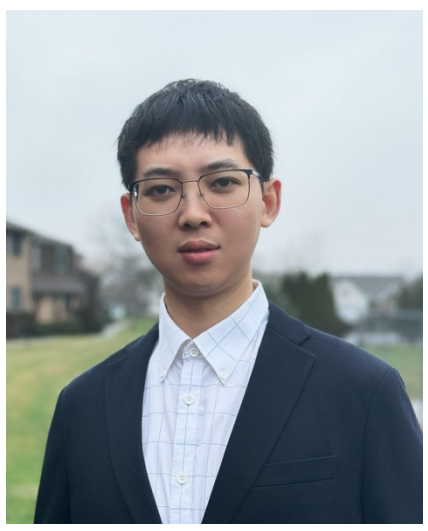
# Department of Physics and Materials Science



## SEMINAR

Improving Adaptation of Deep Learning with Inductive Bias

Prof. Xiajun Jiang

University of Memphis

**Abstract:** Deep learning shows a promising solution to artificial intelligence. However, generalizing or adapting deep learning models to heterogeneous tasks remains an open question. Human intelligence is, on the other hand, good at adapting to a small set of observations, particularly because of the strong ability to 1) use given knowledge and 2) distill knowledge from data, to guide learning, where such ability is the inductive bias in the learning. To improve the adaptation of deep learning, we need to understand the bottleneck in existing works and teach deep learning to adapt like humans.

In this talk, I will focus on improving adaptation of deep learning inductive bias, primarily examining three key questions: 1) how to learn to adapt with the knowledge that can be extracted from data, 2) how to incorporate physics-informed knowledge into neural networks, and 3) how to learn to identify hybrid knowledge with both known prior and unknown errors. To answer these questions, I will present a what-how framework that learns the domain environment and adapts the neural function accordingly. To answer the second question, I will then introduce a white-box model to impose physics into neural networks and a gray-box model that improves learning with partially known physics. For the last question, I will propose a hybrid modeling combining the strength of learning to identify unknown errors from data and adapting with known physics. I will end my talk with an interdisciplinary vision for my future research, including the hybrid model for complex physics, learning to adapt anytime and anywhere, and its application in personalized healthcare.

**Bio**: Dr. Xiajun Jiang is an assistant professor from the Department of Computer Science. He received his Ph.D. at Rochester Institute of Technology. His research interests lie within a broad area of machine learning and health care with specific focuses on interdisciplinary directions of adaptive computing in AI models, physics-informed deep learning, and their applications to medical image analysis. His work has been published in top-tier conferences and prestigious journals, including ICLR, MICCAI, and IEEE TMI.

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## Friday Oct. 11th, 3 - 4 PM Manning Hall 201