GRADUATE SEMINAR

Interactive Learning for Closed-Loop Design of Experiments, Simulations and Expert Feedback

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In most scientific domains including material science, we have control over the data collection procedure from multiple diverse sources. This inspires use of interactive machine learning algorithms that not only find input-output associations but also interact with the data generating process making intelligent decisions about what data to collect, when and how much. This talk will exemplify such interactive learning algorithms that can guide closed-loop design and integration of experiments, simulations as well as prior knowledge in the form of expert feedback. We will talk about passive and sequential experimental design for learning and decision making using a variety of machine learning models ranging from linear, decision trees, gaussian processes to neural networks, as time permits. Along with methods, we will discuss sample use cases for such interactive algorithms in material science problems ranging from automated experimentation, additive manufacturing and structure optimization.

Aarti Singh is an Associate Professor in the Machine Learning Department at Carnegie Mellon University. Her research focuses on interactive algorithms for learning and decision-making in both human-in-loop and human-out-of-loop settings, with applications to enabling social and scientific discoveries. Her work is recognized by an NSF Career Award, a US Air Force Young Investigator Award, A. Nico Habermann Junior Faculty Chair Award, Harold A. Peterson Best Dissertation Award, and best student paper awards. Dr. Singh has served as Program Chair for ICML'20, AISTATS'17, the National Academies Committee on Applied and Theoretical Statistics, NASEM advisory board for NSF DMREF, and Associate Editor for IEEE Transactions.

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