Research statement

Research fields

I am a microeconomic theorist working on the design of institutions and the result-ing incentive issues. My research interests center on using tools from game theory and mechanism design to understand how to optimally design social institutions. In my job market paper, I study the design of contests, an institution widely used to incentivize participants to exert effort in various contexts. The paper studies how different contests compare in terms of the effort they induce and discusses applica-tions to the design of effort-maximizing contests. 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 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 influ-ence the effort exerted by the agents and satisfy their objectives. A typical version of the optimal contest design problem that has been studied in the literature is how can a designer distribute a budget among different prizes so as to maximize total effort. In my job market paper **"Prizes and effort in contests with private informa-tion"**, I consider contests where agents have private information about their abilities and study how different prizes influence the effort exerted by the agents. In such settings, previous research has shown that awarding the entire prize budget to the best performing agent is optimal. In comparison, I obtain a more complete ordering of how different prize vectors compare in terms of the effort they induce. I find that the effect of different prizes and competition on effort depend qualitatively on the

distribution of abilities among the agents. When there is an increasing density of inefficient agents, higher prizes and greater competition generally encourage effort. In contrast, when this density is decreasing, higher values of intermediate prizes and greater competition generally discourage effort. I also discuss applications of these results to the design of optimal contests in some natural environments where the set of feasible prize vectors are constrained or different, thus illustrating the value in having a more complete ordering of how contests compare in terms of the effort they induce.

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 **"Optimality of the coordinate-wise median mechanism for strategyproof facility location in two dimensions"** (published at Social Choice and Welfare, presented at CS conference SAGT 2022), we consider a principal who wishes to choose a location for a public facility on a plane based on the Euclidean preferences of the citizens, defined by their privately known ideal points. We show that locating the facility at 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. While previous research provided strong axiomatic foundations for the coordinate-wise median mechanism, our paper augments this literature by demonstrating its quantitative optimality. The paper also contributes to the literature on approximate mechanism design without money that studies such problems under different domains.

In the second paper **"Project selection with partially verifiable information"** (to be presented at CS conference WINE 2022), we focus on a setting where the principal has to choose one among several available projects but does not how profitable each of these projects are. There is an agent who has complete information about the profitability of all the projects but also has its own preference over them. In this setting, there is no mechanism that the principal can use to exploit the information held by the agent and choose a profitable project. But if the principal can perhaps identify or induce features in the environment that prevent the agent from overselling any of the projects, we show that it can use a simple cutoff mechanism

that makes optimal use of the agent's information to choose profitable projects. In addition, if the agent's preferences over projects become more aligned with those of the principal, we find that the optimal mechanism grants more leeway to the agent. This is well-known in literature as the ally principle. The paper contributes to the literature on principal-agent project selection problems with asymmetric information.

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 contests, there are many other structural elements that the designer can manipulate to suit its objectives. I am particularly interested in studying how simple interventions like information disclosure at intermediate stages and tie-breaking rules can influence the behaviour of the participating agents. In market design, I intend to study other natural economies for which the question of whether there exist fair and stable allocations remains open. More generally, I'm also interested in using game-theoretic models to study some real-world systems and exploring if these systems are actually serving their intended objectives due to the incentives involved.