicine, Mayo Clinic, Rochester, MN
- Potential Support from: NSF and Wisconsin Innovation Grant