CLAMS
Computational Laboratory for
Advanced Manufacturing & Sustainability

PhD Opening in Process Systems Engineering (PSE) at CLAMS

The Computational Laboratory for Advanced Manufacturing and Sustainability, or CLAMS (https://checlams.github.io/), is a young research group led by Dr. Zheyu Jiang, assistant professor in chemical engineering at Oklahoma State University. At CLAMS, we develop systems engineering solutions to tackle some of the most pressing and interdisciplinary challenges, including industrial decarbonization, digital agriculture, and food-energy-water nexus. The group is currently seeking one to two highly motivated and creative students to join the group as Graduate Research Assistants (GRAs) starting in Fall 2025 or Spring 2026.

WHAT YOU WILL DO

- **Multi-scale modeling**: You will develop efficient neural solvers and physics-informed neural networks for accurately solving ordinary and partial differential equations that model complex physiochemical phenomena and processes in various engineering and sustainability applications, such as water infiltration in soil for digital agriculture, CO_2 transport in shale reservoirs for carbon sequestration and storage, electrolyzer and fuel cell modeling for clean energy production, and so on.
- **AI for Science**: You will develop digital twin solutions combining physics-based first principles with data-driven techniques for applications such as variable renewable energy (e.g., solar and wind) forecasting, electricity market price prediction, and battery systems prognosis and optimization. Meanwhile, you will develop computational efficient and scalable algorithms to solve inverse problems (e.g., parameter estimation and uncertainty quantification) for these engineering and environmental applications.
- **Optimization**: You will develop deterministic and/or stochastic optimization models, implement convexification, reformulation, and decomposition techniques, and design efficient algorithms to solve critical problems such as: 1) privacy-preserving decentralized optimization algorithms for joint operation, maintenance, and planning of modern energy systems; and 2) designing resilient infrastructures and supply chains for food and chemicals (e.g., plastic waste and battery waste upcycling) using distributionally robust optimization.
- **Explainable AI**: By leveraging latest advancements in explainable AI, develop new AI/ML architectures and platforms to enhance interpretability and explainability, improve accuracy, ensure underlying physics, and/or preserve data privacy of classic AI/ML methods in solving problems related to clean energy technologies and digital agriculture.
- **Safe reinforcement learning (RL) and optimal control**: You will develop new theories and algorithms in safe RL to smoothly integrate hard safety constraints RL with provable convergence and optimality properties for optimal control of batch crystallization process for pharmaceutical/agrochemical manufacturing, greenhouse/building thermal systems, agricultural irrigation, etc.

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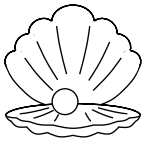
WHY YOU SHOULD JOIN

- You will be working on an exciting project funded by the U.S. National Science Foundation. Dr. Jiang also collaborates extensively with faulty members with backgrounds in optimization, data-driven modeling, AI/ML, and robotics. Students will benefit from these collaborations via joint mentorship/advising.
- OSU is located in the safe, inclusive, and friendly college town of Stillwater which has very low cost of living and state-of-the-art research, education, and wellness facilities. Each GRA will receive a monthly stipend of $2,500, plus full tuition waiver for graduate courses and coverage of single-person health insurance premium. Stillwater is one of the few college towns in the U.S. that has an airport operating commercial flights, making domestic and international travel convenient. Oklahoma is one of the fastest growing states in the U.S. with lots of opportunities and great convenience. Stillwater is within 1-hr drive from Oklahoma City and Tulsa, the two largest cities in Oklahoma with outstanding food scenes as well as many indoor and outdoor activities.
- We believe that actively participating and engaging in national and international conferences plays a vital role in exchanging research thoughts and progress, generating new ideas, and building strong professional networks across academia and industry. Therefore, we encourage our students to submit abstracts and give talks at related conferences, including AIChE Annual Meeting, INFORMS Annual Meeting, IISE Conference, Process Systems Engineering Conference, etc. In the past, each student would present at least one of the conferences each year. The group and OSU will offer full travel coverage on food, lodging, and transportation to each student attendee.
- We value industrial experience and believe that it is beneficial to student's graduate research and long-term development. We encourage our students to seek and apply for summer internship opportunities in industry and national labs to complement their research at CLAMS, expand their vision and scope, and offer them a glimpse of the corporate world. In the past, our students have gone for summer internships at large, multi-national cooperations (e.g., American Airlines). We will provide all necessary resources and support to help students succeed in their applications, including writing letters of recommendation, hosting resume workshops, sharing interview insights and tips, conducting mock interviews, etc.

QUALIFICATIONS

- Although the lab is housed in the School of Chemical Engineering, due to the multidisciplinary nature of our work, we seek BS/MS candidates from a diverse pool of expertise, including chemical engineering, industrial engineering & operations research, mathematics, computer science.
- Candidates should have a strong quantitative background and solid understanding of calculus, linear algebra, and probability/statistics. They should be comfortable with mathematical reasoning, such as performing mathematical derivations, writing proofs, coding, and conducting numerical experiments.



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- We are looking for candidates who demonstrate self-motivation and commitment toward PhD study as well as strong enthusiasm for learning new topics in mathematical modeling, optimization, AI/ML, and optimal control.
- Good familiarity in one or more scientific computing software packages and programming languages (e.g., MATLAB, Python, Julia, GAMS, Pyomo), as well as open-source machine learning frameworks (e.g., PyTorch).
- Good verbal and written communication skills using English. Proof of English competency can be in the form of an official TOEFL, PTE Academic or IELTS score. Scores must be from an exam taken within the last two years. The minimum requirements are TOEFL 79 iBT, 53 PTE Academic or 6.5 IELTS academic stream.
- Preferred (but not required) background: ordinary/partial differential equations, linear/nonlinear/integer/Bayesian optimization, explainable AI, AI for Science, and optimal control.

HOW TO APPLY

Interested candidates can directly contact Prof. Zheyu Jiang at zheyu.jiang@okstate.edu with their latest CV and transcript(s) attached. A short written assessment about the candidate's quantitative skills may be sent via email to candidates who successfully pass the CV screening stage. Upon receipt of the written assessment, candidates will have 48 hours to complete it and to scan and email their answers back. Prof. Jiang may then schedule one or two rounds of virtual interviews with the qualified candidates before final decisions are made. Applications will be accepted on a rolling basis until the position is filled.

We understand that graduate program application can be a long and arduous experience, which mostly comes from the uncertainty and frustration during waiting. Therefore, we strive to make our interview process as fast and transparent as possible. We offer timely application status update to each candidate to minimize waiting time.

OUR COMMITMENT

OSU and CLAMS adhere to a policy that prohibits discrimination on the basis of race, color, sex, sexual orientation, gender identity, religion, creed, national or ethnic origin, citizenship status, age, disability, veteran status, or any other legally protected class. OSU and CLAMS value diversity and seeks talented students from diverse backgrounds. Oklahoma State University is an equal opportunity employer.