

# ANGELA ZHOU

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## EDUCATION

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### **Cornell University**

Fifth Year PhD Student,

Department of Operations Research and Information Engineering.

Undergraduate: Princeton University. Class of 2016, Operations Research and Financial Engineering. Summa cum laude.

*September 2016 - Present*

Overall GPA: 4.067

## RESEARCH INTERESTS

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Statistical machine learning, causal inference, data-driven decision-making under ambiguity (sensitivity analysis), partial identification, personalization, trustworthy machine learning.

## SELECTED PUBLICATIONS

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Author order is alphabetical, following Operations Research convention.

### **Confounding-Robust Policy Evaluation in Infinite-Horizon Reinforcement Learning**

*With Nathan Kallus*

We partially identify policy value in the infinite-horizon reinforcement learning setting with unobserved confounders.

### **Assessing Algorithmic Fairness with Unobserved Protected Class Using Data Combination**

Accepted at Management Science.

*With Nathan Kallus and Xiaojie Mao*

We build on methodology from partial identification and data combination to identify interval bounds and convex hulls of conditional parity metrics of interest when race is not observed in a primary dataset, but auxiliary data is available.

### **Minimax-Optimal Policy Learning Under Unobserved Confounding**

Accepted at Management Science.

*With Nathan Kallus*

We study the problem of learning personalized decision policies from observational data while accounting for possible unobserved confounding in the data-generating process. Our approach “robustifies” IPW-based approaches for policy learning and guarantees improvement upon a baseline, if the confounding strength is well-specified.

## PUBLICATIONS

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### **Assessing Disparate Impacts of Personalized Interventions: Identifiability and Bounds**

Proceedings of Neurips 2019.

*With Nathan Kallus*

We study identification of fairness in personalized intervention, where giving a treatment results in censoring alternative outcomes. We demonstrate this on a case study of a job training experiment.

**The Fairness of Risk Scores Beyond Classification: Bipartite Ranking and the  $\alpha$ AUC Metric** Proceedings of Neurips 2019.

*With Nathan Kallus*

We study fairness of probabilistic risk scores and develop inequity measures, in relation to bipartite ranking, tailored for the setting where an analyst develops a risk score for use under a wide range of possible downstream thresholds (e.g. under expert discretion).

**Interval Estimation of Individual-Level Causal Effects** Proceedings of AISTATS 2019.

*With Nathan Kallus and Xiaojie Mao*

We study the problem of providing bounds on individual-level causal effects while accounting for possible unobserved confounding in the data-generating process. Our approach “robustifies” a kernel-based estimator of causal effects.

**Residual Unfairness in Fair Machine Learning from Prejudiced Data** Proceedings of ICML 2018

*With Nathan Kallus*

We characterize the impacts of selection bias on dataset construction and model validation. Where previous censoring may have harmed groups due to under-inclusion, we study conditions under which fair ml is “bias-in, bias-out”.

**Policy Evaluation and Optimization with Continuous Treatments** Proceedings of AISTATS 2018

*With Nathan Kallus*

## HONORS/AWARDS

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Winner, INFORMS 2018 Data Mining Best Paper Award (Confounding-Robust Policy Improvement)

2nd place, INFORMS 2018 Junior Faculty Interest Group Paper Competition (Confounding-Robust Policy Improvement)

Finalist for Best Paper of INFORMS 2017 Data Mining and Decision Analytics Workshop (Policy Evaluation and Optimization with Continuous Treatments)

National Defense Science and Engineering Graduate Fellowship, awarded 2016

Ahmet S. Cakmak Thesis prize winner for undergraduate thesis, 2016.

## PROFESSIONAL EXPERIENCE

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**Microsoft Research New York City**

June 2019 - August 2019

*Research Intern; Mentors: Jenn Wortman Vaughan and Miro Dudik*

*New York*

- Researched optimal data collection strategies for improving inequities in machine learning regression model performance across groups.

**PlaceIQ**

June 2016 - August 2016

*Data Science Intern*

*New York*

- Analyzed geospatial basemap data for data analytics company assessing causal effects of online advertising on brick-and-mortar visitation.

**AppNexus**  
*Optimization Intern*

June 2015 - August 2015  
*New York*

- Developed a A/B testing experiment reporting and analysis tool to analyze revenue lift of production experiments.

## TEACHING

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Guest lecture, Applied Machine Learning ORIE 5750 (Spring 2018, Spring 2019)

Spring 2018: Co-organized PhD student research seminar on Fairness and Ethics in Operations Research

## RELEVANT COURSES

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Convex Optimization x2, Mathematical Programming (Linear), Probability Theory, Statistical Principles, Theoretical Machine Learning, Analysis of Algorithms, Machine Learning and Causality for Intelligent Decision-Making, Semi/Non-Parametric Econometrics, Bayesian Machine Learning, Optimal Learning, Stochastic Processes, Real Analysis

## INVITED TALKS

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Kellogg-Wharton OM Workshop (7/2020), Duke Fuqua Workshop on Operations Research and Data Science (12/2019).

Cancelled due to COVID: INFORMS Optimization Society Conference, Columbia Causal Inference Reading Group

*Assessing Algorithmic Unfairness with Unobserved Protected Class*: Experian DataLab Brazil, (7/2020).

*Assessing Fairness of Personalized Interventions*: INFORMS (11/2019)

*Towards an Ecology of Care for Data-Driven Decision Making*: Cornell Digital Life Initiative (4/2019).

*Confounding-Robust Policy Improvement*: INFORMS Conference on Healthcare (7/2019), Princeton (4/2019), MSR NYC (9/2018), INFORMS (11/2018)

*Residual Unfairness*: Crime Lab New York (UChicago Urban Labs) (7/2018)

*Policy Evaluation and Optimization with Continuous Treatments*: Spotify (7/2017), INFORMS (11/2017)

## SERVICE

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Workshop Co-organizing:

- “Do the right thing: machine learning and causal inference for improved decision making”, Neurips 2019
- Participatory Approaches to Machine Learning, ICML 2020
- Workshop on Consequential Decision Making in Dynamic Environments, Neurips 2020

Reviewer: Neurips 2019 (top 400 reviewer)-2020, ICML 2019 (top 5%) -2020 (top 33%), UAI 2019,

Refereeing (journals): Management Science, Journal of Machine Learning Research, Statistics in Medicine, ACM Computing Surveys

Program Committee (incl. reviewing): IJCAI Workshop for Social Good 2019, FAT\* 2020, AAAI Emerging Track on AI for Social Impact 2020, Theoretical Foundations of Machine Learning ICML 2020 workshop, AI in Financial Services Neurips 2020 workshop, MD4SG Conference 2020