Research fields

I am a microeconomic theorist. My research interests center on using game theoretic models to study issues of incentives in the design of institutions. Each chapter of my PhD dissertation studies an institutional design problem from a different perspective. My job market paper studies how different contests incentivize participants to exert effort and discusses applications to the design of effort-maximizing contests in various environments. Another chapter illustrates the quantitative optimality of the coordinate-wise median mechanism among mechanisms that are incentive compatible for aggregating Euclidean preferences in two dimensions. The final chapter illustrates how a principal can extract rent from an agent with private information by identifying or inducing partial-verifiability constraints like no-overselling on the agents messages. Going forward, I'm interested in using game-theoretic models to study whether some real-world systems are actually serving their intended objectives due to the incentives involved. I'm also interested in exploring problems at the intersection of computer science and economics, like fair division of discrete resources and approximate mechanism design.

Recent and current research

In my job market paper "Prizes and effort in contests with private information", I consider contests where agents have private information about their ability and study the effect of prizes and competition (measured by inequality between the values of top and bottom prizes) on the effort exerted by the agents. While there is a significant literature that studies contest design in incomplete information environments, my focus on obtaining a more complete comparison of how prize structures compare in terms of the effort they induce, and also the distributional assumptions I make allowing for agents with almost zero marginal costs of effort, allows me to differentiate this work from the literature and contribute to it. I find that the effects of prizes and competition on effort depend qualitatively on the distribution of abilities among the agents. In particular, I find that if the density of inefficient agents is increasing, increasing the value of prizes or making the contest more competitive encourages effort. In contrast, if this density is decreasing, increasing the value of intermediate prizes or making the contest more competitive discourages effort. I discuss applications of these results to the design of effort-maximizing contests in environments that impose natural constraints on feasible contests including grading contests, contests with risk-averse agents, and contests where the designer can only award homogeneous prizes of a fixed value.

My other work includes two projects in mechanism design with Wade Hann-Caruthers, a fellow PhD student at Caltech. The first project "Optimality of the Coordinate-wise Median Mechanism for Strategyproof Facility Location in Two Dimensions" is published at Social Choice and Welfare. I also presented this work at the CS conference "Symposium of Algorithmic Game Theory" (SAGT) in September 2022. In this project, we consider a facility location problem in two dimensions and show that for a large class of social cost functions (including p-norm and weighted utilitarian), the coordinate-wise median mechanism has the smallest worst-case approximation ratio among strategyproof mechanisms. We also find this ratio exactly for the utilitarian objective and obtain bounds for the general p-norm objective. The paper augments the previous literature that provides strong axiomatic foundations for the coordinate-wise median mechanism by demonstrating its quantitative optimality.

The second project "Project Selection with Partially Verifiable Information" will be presented at the CS conference "Web and Internet Economics" (WINE) in December 2022. It studies a principal-agent project selection problem with asymmetric information under a novel and natural partial verifiability constraint of no-overselling. Without such partial verifiability, the principal can do no better than just choosing the ex-ante optimal project. But partial verifiability constraints such as no-overselling (agent cannot say a project is worth more to the principal than it actually is) may be inherent in the environment or induced by the principal by requiring the agent to furnish some kind of evidence supporting its claims. We show that there is value for the principal in identifying or inducing such constraints. We characterize the class of strategyproof mechanisms under the no-overselling constraint, and find that the optimal mechanism has a simple cutoff structure. We further find that the principal gives more authority to an agent with more aligned preferences and so our model lends support to the well-known ally principle.

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 under which core 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.

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