COLLEGE OF ENGINEERING
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Dissertation Defense

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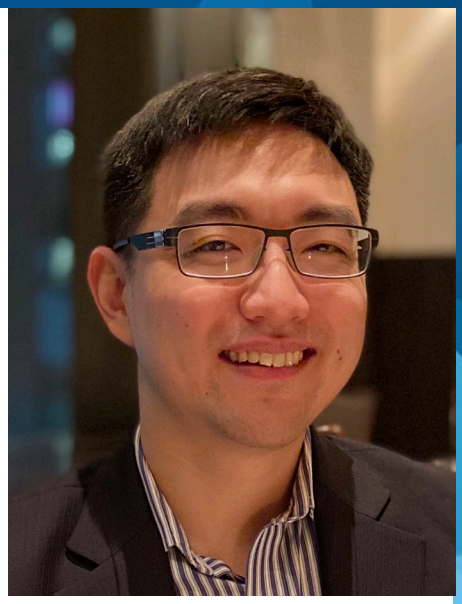

Agent-based Models for Analyzing Strategic Adaptations to Government Regulation

Wednesday, January 22, 2020
1:30 pm – 3:30 pm 3725 Beyster Bldg.

ABSTRACT: In many economic systems, participants are unable to internalize social costs. These can be anything from pollution to default risk in financial systems. To deal with these costs, regulators impose limits on the behavior of market participants. These regulations do not always have straightforward effects, and for new regulations a model is required to evaluate them. In this thesis I will perform this modeling task in several domains using a computational agent-based approach. This approach affords two advantages. First, agent-based models can handle intricate models of participant behavior. This is often necessary when participants are operating in a complex domain, using large modeling and computational resources of their own. Second, agent-based models combined with empirical game theoretic analysis (EGTA) can calculate Nash equilibria under new regulations. This addresses in part the Lucas critique of models with regulation, which stipulates that agents can adapt their behavior in ways that break fixed assumptions about agent behavior.

I evaluate the overall effects of regulation using metrics appropriate to each domain I study. Using two models of the financial system, one based on an asset market and one based on a debt market, I study Basel regulations which have been criticized for being too simplistic and for actually being counterproductive. I find that in fact, when accounting for the strategic adaptations of banks, Basel regulations are largely beneficial for financial stability. I then examine recent EPA regulations that allow the trading of emissions credits in an attempt to bring down the cost of reducing emissions. I find that while the cost of reducing pollution is reduced as desired, costs to consumers are increased by firms that use emissions trading to coordinate price hikes. In all cases, the use of game-theoretic analysis was crucial to evaluating the effect of regulation.

Chair: Prof. Michael Wellman