CHANGHWA LEE

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UNIVERSITY OF PENNSYLVANIA

Education:
  Ph.D., Economics, University of Pennsylvania, 2022
  M.A., Economics, University of Pennsylvania, Highest Distinction, 2017
  B.A., Economics, Sogang University, Highest Distinction, 2014

Thesis Committee and References:

Rakesh V. Vohra (Advisor)
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Research Fields:
  Mechanism and Information Design, Industrial Organization, Algorithmic Discrimination

Teaching Experience:
Teaching Assistant (TA) at University of Pennsylvania:
  Fall, 2021   *Introduction to Economics (Undergraduate)*, TA for Professor Anne Duchene
  Spring, 2019   *Game Theory and Applications (Graduate)*, TA for Professor Yuichi Yamamoto
  Fall, 2018   *Micro Economic Theory II (Graduate)*, TA for Professor Yuichi Yamamoto
  Spring, 2018   *Game Theory and Applications (Graduate)*, TA for Professor Yuichi Yamamoto
  Fall, 2017   *Micro Economic Theory II (Graduate)*, TA for Professor George Mailath
Teaching Assistant (TA) at Professional Graduate Schools, Sogang University
  2014-2015   *Various Courses (Graduate)*, Head TA for Professor Hahn Shik Lee

Research Experience and Other Employment:
Research Assistant (RA) at University of Pennsylvania:
  2019   RA for Professor Annie Liang
  2019   RA for Professors Rakesh Vohra and Aaron Roth
  2018   RA for Professors Ashley Swanson and Matthew Grennan
  2018   RA for Professor George Mailath
Research Assistant (RA) at Sogang University:

2014-2015   RA for Professor Jungmin Lee

Professional Activities:

Referee   AER Insight, Management Science

Presentations   NBER Decentralization: Mechanism Design for Vulnerable Populations (2021), ACM Conference on Economics and Computation (2020), Pennsylvania Economic Theory Conference (Poster, 2019), Economics Joint Conference of Korea (2016)

Honors, Scholarships, and Fellowships:

2021   Summers-Weintraub Fellowship in Economics for Outstanding Theory, Macroeconomics or International Economics Student, University of Pennsylvania

2020   Sidney Weintraub Memorial Fellowship in Economics for Outstanding Theory Student, University of Pennsylvania

2019   Excellence for Third Year Paper, University of Pennsylvania

2017   Lawrence Robbins Prize for Best First Year Student, University of Pennsylvania

2016-2021   Fellowship, University of Pennsylvania

2014   Summa Cum Laude (ranked first among graduates), Sogang University

2013-2014   Kwanjeong Foundation Scholarship, Kwanjeong Foundation

Papers in Refereed Conference Proceedings:

"*Fair Prediction with Endogenous Behavior*" (with Christopher Jung, Sampath Kannan, Mallesh Pai, Aaron Roth and Rakesh Vohra) EC 2020 (computer science conference with acceptance rate 27%)

There is increasing regulatory interest in whether machine learning algorithms deployed in consequential domains (e.g. in criminal justice) treat different demographic groups "fairly." However, there are several proposed notions of fairness, typically mutually incompatible. Using criminal justice as an example, we study a model in which society chooses an incarceration rule. Agents of different demographic groups differ in their outside options (e.g. opportunity for legal employment) and decide whether to commit crimes. We show that equalizing type I and type II errors across groups is consistent with the goal of minimizing the overall crime rate; other popular notions of fairness are not.

"*Moment Multicalibration for Uncertainty Estimation*" (with Christopher Jung, Sampath Kannan, Mallesh Pai, Aaron Roth, Rakesh Vohra) COLT 2021 (computer science conference with acceptance rate 27%)

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Research Papers:

"*Optimal Recommender System Design*" (**Job Market Paper**)

Intermediaries like Amazon and Google recommend products and services to consumers for which the intermediaries receive compensation from the recommended sellers. Nevertheless, consumers will find these recommendations useful if they are informative about the quality of the match between the sellers' offerings and consumers' needs. The intermediary would like the consumer to purchase the product from the seller who pays the most for a recommendation but is constrained because consumers will not

follow the recommendation unless it is in their interest to do so. I frame the intermediary's problem as a mechanism design problem in which the mechanism designer cannot directly choose the outcome, but must encourage the consumer to choose the desired outcome. I show that in the optimal mechanism, the recommended seller has the largest non-negative virtual willingness to pay adjusted for the cost of persuasion. The optimal mechanism can be implemented via a handicap auction.

I use this model to provide insights for current policy debates. First, to examine the impact of the intermediary's use of seller data, I identify types of seller data that lead to benefit or harm to the consumer and sellers. Second, I find that the optimal direct mechanism protects consumer privacy, but consumer data is leaked to sellers under other implementations. Lastly, I show that the welfare-maximizing mechanism increases the consumer surplus, but reduces the joint profit of the intermediary and sellers relative to the revenue-maximizing mechanism.

"*Outcome Test for Policies*" (with Mallesh Pai and Rakesh Vohra)

The marginal outcomes test (Becker (1993)) has become one of the most popular test of taste-based discrimination in classification or allocation settings. We consider settings with two key properties: (1) the underlying attribute of the agent being classified is strategically chosen by the agent, and (2) the prinicpal commits to a policy, taking the agent's strategic behavior into account. In this setting we show the outcome test is misspecified: the optimal rule will result in different marginal outcomes across demographics, even in the absence of any discriminatory motive for the principal. We derive a correctly specified test in such a setting. The test statistic requires estimation of both marginal and average outcomes---the latter portion captures the effect on agents' incentives. Under additional assumptions we identify the direction of misspecification for the classical marginal outcomes test.

Research Papers in Progress:

"*Regulating Lobbyists*" (with Rakesh Vohra)

"*Fair Algorithms in the Hands of Unfair Humans: How a Fair Algorithm Can Make the Outcomes More Unfair*"

"*Initial Coin Offering*" (with Scott Kominers and Piotr Dworczak)

Language: South Korean (native), English (fluent)

Computer Skills: MATLAB, STATA, R, Mathematica, Python