Karthik Rajkumar

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To the organizers of the 2020 Economics of Digitization PhD student tutorial:

I am a 5th year PhD student in the economics department at Stanford, studying econometrics. I am advised by Susan Athey and Guido Imbens. My research agenda has aimed at creating transparent statistical methodology using tools from causal inference and machine learning to answer questions of economic importance. For e.g., I created multivariate random forests for heterogeneous treatment effects estimation, which is now being used in settings ranging from public economics to health. The explosion and usefulness of machine learning today in research and industry are directly related to the ubiquity of data, a product of the digitization of the modern economy.

These data and modern digital experimentation help us social scientists answer formerly-hard-to-answer questions. For instance, we read discussions in the labor and sociology literatures on the central importance of social networks on labor market success. It is, however, hard to test this theory because of the lack of a credible source of exogenous variation in social network structure. The digital economy can help here. In my dissertation, I exploit experiments on LinkedIn's People-You-May-Know user suggestion algorithm to obtain unique causal variation in users' social networks. Using this, I find that the intensive margin of connecting with more "strong" ties—such as people in your proximate school, work, or home network—does little to improve your labor market success, whereas connecting with "weak" ties can significantly improve your reach. These results could help guide policies that incentivize people with low social capital to expand their networks and gain access to information flows more efficiently.

Digitization is therefore not only useful for us social scientists but could decrease inequality in the labor market at large. Given my background in the data technologies behind digitization as well as my applied work understanding their social impact, I am excited about the prospect of attending the Economics of Digitization Conference, and the PhD student tutorial in particular. I hope to meet members of the quickly-growing digitization research community and find long-term collaborators in our quest to understand and improve today's economy for all.

Thank you for considering my application. My CV is attached.

Sincerely,
Karthik Rajkumar

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EDUCATION

Stanford University, Stanford, CA
Ph.D., Economics, 2021 (expected); M.A., Economics, 2018; M.S., Statistics, 2015

Indian Institute of Technology Madras, Chennai, India
B.Tech., Electrical Engineering, 2013; Minor in Theoretical Computer Science

WORKING PAPERS

"Optimized Partial Identification Bounds for Regression Discontinuity Designs with Manipulation." With Evan Rosenman. 2019. https://arxiv.org/abs/1910.02170.

"Ridge regularization for Mean Squared Error Reduction in Regression with Weak Instruments." 2019. https://arxiv.org/abs/1904.08580.

WORK IN PROGRESS

"Does network structure matter? A causal approach to long-term labor market outcomes." With Guillaume Saint-Jacques and Iavor Bojinov.

"Randomization methods for regression discontinuity designs." With Evan Rosenman.

"Latent factor models for estimating transition probabilities in the labor market." With Susan Athey and Lisa Simon.

SOFTWARE

"Multivariate generalized random forests." With Susan Athey, Stefan Wager, and Julie Tibshirani. R and C++ versions available at https://github.com/rajkumarkarthik/mgrf-develop.

POSTERS AND PRESENTATIONS

"The power of open networks: Evidence from LinkedIn experiments." MIT Conference on Digital Experimentation, Boston, 2019.

"Randomization methods for regression discontinuity designs with manipulation." Atlantic Causal Inference Conference, Montreal, 2019.

"Ridge regularization for Mean Squared Error Reduction in Regression with Weak Instruments." Atlantic Causal Inference Conference, Montreal, 2019.

"Multi-task Bayesian Optimization in noisy experiments." MIT Conference on Digital Experimentation, Boston, 2018. Python software available at https://github.com/cornellius-gp/gpytorch.

EXPERIENCE

Research Intern, LinkedIn, Applied Research team, June–September 2019

Research on causal inference of social network structure on the labor market..

Research Intern, Facebook, Core data science team, June–September 2018

Researched and designed multi-task Gaussian process models.

HONORS AND AWARDS

- Outstanding Teaching Assistant Award, Stanford economics department, 2019
- Amos Warner research fellowship, 2016–17; Graduate student fellowship, 2015–16, both from the Stanford economics department
- Working Internships in Science and Engineering (WISE) scholarship, German Academic Exchange Service (DAAD), 2012
  To do a fully-funded summer research project at TU Berlin, Germany.
- Indian Institute of Technology Madras Merit Award, 2009
  For ranking 143 among 400,000 students nation-wide in the IIT Joint Entrance Examination.
- Central Board of Secondary Education merit scholarship, 2009
  For ranking 179 among over one million students nation-wide in the All India Engineering Entrance Examination.
- Kishore Vaigyanik Protsahan Yojana (KVPY) fellowship Department of Science and Technology, Government of India, 2008
  One of 125 fellows from across the nation.

COURSEWORK

Economics

Core graduate microeconomics, core graduate macroeconomics, advanced econometrics, computational econometrics, public economics, industrial organization, social networks, machine learning for causal inference, economic history.

Statistics & Mathematics

Core graduate probability theory, core graduate mathematical statistics, advanced topics in statistics, modern applied statistics, real analysis, measure theory, time series analysis, graphical models, stochastic processes, ANOVA, applied linear algebra, mathematical logic, complex analysis.

Electrical Engineering & Computer Science

Programming abstractions, analysis of algorithms, graph theory, machine learning, computational methods, theory of computation, information & coding theory, non-linear control & analysis, analog & digital signal processing, networks & systems.

SKILLS

R, MATLAB, C++, Python, Git, Latex, Stata, ArcGIS