

# Research statement

## Research fields

My research interests are in topics at the intersection of economics and computer science. In particular, my interests center on using tools from game theory and mechanism design to study the design of institutions while accounting for the incentives they create. During my graduate studies, I have studied the design of contests, an institution widely used to incentivize participants to exert effort in various contexts. I have also studied institutions for aggregating preferences to reach socially optimal decisions in the context of facility location problems, and institutions for extracting information held by another agent to take personally optimal decisions in the context of project selection problems. The challenge in both of these problems is to identify institutions that incentivize the self-interested agents to reveal their private information or preferences, and then compare them in terms of the information rent they pay and the welfare losses they incur. Recently, I've also worked on problems of allocating or redistributing discrete resources among agents. In two co-authored papers, we identify conditions under which stable and fair allocations exist and discuss algorithms that can find these allocations.

## Recent and current research

### *Contests*

Contests are situations where agents exert costly effort or resources to win one or more prizes. In many applications like sporting events, classrooms, labor markets, etc, the contest designer can manipulate the different features of a contest to influence the effort exerted by the agents and satisfy their objectives. In the paper “**Prizes and effort in contests with private information**”, I consider contests where agents have private information about their abilities and the contest designer can manipulate the values of different prizes to influence effort. In such settings, I study the effect on effort of two different interventions from the designer: increase in the value of prizes and increase in competition (transfer of value from worse to better prizes) and find that these effects depend qualitatively on the prior distribution of abilities in the population. I also discuss applications to the design of optimal contests in three different environments including grading contests. Our analysis allows us to establish a link between the informativeness of grading schemes and the effort they induce from the students.

*Mechanism design*

There are many settings where a principal wishes to take a socially or personally optimal decision but the information required to make the right decision is held by another agent or is spread across many different agents. The theory of mechanism design provides us the tools to study and compare different institutions in these environments in terms of their ability to extract the relevant information from the agents and make the right decisions. I've worked on two papers in mechanism design, both joint works with Wade Hann-Caruthers. In one, we study the problem of aggregating Euclidean preferences in two dimensions and show that the coordinate-wise median of the agent's ideal points is a good institution for this problem in the sense that it has the smallest worst-case approximation ratio among all incentive compatible mechanisms for a big class of social cost functions. The second paper considers a principal-agent project selection problem with asymmetric information and illustrates how the principal can gain from inducing partial verifiability constraints like no-overselling on the agent.

*Market design*

I'm also currently working on two projects in market design with Professor Federico Echenique and Professor SangMok Lee. In one, we consider exchange economies with indivisible goods and identify sufficient conditions on the economies under which stable allocations exist. We also propose an algorithm for finding stable allocations in these economies and show that the algorithm, when applied to a housing market, mimics the Top Trading Cycle (TTC) algorithm. In the other paper, we study fair allocation of indivisible goods over time. We introduce the fairness notion of envy-free up to one exchange (EF1X) and propose an algorithm inspired by TTC that leads to allocations that satisfy this and other well-known notions of fairness.

**Future research**

These papers are representative of the research I expect to conduct in future. In mechanism design, I am interested in studying the consequences of incomplete preferences or constrained manipulation on the set of incentive compatible mechanisms. In market design, I intend to study other natural economies for which the question of whether there exist fair and stable allocations remains open. In contests, I am interested in exploring the effect of information disclosure on the effort exerted by the agents. More generally, I'm also interested in using game-theoretic models to study some real-world systems and investigating if these systems are serving their intended objectives once you account for the incentives they create.