STUDENT PREFERRED QUALIFICATIONS & REQUIREMENTS

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2. Commit to a mentored research experience in a faculty member's lab for 9-12 hours/week for 2 semesters
3. Participate in a 3-week summer professional development program called The Leadership Academy. It is a live, online professional development program with other students in tech and engineering. It consists of 5 afternoon sessions per week for 3 weeks. The dates are June 10 - 28, 2024. Expect a total time commitment of about 25 hours for the 3-week course

RESEARCH AREA

Wei Ding's research explores how to extract useful information from large and complex data sets, with applications to bio-informatics, health sciences, astronomy, geosciences, and environmental sciences. These fields generate and collect massive amounts of biological, genomic, astronomical, and environmental data that require advanced methods and techniques for analysis and interpretation.

Wei's research group develops and applies knowledge discovery, data mining, and machine learning algorithms to solve data-driven problems and discover new insights.

STUDENT RESPONSIBILITIES

• Implement and test new AI/ML algorithms
• Strong programmer

RESEARCH LEARNING OUTCOMES

• A research paper.

Wei Ding
Professor, Computer Science
UMass Boston

Wei ding@umb.edu

STUDENT RESPONSIBILITIES
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STUDENT PREFERRED QUALIFICATIONS & REQUIREMENTS
• Basic understanding of computer programming, preferably Python
• Familiar with latexes
• Additional Responsibilities
  o Reading assignments
  o Weekly research updates
  o Implementing recommendation models
  o Poster/ workshop presentation in the research area of our lab

FACULTY MENTOR
Kenneth Fletcher
Associate Professor, Computer Science
UMass Boston

RESEARCH AREA
We are exploring how we can use reinforcement learning to improve the accuracy and diversity of personalized recommender systems.
We are currently looking at an application in news recommendations. By incorporating natural language processing tasks of topic extraction and word embeddings, we hope to capture user dynamic preferences on news item consumption for personalized recommendations by a recommender agent.

RESEARCH LEARNING OUTCOMES
• Understand recommender systems and their impact to society.
• Build a framework for testing and evaluating recommendation algorithms with Python.
• Understand and implement accurate recommendations for users using simple and state-of-the-art algorithms.
• Use LLMs to improve recommendation accuracy and diversity.

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RESEARCH LEARNING OUTCOMES
FUNDED BY A GRANT FROM THE ALFRED P. SLOAN FOUNDATION
FACULTY MENTOR

Daniel Haehn
Assistant Professor, Computer Science
UMass Boston

RESEARCH AREA

Biomedical Imaging, Visualization, Computer Vision+Graphics, Human-Computer Interaction

The Machine Psychology research group at UMass Boston develops visual computing methods to accelerate biological and medical research. Our group also manages the Artificial Intelligence Research Core with applications in Data Science, High-Performance Computing, and Cybersecurity.

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STUDENT PREFERRED QUALIFICATIONS & REQUIREMENTS

- Python / JavaScript

RESEARCH LEARNING OUTCOMES

- Hands-on Research and Development using current Machine Learning and Visualization libraries

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FACULTY WEBSITE

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daniel.haehn@umb.edu
STUDENT RESPONSIBILITIES

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STUDENT PREFERRED QUALIFICATIONS & REQUIREMENTS

- Basic programming skills and some knowledge of computer networks

FACULTY MENTOR

Yinxin Wan
Assistant Professor, Computer Science
UMass Boston

RESEARCH AREA

My research interest lies broadly in the areas of cybersecurity and networked systems. My recent research focus is centered on studying smart home security and privacy, as well as quantum networking.

At UMass Boston, our research lab is dedicated to exploring innovative technologies for enhancing performance and protecting the safety and privacy of network systems around us.

RESEARCH LEARNING OUTCOMES

- Develop basic research skills in both theory and systems.
- Hands-on experience in examining real-world cybersecurity problems.
- Potential research paper publications.

FACULTY WEBSITE


FACULTY CONTACT

yinxin.wan@umb.edu
In the NanoBio interfaces Lab we develop low-cost nanosensors for infectious disease, food safety, water quality, and citizen science. Our aim is to make tests that can be easily operated and read out by eye or by mobile phones. We construct paper assays that change color upon detection of viruses, bacteria, or contaminants.

Students will be able to engineer low cost sensors and quantify their behavior, use chemical and biological instrumentation, with options to develop microcontroller systems and/or mobile phone app for readouts.

Students will learn how to work in an interdisciplinary group, how to give scientific oral presentations, communicate technically with team members and the PI, plot and analyze data, and get some experience in technical writing.

To get the most out of working in this lab, students should be open to working at the interface between engineering with chemistry and biology, and doing wet lab experiments.

Some experience with working with Arduinos/Raspberry Pi helpful but not required.
SLOAN STUDENT MENTORING PROGRAM 2024-25
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FACULTY MENTOR

Rafael Rodrigues
Assistant Professor, Engineering
UMass Boston

RESEARCH AREA

My research is strongly oriented by the wind industry needs. I am focusing on multidisciplinary wind farm flow physics, design, and optimization by developing computational software applicable to the wind energy industry.

My mission is to leverage the next generation of wind power systems by enhancing their productivity, helping to tackle some of the next environmental challenges that our generation will have to deal with.

RESEARCH LEARNING OUTCOMES

- Open-source software highly relevant for the wind energy industry.
- Writing abstracts and participation in journal articles
- Computational fluid dynamics
- Lab Hands-on experience if possible on cavitation

STUDENT RESPONSIBILITIES

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STUDENT PREFERRED QUALIFICATIONS & REQUIREMENTS

- Strong background in programming and multidisciplinary optimization

FACULTY WEBSITE

https://bit.ly/3uz6Yo4

FACULTY CONTACT

R.ValottaRodrigues@umb.edu
STUDENT RESPONSIBILITIES

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STUDENT PREFERRED QUALIFICATIONS & REQUIREMENTS

- Understanding of the fundamentals of power systems engineering.
- Knowledge in any of the subsequent areas:
  - Programming languages such as C, Python, Matlab/Simulink
  - Embedded systems and hardware security
  - Mathematical optimization (CVX, AMPL, GAMS, etc.), or
  - Machine learning, work with others, and take an interest in the research area of our lab

RESEARCH AREA

My research endeavors are concentrated within the realm of cyber-physical systems security, particularly focusing on the utilization of embedded systems within industrial settings, distributed energy, and power grid infrastructure.

The scope of my research initiatives encompasses the integration of cutting-edge principles drawn from computer hardware, embedded systems, communications protocols, and data science methodologies, with the overarching objective of fortifying the integrity and reliability of mission-critical components within the power grid infrastructure.

RESEARCH LEARNING OUTCOMES

- Comprehensive understanding of critical issues within the domain of security and resilience in electric power grid operation and control, tailored to individual student interests. Demonstrate a proficient comprehension and critical analysis of relevant research in the realm of electric power grid security and resilience.
- Communicate their research findings effectively, both orally and in writing, adhering to concise presentation standards and within allocated time constraints. Defend their research approach, design decisions, and evaluation methodologies.
FACULTY MENTOR

Madalina Fiterau
Assistant Professor, Computer Science
UMass Amherst

RESEARCH AREA

We are working on a project that aims to develop adaptive multi-modal fusion techniques for learning systems. Multi-modal fusion is the process of combining different types of data, such as text, images, audio, video, etc., from various sources, to enhance the performance and capabilities of the systems. However, multi-modal data is highly variable and complex, and there is no one-size-fits-all solution for how to fuse it.

Our project will introduce a new paradigm for multi-modal learning that can dynamically adjust the fusion mechanism.

RESEARCH LEARNING OUTCOMES

- Understand the basics of multi-modal machine learning, in terms of training and evaluation on benchmark datasets.
- Understand the issues related to efficiently training large multi-modal models, in terms of resource allocation, scheduling of data input and ability to issue real time responses.
- A potential paper publication in the area of machine learning, computer vision, or system venues.

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STUDENT PREFERRED QUALIFICATIONS & REQUIREMENTS

- Read and summarize research papers related to the project, about one per week. Meet weekly with other students in the lab to discuss research progress
- Have taken some math courses, interest in machine learning

FACULTY WEBSITE

https://bit.ly/3l0a5lz

FACULTY CONTACT

mfiterau@cs.umass.edu
STUDENT PREFERRED QUALIFICATIONS & REQUIREMENTS

1. Take part in small mentoring groups with 2 faculty in Computer Science or Engineering and learn about post-graduation career options
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RESEARCH AREA

We are passionate about applying systems, energy, machine learning, and technology for developing regions. We are working on several projects that aim to improve the access, quality, and consumption of electricity in low-income communities, especially in sub-Saharan Africa. We are developing models and tools to predict and stimulate electricity demand, monitor and enhance grid reliability, and measure and improve infrastructure quality. We are collaborating with electricity service companies, utilities, and universities to achieve our goals.

We are evaluating the cost-effectiveness and sustainability of our solutions, as well as the potential for scaling and replication in other contexts. We hope to contribute to the global efforts of providing universal and affordable electricity access for all.

RESEARCH LEARNING OUTCOMES

- I would like students to become familiar with energy systems challenges in developing regions. On the computing side, I am keen for students to develop data analysis skills with relevance to large spatial and temporal datasets.

FACULTY MENTOR

Jay Taneja
Assistant Professor, Computer Science
UMass Amherst

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SLOAN STUDENT MENTORING PROGRAM 2024-25
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FACULTY MENTOR

Stacyann Bailey
Assistant Professor, Engineering
UMass Amherst

RESEARCH AREA
My research focuses on understanding the factors that affect bone quality and lead to increased fragility. By studying the mechanical and material properties of bones, particularly those weakened by diseases like osteoporosis, diabetes, and cancer, I aim to develop better ways to predict and prevent fractures. This work includes examining the role of bone extracellular matrix proteins and their modifications, which are crucial for bone strength.

I have delved into clinical studies, specializing in cancer epidemiology and biostatistics. My work with extensive healthcare databases has honed my data analysis skills, allowing me to merge clinical observations with my research on bone health and disease.

RESEARCH LEARNING OUTCOMES
• Gain experimental skills in mammalian cell culture; analyze bone matrix properties through the use of mechanical testing and material characterization techniques (x-ray imaging, histology, and spectroscopy); apply statistical methods to analyze experimental results; participate and present research results in group meetings.

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STUDENT PREFERRED QUALIFICATIONS & REQUIREMENTS
• Experience in biology, chemistry, biomedical engineering wet lab environments. One who is quick to grasp new ideas and concepts, works well on own initiative as well as part of a team.
• A versatile, diligent, and self-motivated individual, with an intrinsic desire to excel.

FACULTY WEBSITE

FACULTY CONTACT
stacyann.bailey@umass.edu
FACULTY MENTOR

Meghan Huber
Assistant Professor, Engineering
UMass Amherst

RESEARCH AREA
In the Human Robot Systems Laboratory, we design and develop robotic technology to assist and retrain motor function. We also conduct basic science research to deepen our understanding of how the human nervous system adapts and learns through physical interactions with robotic technology.

This project will involve improving the electromechanical design of a robotic hip exoskeleton to assist walking and running and investigating neural changes resulting from long-term practice with the exoskeleton.

RESEARCH LEARNING OUTCOMES
- How to design wearable robotic exoskeletons (mechanical and electrical design).
- How to measure human neural and motor behavior with different sensing modalities and analyze data with statistics.
- How to conduct experiments with human participants.
- How to communicate research to the broader community.

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STUDENT PREFERRED QUALIFICATIONS & REQUIREMENTS
- Genuine interest and enthusiasm to both (1) design and build robot exoskeletons AND (2) study their effect on human behavior
- Ability to independently drive and sustain personal motivation, especially when problem-solving
- Strong organizational and time management skills

FACULTY WEBSITE
https://hrs-lab.org/

FACULTY CONTACT
mehuber@umass.edu

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STUDENT PREFERRED QUALIFICATIONS & REQUIREMENTS
• Background of at least one intro AI, QC or computer network course is preferred
• Knowledge of programming in Python would be helpful
• Eagerness and enthusiasm to learn and collaborate with others

RESEARCH LEARNING OUTCOMES
• Research in computer networks, Model and analyze real networking problems, Programming AI algorithms, Communicate research findings, both in written and oral formats.