Anson Kahng
Social Choice and AI: Helping Humans Make Decisions
Thursday, April 16, 2020 – 1:00 p.m. – Remote

This thesis studies how to help people make decisions by using tools from artificial intelligence and computational social choice. On a high level, this thesis can be broken down into two major thrusts. The first is the analysis and refinement of two new paradigms of democratic decision-making, virtual democracy and liquid democracy. The second is the design of new mechanisms that satisfy certain theoretical properties, namely strategyproofness and consensus.

Virtual democracy is a method for automating decision-making by learning models of people and letting these models vote in order to make decisions. In such a system, we the question of how to aggregate the electorate's predicted votes. We prove that the Borda count is provably robust in this setting and study a real-world implementation of virtual democracy in collaboration with a nonprofit organization in Pittsburgh, 412 Food Rescue.

Liquid democracy, on the other hand, is a democratic paradigm where voters are allowed to transitively delegate their voting rights to other voters, who then may cast a vote of commensurately greater weight. We study liquid democracy from an algorithmic point of view and prove that liquid democracy is not guaranteed to outperform direct democracy. We then focus to minimizing the maximum weight voter in liquid democracy systems, a problem in both theory and practice.

Turning now to designing voting rules that satisfy certain desirable properties, we start with impartial peer assessment, where our goal is to design a mechanism by which a set of agents can provide input on relative rankings between themselves in order to produce an aggregate ranking. We analyze impartial (or strategyproof) rules, and prove accuracy guarantees on their performance. Additionally, we develop HirePeer, a novel alternative approach to hiring at scale that leverages peer assessment to evaluate worker qualities in online labor markets.

Finally, we present current and future work. First, we discuss voting rules that incentivize consensus (i.e., compromise) between agents with heterogeneous beliefs. Second, we discuss an extension to the framework of virtual democracy. Finally, we discuss another project on designing and evaluating voting rules in order to ensure proportional representation in multiwinner elections.