**James Michelson, PhD** https://jmemich.github.io

## Contact Information

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## Summary

Research scientist and machine learning engineer with over a decade of experience across academia and industry. Expertise in auction design, forecasting, machine learning platform engineering, survey design, and AI safety, with a focus on developing novel algorithms and building complex systems. Looking for exceptional opportunities to transform science and build a better world.

## Education

**Carnegie Mellon University**, Pittsburgh, USA

PhD, Logic, Computation and Methodology 2021 - 2024

(Microeconomics) computational approaches to finding profitable auction designs in intractable multi-dimensional settings

- Developed a novel algorithm to find revenue-maximizing auction formats in multi-dimensional settings (code). Extensive experience profiling, optimizing, and testing numerical code in Python.
- Discovered a revenue-maximizing new auction format in multi-dimensional settings with simple properties. This work generated a number of major conjectures for future theoretical work in optimal auction design (article)

(Philosophy of science) methodological innovations for problems with observer effects in social science

- Drew connections to recent developments in theoretical computer science to argue for the adoption of novel methodological techniques to address measurement error and related problems (article)

(AI safety) multi-agent reinforcement learning simulations to test harm from colluding AI agents in markets

- Simulated collusion among reinforcement learning agents in market settings to evaluate claims concerning the possibility of harms from AI agents. Extended the ethical framework behind fair machine learning research to market settings where algorithmic agents can learn to collude (article)

MSc, Logic, Computation and Methodology 2018 – 2021

- Coursework: game theory, machine learning, optimization, theoretical statistics, logic, philosophy of science, ethics

**University of Toronto**, Toronto, Canada

MA, Political Science 2011 – 2012

**London School of Economics and Political Science**, London, UK

BSc, Government 2007 – 2010

## Industry Experience

**Priorities USA**, remote

Consulting Data Scientist Summer 2022

- Trained existing data science team on individual-level election forecasting approaches and implemented data processing pipelines to put model into production.
- Post-election evaluation found the new forecasting model had three times less error than existing approaches in battleground states.

**Civis Analytics**, Chicago, IL & Washington, DC, USA

Senior Data Scientist 2017 – 2018

- Project managed team of three data scientists over multiple quarters to develop a novel individual-level election forecasting algorithm for the 2018 election cycle.
- Trained and tested sparse data modeling algorithms on billions of observations before deploying them for primary election forecasts, improving previous forecast accuracy & AUC by 10% and up to 20% among key targeting subgroups.
- Responsible for developing data science software engineering training materials (e.g., git, Docker) for new hires.

Data Scientist 2014 – 2017

- Machine learning engineer on CivisML, a cloud-based, distributed machine learning application. Responsible for the core distributed prediction and scoring code, containerization infrastructure, and data engineering pipelines.
- Principal architect of Python & R production codebase to manage processing and automated quality-control of hundreds of daily surveys. Helped to develop an innovative sampling algorithm to reduce survey costs by 10-15%.

**Vox Pop Labs**, Toronto, Canada

Data Scientist 2013 – 2014

- Worked on statistical methods powering the Vote Compass application. Wrote and optimized R code to model and visualize public opinion data and forecast international elections within a 2-3% margin of error.

WRITING (ACADEMIC)

'Optimal Multi-dimensional Auctions: Conjectures and Simulations' (with Alexey Kushnir)

'Reflexive Measurement'

'Developing a Philosophical Framework for Fair Machine Learning: The Case of Algorithmic Collusion and Market Fairness'

The Case for Design-Based Science (with Adrian K. Yee) (draft available on request)

WRITING (POPULAR)

'The Joys of Reading Python Source Code', Civis Analytics Blog, October 2017

PROGRAMMING

Python, R, C, C++, Ruby, Go, SQL, bash

CITIZENSHIP

UK, USA

PERSONAL

I like to cook. Some of my recipes are here.