**Andrew Allman – University of Michigan – Department of Chemical Engineering**

**Bio**

Andrew Allman is currently an assistant professor in the Department of Chemical Engineering at the University of Michigan and has been in this position since fall 2020. Andrew is an alumnus of the University of Minnesota's PSE groups, where he obtained his Ph.D. with Prodromos Daoutidis in 2018 and subsequently worked in a post-doctoral position with Qi Zhang from graduation until joining Michigan. His awards include receiving the NSF CAREER Award in 2023, and the CAST Director's Student Presentation Award in 2018. His recent research at Michigan has focused on solving many-objective optimization problems, assessing the operation and control of modular chemical production systems, embedding machine-learned classifier models to enhance moving horizon decision making, and solving constrained machine learning problems.

**Title**: Ensuring GenAI Works for Chemical Process Systems: Perspectives on Use Cases and Alignment

**Abstract:** Recent years have seen the rapid proliferation of generative AI tools, from chatbots to autonomous “agents.” These tools have transformative potential in all parts of society, including the chemical process industry. However, deploying these tools to their full effect will require careful consideration of the areas where generative AI can enhance, rather than replace existing chemical engineering knowledge, and how it can be deployed in a safe manner given the current limitations in generative AI technology. The first half of this talk reviews some promising use cases of generative AI in process systems engineering emphasizing areas where first principles knowledge is insufficient for the task. In particular, efforts utilizing AI for generating new decompositions of large scale optimization problems, explaining optimization outcomes, and incorporating hard-to-quantify sustainability objectives into decision making frameworks are discussed. In the second half of the talk, I transition to considering the alignment of generative AI models, an essential quality of AI systems to ensure they support real industry objectives and are deployed in a safe manner. I note that the process systems community is particularly well suited for addressing these issues given its expertise in constrained optimization, model predictive control, multi-objective optimization, and dynamic systems. The need to move from soft-constrained to hard-constrained AI models to ensure alignment is emphasized, and efforts in the chemical process systems community towards constrained AI are highlighted, including new methods for constrained network structure detection and neural network training.