Amy B.Z. Zhang

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PERSONAL STATEMENT

- Final year PhD candidate at Cornell ORIE, thesis in Operations Research focusing on algorithms for approximate dynamic programming; strong interest in recommender systems (technical and societal).
- Driven problem solver invested in proficiency in the full product lifecycle of a model, including communication with stakeholders, formulation, implementation, testing, and iterating.
- Seeking full-time opportunities to research and build technical solutions. Canadian citizen eligible for OPT.

EDUCATION

Ph.D. in Operations Research and Information Engineering (ORIE)**, Cornell University** May 2022

- Advisor: Prof. Itai Gurvich; Concentration: Applied Probability and Statistics
- Minor: Mathematical Programming, Computer Science
- Doctoral fellow (2020-2021) of Digital Life Initiative, led by Prof. Helen Nissenbaum

Honors B.Sci. in Department of Mathematics, **University of Toronto** (UToronto) June 2016

- Major: Mathematical Statistics & Economics; Minor: Computer Science
- Graduated with High Distinction • Dean's List Scholar 2013-2016 • GPA 3.95

SKILLS

Programming: Python, SQL, Java, Julia, MATLAB, VBA, SAS, R.
Technical: algorithms, optimization, probability and statistics, machine learning, reinforcement learning.

SELECTED COURSES

Graduate: Algorithms | Probability | Optimization | Networks | Reinforcement learning | Game theory
Undergraduate: Machine learning | Microeconomics | Graph theory | Data analysis | Software design | Psychology

WORK EXPERIENCES

Research Scientist -Applied Machine Learning | Etsy Inc - Brooklyn, NY May 2021 - Aug 2021

- Proposed a new mathematical construct for sequential recommendations, assessing a user's willingness to explore and branch out of existing search patterns into a more diverse space of listings.
- Performed data analysis that demonstrate the usefulness of the measure. Developed proof of concept machine learning models that predict the measure and utilize it to improve next-item recommendations.

Operations Research Scientist | Wayfair Inc - Boston, MA June 2019 - Aug 2019

- Developed in-house supply chain optimization tool to solve for cost-minimizing assignments of shipping containers onto trans-pacific carriers, accounting for constraints of various types and timescales.
- Identified key improvement opportunity via database deep-dive and cross-team negotiations. Revised and implemented model to be used in production. Invited to share takeaways in lauded team presentation.

Analyst Intern | Pinpoint Asset Management Ltd - Hong Kong May 2014 - Aug 2014

- Created novel portfolio selection technique under the direction of Chief Investment Officer, Qiang Wang, extending Markowitz model to enable expert inputs. Developed customized Excel tool using VBA.

Teaching Assistant | Cornell University - New York Aug 2016 - May 2021

RESEARCH EXPERIENCES

Research Assistant | Cornell Tech | Supervisor: Prof. Itai Gurvich Jan 2017 - present

A Low-rank MDP Approximation via Moment Coupling

We develop an efficient yet principled approximation framework for Markov Decision Processes. When the target chain itself is approximated with one that has a different transition matrix, the solutions can be related via a PDE that depends on the transition matrices only through their first moments. We show that state aggregation can produce such a low-rank chain, and design simple algorithms to choose parameters for matching transition moments, obtaining an optimal control algorithm with computation efficiency and performance guarantees.

Model Learning With Moment Matching Aggregation

Models learned from samples results in inaccuracies when data is limited, with sample complexity requirements adversely affected by large variance. It is intuitive to use coarser, thus computationally cheaper, approximation during early stages of learning, as the accuracy loss from estimation may limit the benefit from higher fidelity. We consider a generative model where the model dynamics are only known through an oracle, and explore the interaction between estimation and approximation within the moment matching aggregation framework we put forth. Specifically, we examine how the abstraction resulted from our moment-based view of transitions affects the convergence and solution quality through the lens of bias-variance tradeoff.

Research Scientist | AML Team, Etsy Inc | Manager: Karl Ni; Director: Diane Hu May 2021 - Oct 2021

Dispersion: a New Dimension in Sequential Recommendations

Given user interaction logs, we define the mathematical construct of *dispersion* that measures the spread of items in a fixed length trajectory, to study the exploratory intent of users. By identifying the transition between desires for closely related content vs the new and different, more suitable recommendations can be served. While the immediate implications are for e-commerce, by expanding the vocabulary, the proposed concepts also have potential to promote discussions and improvements for news recommendations and more.

NSERC Researcher | University of Toronto | Supervisor: Prof. Chi-Guhn Lee May 2015 - Oct 2015

Adaptive Signal Control in Heavy Traffic Situations using Markov Decision Process.

We develop adaptive control for traffic signal at intersections in the heavy traffic setting. We optimize length of green-signal phase for each set of nonconflicting direction based on current state of the road system to minimize total wait. We formulate the system using discrete-time Markov Decision Processes, implement MATLAB-based solutions, and examine potential heuristics.

PRESENTATIONS

- Personalized Recommender Systems: Technological Impact and Concerns | Digital Life seminar, NYC 2021
- Low-rank MDP Approximation via Moment Coupling | INFORMS, virtual 2020
- Dynamic Programming Aggregation via Local Moment Matching | INFORMS, Seattle, WA 2019
- State Aggregation as Sister Chain | New York City Operations Day, Columbia University 2019

LEADERSHIP ACTIVITIES

Co-President | PhDs at Cornell Tech (PACT), Cornell 2019-2020

- Initiated various academic and social programming. Created funding request scheme to incentivize initiatives.

Co-Executive Secretary | Hart House Singers, UToronto 2015-2016

- Headed executive committee. Managed financial and logistical operations of 100-piece choir.

General: active in department programmings such as mentorship, visit week, and WIOR (women in OR) events.