Last Updated August 2023

Justice C. Harasha

justiceharasha.github.io justice.harasha@yale.edu

Education

Yale University May 2024

Bachelor of Arts in Mathematics, Bachelor of Arts in Economics

Relevant Coursework

Mathematics Courses: Linear Algebra, Vector Calculus, Discrete Mathematics, Real Analysis I, Set Theory, Real Analysis II: Lebesgue Integration and Fourier Series, Measure Theory and Integration*, Abstract Algebra, Functional Analysis*

Economics Courses: Microeconomic Theory, Macroeconomic Theory, Introduction to Probability and Statistics, Econometrics, General Economic Theory: Microeconomics I*, General Economic Theory: Microeconomics II* Econometrics I*, Advanced Micreconomic Theory I*, Advanced Micreconomic Theory II*

Other Relevant Courses: Advanced Optimization Techniques*, Topics in Contemporary Social Theory, Directed Studies (* denotes graduate level course)

Research Experience

Yale University Department of Economics | *Research Assistant* August 2023 - present

Research assistant for Professor Ed Vytlacil. Assisted in proof-writing and computation on working paper refining partial identification methodology.

Federal Reserve Bank of New York | *Summer Research Analyst* June 2023 - August 2023

A returning primary research intern in the Time Series Econometrics group, used Bayesian estimation techniques to estimate the reduced-form dynamics of economic activity factors and the trend component of inflation. Used Markov Chain Monte Carlo methods to generate samples from the predictive distribution. Further, examined a set of recovered impulse response functions generated by the VAR to consider settings that include monetary policy and oil price shocks. Collaborated with FRBNY economists Martin Almuzara and Argia Sbordone.

Yale University Department of Economics | *Tobin Research Assistant* January 2023 – May 2023

Research Assistant for Professor Dirk Bergemann on his "Cost Based Nonlinear Pricing" paper. Used MATLAB and Mathematica to determine the set of all equilibrium profit and consumer surplus shares with quadratic costs. At conclusion of research assistance, began writing senior thesis under Professor Bergemann's advisement.

Federal Reserve Bank of New York | *Summer Research Analyst* June 2022 - August 2022

Working as the primary research intern in the Time Series Econometrics group, collaborated with economist Daniel J. Lewis (formerly FRBNY, now University College London) and his coauthor Professor Eben Lazarus (MIT Sloan) on the construction of a new Heteroskedasticity Autocorrelated Robust Estimator, using an Equal-Weighted Cosine orthogonal series estimator with fixed-b critical values. Coded primarily in STATA's back-end language Mata.

Yale University Department of Economics | *Tobin Research Assistant* August 2021 – May 2022

Research assistant on Professor Paul Goldsmith-Pinkham's "Housing and Mortgage Markets" project. Modeled and visualized mortgage rate "bunching," a phenomenon where commercial banks seem to charge rounded rates that are vastly similar across varying mortgage networks and communities.

Working Papers

Private Posterior Implementation in Collective Decision Problems | *Advised by Dirk Bergemann*
Posterior implementation is a sparsely studied solution concept for mechanism design when there are interdependent agent types. In posterior equilibrium, it is required that each agent's strategy is optimal with respect to the strategies played by their fellow agents for each possible message profile. There are two main considerations of posterior implementation in the current literature. First, Green and Laffont (1987) offer a geometric characterization of posterior implementable social choice functions in two agent, binary collective decision problems. Then, Niemeyer (2022) generalizes this analysis by considering binary collective decision problems with any number n of finitely many agents, with the main insight being that posterior implementable social choice functions are posterior implementable by score voting mechanisms. In both cases, it is assumed that all messages sent by agents are publicly observable. In this paper, we examine cases where only some aspects of agent messages are observable. Namely, we consider a case where agents submit their messages to a a central agent, or collector, who then uses these reports to make a public choice. Agents, therefore, form posterior beliefs regarding the types of their fellow agents based on this public choice, not on the granular message reports of their fellow agents. This, in turn, creates coarser agent posterior beliefs. We thus define an amended notion of posterior implementation, which we denote *private posterior implementation*, and for this, obtain a complete characterization of the set of privately posterior implementable decision rules in n-person binary collective decision problems. We also consider non-binary collective decision problems, where the public choice is a parameter, such as a price vector, and discuss the challenges that arise in such settings.

Strategy-Proofness in Elections with Multidimensional Signals | *Advised by Adam Meirowitz*
From Moulin's classic 1980 result, we know that, under a single-peaked domain, the Gibbard-Satterthwaite theorem can be sufficiently relaxed such that voters truthfully report their best preferred alternative when the central authority elects the median-reported 'peak.' This well-studied result provides an initial framing for this paper. We consider a two period election setting, where a policy is fixed in the first period. Agents report their ideal point and a strength of preference parameter, which denotes how sharply their utility decreases in movement to either direction of their ideal point. From this construction, we employ a mechanism design setting without transfers to consider the set of social choice functions that can be implemented in Bayesian-Nash equilibrium when agents are reporting this additional parameter. Then, after establishing the set of implementable social choice functions in a setting that does not allow transfers, we consider the same two period election setting where agents report an ideal point and strength of preference parameter, now allowing for monetary transfers and proceeding to characterize the set of social choice functions that are implementable in dominant strategies when transfers are allowed. We conclude with a brief discussion of application, namely considering how our results prove that it is in the best interest of party leaders and policymakers to consider the strength of voter preferences in movements away from ideal points and seek to give those with higher strength of preference parameters stronger sways over party directions and policy decision-making.

Algorithmic Mechanism Design in Combinatorial Auction Settings | *Advised by Sekhar Tatikonda*
Auctions are well-studied settings of economic exchange. Most commonly, they are composed of a seller, a set of bidders, and an item or group of items being auc- tioned. Traditionally, in multiple object auctions, attention is restricted to situations where those items are identical in nature. We consider a slightly altered auction setting, known as the combinatorial auction, an auction setting where bidders can place bids on combinations of discrete, heterogeneous goods. In these combinatorial auc- tion settings, it is well-documented that determining winners such that all agents are maximizing revenue is a problem of N P-complete complexity. Numerous approaches have been presented to resolve the intractability of this problem, most commonly re- sorting to restricting the allowable sorts of combinations that bidders can make. Our contribution continues in this direction, looking to alleviate the computational com- plexity of finding welfare-maximizing solutions in

combinatorial auctions with the least amount of restrictions placed on allowable bidder actions. Specifically, we proceed in four distinct steps: We begin by (i) formalizing a construction of a combinatorial auction setting and consider an efficient direct mechanism, then proceed to (ii) survey the existing attempts in the literature to alleviate the computational complexity of finding optimal, revenue-maximizing bundles in combinatorial auctions, (iii) map the combi- natorial auction setting onto the classical knapsack problem, and finally (iv) present an amended algorithm that attempts to resolve the computational intractibility of com- binatorial auctions through introducing welfare and redistributional considerations.

Skills and Research Interests

Languages: Python, STATA, R, Julia, MATLAB, Mathematica, LaTeX
Research Interests: I am broadly interested in economic theory, particularly in the application of mechanism design to settings where transfers are not apparent, information economics, and game theoretic approaches to problems in political economy.