

Swenson College of Science & Engineering at the University of Minnesota Duluth

McKnight Postdoctoral Fellowships in Engineering and Computer Science

We have funding available to support multiple McKnight Teaching Postdoctoral Fellows within our engineering and computer science programs. **This two-year fellowship** also includes a research stipend for the Fellow to spend on supplies and travel. The McKnight Fellow will be expected to **teach one course per semester and carry out research**. The teaching assignment is open for any area of engineering or computer science. Importantly, upon identifying a Fellow and through discussions with them, the PI will provide **a mentoring plan** that describes the strategy for the Fellow to develop the research, teaching, and mentorship skills necessary for a successful career. Please contact the potential mentor directly to learn more, and see below about how to apply. For additional questions, reach out to Associate Dean [Erin Sheets](#). Application review will begin January 8, 2024, and continue until the positions are filled.

Applications and Questions Related to the McKnight Postdoctoral Fellows Program

- Visit the University of Minnesota HR Job Search website at <https://hr.umn.edu/Jobs/Find-Job> and search for **Job ID 352721**. Application review will begin January 8, 2024, and continue until the positions are filled.
- Contact Dr. Erin Sheets with questions at edsheets@d.umn.edu or the potential faculty mentor directly.

[Chemical Engineering](#)

Victor Lai. This project is in collaboration with Dr. Benjamin Clarke from the UMD Medical School to study Lyme Disease. The two main projects are (1) Design of a soft bioengineered tissue equivalent to study macrophage-bacteria interactions using *Borrelia burgdorferi*, the bacteria that causes Lyme Disease, as the model bacteria; and (2) Design of an artificial tick feeding system to understand how different conditions (humidity, light cycle, bacterial load, etc) influence ticks' feeding behavior. <https://scse.d.umn.edu/faculty-staff/victor-lai>.

Sam Toan. Please review the following links for the potential research projects

<https://scse.d.umn.edu/faculty-staff/sam-toan>.

Weiguo Xie. Mathematical modeling and computational simulation in chemical engineering and mineral processing; Optimization and control in large-scale process system; Real-time online measurement techniques. <https://scse.d.umn.edu/faculty-staff/weiguo-xie>.

Civil Engineering

Manik Barman. Execution and management of the ongoing and future research projects in the area of pavement engineering. Participation in writing of research reports, articles for publications and research proposals. Current and past research projects can be found in <https://www.cts.umn.edu/research/investigator/manik-barman>.

Mary Christiansen. At the heart of the project will be investigations of various depths of microscopic characterization (SEM/XRD/TGA/etc) and macroscopic characterization (mechanical/electrical/diffusion/thermal/porosity/etc) of portland cement-based binders as well as alternative cements. The goal will be to supplement already existing work by the PI with characterization necessary for publication and to offer the MTPF a variety of experiences that will strengthen existing skills and also develop new ones.

Xingzhou Guo. AI-based ergonomic analysis of transportation and construction workers for improvement of health and safety. <https://scse.d.umn.edu/faculty-staff/xingzhou-guo>.

Abdullah Haroon. Assessing the Impact Resistance of Ultra High Performance Concrete (UHPC) Precast Elements. UHPC represents an innovative category of high-strength concrete known for its exceptional strength and durability. The pressing demand lies in the comprehensive evaluation of its performance across a spectrum of loading conditions, particularly in the context of impact loads. <https://scse.d.umn.edu/faculty-staff/abdullah-haroon>.

Nathan Johnson. Anaerobic wastewater treatment processes are rapidly becoming a more common way for municipalities and industry to implement energy efficient pollutant removal. A McKnight postdoc in Civil Engineering will work with ongoing partners and projects to evaluate the potential for waste sulfur and iron to contribute to these solutions. Drs. Chun (<https://sites.google.com/d.umn.edu/chunlab/>) and Johnson (<https://sites.google.com/a/d.umn.edu/nwjohnso/>) will help to direct postdoctoral research on physical or mathematical experimentation of anaerobic wastewater treatment processes utilizing sulfur and iron.

Michael Pluimer. The post-doctoral associate will join a national research team focusing on the research, development and testing of more sustainable and resilient materials for civil engineering infrastructure and other applications. Additionally, the McKnight post-doctoral associate will teach one course per semester in the Applied Materials Science Master's program, with the specific topics of the course depending on the individual's expertise and consultation with the Director of the Advanced Materials Center (<https://scse.d.umn.edu/research/amc>).

Kun Zhang. The postdoctoral fellow's research will revolve around Integrating data-driven analytics and urban hydrologic & hydraulic models to elucidate hydrologic and biogeochemical mechanisms, make predictions, and optimize the design and spatial placement of stormwater infrastructure in urban watersheds. The research project will include building urban hydrologic models in Duluth, MN and/or Milwaukee, WI, comparing them with data-driven models (such as machine learning models), and utilizing them for decision making through optimization. My website is: <https://sites.google.com/d.umn.edu/kkhydro/home>.

Computer Science

Eleazar Leal. This research project involves designing, developing, and analyzing learned hardware-accelerated parallel algorithms for spatial data management algorithms. This topic encompasses developing indexes and search algorithms for raster and trajectory data by exploiting the features of GPUs, multicore CPUs, and other parallel architectures. For more information, consult the website <https://scse.d.umn.edu/faculty-staff/eleazar-leal>.

Peter Peterson. Adversarial Thinking (AT) is seen as perhaps *the* critical skill for cybersecurity research and practice, but it is not well-defined; as a result there is no test for it and thus no way to measure it in students or evaluate educational interventions meant to improve the skill. Starting from a consensus-based identification of AT's critical components developed as part of the mentor's NSF CAREER project (https://www.nsf.gov/awardsearch/showAward?AWD_ID=2146129), the postdoc would help develop, validate, and apply a non-technical test that measures AT in individuals, leading to improvements in AT and thus cybersecurity. The postdoc -- who ideally would be specifically interested in cybersecurity education teaching and research -- might also develop AT interventions to test and would also be invited to join the mentor's other ongoing cybersecurity education projects and collaborations to broaden their research base and make connections in the field of cybersecurity education. (<https://www.d.umn.edu/~pahp/>)

Jomara Sandbulte. The postdoctoral fellow will join our ProHealth Initiative research project. The ProHealth Initiative aims to examine how health applications can be designed to support individuals in their pursuit of a healthy lifestyle as well as their desire to collaboratively promote healthy living within close relationships. More details, check Dr. Sandbulte website: <http://umn.edu/~jsandbul>.

Electrical Engineering

David Anderson. Research will involve topics of applied and embedded machine learning, hearing health science, and acoustics in the Electro-Acoustics Research (EAR) Lab. <https://mozartandcircuits.com/hearing-protection-research/>.

Mechanical & Industrial Engineering

Abigail Clarke-Sather. Promote circular economy design as part of the Applied Sustainable Product Innovation and Resilient Engineering (ASPIRE) Lab through scale up of textile-to-fiber mechanical recycling in partnership with Goodwill of Duluth. Measure and design out environmental and health & safety impacts from microplastics generated during shredding processes and from textile use. Promote economic development by growing partnerships with regional and local businesses for manufacturing of new yarns and textiles for commercial sale from recycled fibers. <https://sites.google.com/a/d.umn.edu/abbie/>.

Craig Hill. The Postdoctoral Fellow will engage in research activities focused on developing control strategies for small to mid-scale wave energy converters operating in low energy seas (i.e. conditions similar to Lake Superior). I hope to recruit someone with a background that spans control systems and fluid dynamics. As a team, we will work with undergraduate and graduate students to develop designs for WECs to deploy and simulate their control and response in wave conditions typical to the Great Lakes.

<https://www.craighilllab.com/research.html>

Alison Hoxie. This research involves using Comsol and other modeling techniques to study Thermoactive Foundation Design specifically for cold weather climates. The study will include modeling of innovative heat exchanger design along with coupling multiple renewable energy systems.

Hessam Mirgolbabaie. It has been proved that for any manifold of dimensionality higher than 10, the results of multivariate data analysis will not often change significantly if a subset of the variables is chosen. An application will be toward the fire environment to simulate heat transfer from fire-pool to engulfed packages for transportation risk studies. Since risk studies require multiple simulations, analysis tools must be rapid and accurate, which is hypothesized to be achievable through the dimensionality reduction. Website:

https://sites.google.com/d/1ku4_dQAKvNGmKoK2gPPTaF3qWHZE4F7P/p/1NvQfcy6z6D8Ge3yHq7ZBwGCo3evnTUkh/edit

Ruihang Zhang. My research mainly focuses on the cardiovascular flow of aortic models using PIV. The potential project that the postdoctoral fellow will work on is about CFD simulation for aortic valve and arch models under unsteady flow conditions. Here is my website:

<https://sites.google.com/d.umn.edu/rita-group/home>

Ping Zhao. The research projects focus on implementing artificial intelligence into the design of piezoelectric energy harvesting systems and additive manufacturing of piezoelectric composites. The research includes both experimental and theoretical studies. Candidates with a strong background in materials, manufacturing and data analysis are preferable.

Debao Zhou. 1. Working on a project entitled: Remote Heartbeat Detection System for the Early Warning of Heart Attack. 2. The main work include: (1) Develop a physical system to demonstrate the remote sensing of heartbeats, (2) Develop an artificial intelligence (AI) method

to process the normal and abnormal signals and to identify the patterns that can predict possible heart problems, such as a silent myocardial infarction (SMI), happen.

About the [Swenson College of Science and Engineering](#)

The Swenson College of Science and Engineering at the University of Minnesota Duluth (UMD) houses ten departments across the natural sciences, mathematics, and engineering.

- Biology
- Chemical Engineering
- Chemistry and Biochemistry
- Civil Engineering
- Computer Science
- Earth and Environmental Sciences
- Electrical Engineering
- Mathematics and Statistics
- Mechanical and Industrial Engineering
- Physics and Astronomy

Swenson College and UMD have a wealth of [resources for you to grow and succeed as a scholar](#), and Duluth Minnesota is a [great place to live and work](#).