Helen Zhang

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Education

Sept. 2021 - Present	**University of British Columbia - 95.3%** *M.Sc. Computer Science, Lab of Computational Intelligence* Supervised by Dr. Mark Schmidt Thesis (in progress): Safe Reinforcement Learning via Constraint Optimization
Sept. 2015 - Sept. 2019	**University of British Columbia - Major 87.3%** *Combined Honours in Computer Science and Mathematics* Graduated with Distinction

Research Experience

Sept 2022 - Present	**Optimization in Safe RL -Master's Thesis in progress** *UBC · Department of Computer Science* Supervised by Dr. Mark Schmidt and Dr. Sharan Vaswani (SFU) - Researched safe reinforcement learning modeled by constrained Markov Decision Process, its linear programming formulation, and existing convergence bounds - Approaching zero constraint violation in tabular online learning via Interior Point Method, and explored extension to linear function approximation via policy mixture
May 2022 - Aug 2022	**Thompson's Sampling on MDP - Research Assistant** *UBC · Department of Computer Science* Supervised by Dr. Mark Schmidt and Dr. Bingshan Hu (Amii) - Studied frequency analysis proofs of Thompsons Sampling in finite episodic MDP - Implemented posterior sampling algorithm and compared with optimism-based methods
May 2019 - Aug 2019	**Safe Set Reachability Analysis - Undergraduate Research Assistant** *UBC · Department of Computer Science* Supervised by Dr. Ian Mitchell - Investigated finite horizon invariant kernel of an affine system using zonotopes - Improved approximation of heuristic objectives and proving its convexity under scaling - Formulated optimization and automated test routines in Julia using convex.jl and JuMP
Jan 2019 - Apr 2019	**Mini-max game on Galton-Watson Tree - Directed Studies** *UBC · Department of Mathematics* Supervised by Dr. Omer Angel - Studied minimax game and its convergence and endogeny on Galton-Watson tree - Analysed uniqueness of distribution function via numerical Taylor series expansions

Scholarships and Awards

2022	**UBC Cloud Innovation Center Fellowship, $20000** - Assistantship and scholarship funding based on academic performance and experience
2019	**NSERC Undergraduate Student Research Award, $6000** - Awarded to students demonstrating exemplary qualities for research in natural sciences
2018	**UBC Faculty of Science International Student Scholarship, $10000** - Awarded to students demonstrating strong academic achievement, engagement in the faculty and potential to make scholarly contributions within their chosen field of study
2016, 2017, 2018, 2019	**UBC Science Faculty Dean's Honour List** - Awarded to students maintaining an academic average above 80%
2015	**UBC Outstanding International Student Award, $6000** - Entrance scholarship awarded to qualified students showing strength academically and display involvement outside of the classroom

Course Projects

Sep 2021 - Dec 2021 **Transfer Learning in Dynamic Environment**
UBC · CPSC 533V: Learning to Move

- Implemented Soft Actor-Critic method on OpenAI gym classic control games with Proximal Policy optimization method and GAE lambda advantage function
- Trained universal policy with dynamic system identification to reduce Sim-to-Real gap

Jan 2022 - Apr 2022 **Stability of Stochastic Gradient Descent**
UBC · CPSC 532S: Statistical Learning Theory

- Conducted literature review on generalization error and uniform stability of SGD and its practical implications in differential privacy and online learning

Jan 2022 - Dec 2022 **Deep Generative Models**
UBC · CPSC 540: Machine Learning

- Studied architecture of Variational Auto-encoder, Generative Adversarial Networks, and normalizing flows, compared advantages, limitations and applications of each model

Sep 2021 - Dec 2021 **Mitigating Bias in Hate Speech Detection**
UBC · CPSC 503: Computational Linguistics

- Fine-tuned and compared BERT, LSTM, and RNN for online hate speech detection
- Mitigated bias by generating synthetic identity words via LDA topic modeling

Sep 2021 - Dec 2021 **Graph Recommendation System**
UBC · EECE 571F: Deep Learning with Structures

- Implemented experiments on feature transformations and activations on Graph Convolutional Neural Network based collaborative filtering recommendation system
- Combine knowledge graph with GCN models to exploit auxiliary information

Teaching

July. 2017 - Present **Graduate Teaching Assistant**
UBC · CPSC 532M/340: Machine Learning and Data Mining

- Gave guest lectures on Deep Reinforcement Learning and Autonomous Driving
- Hosted weekly tutorials on topics in algorithms for dimensionality reduction, nonlinear regression, classification, clustering and unsupervised learning

Jan. 2018 - Apr. 2018 **Undergraduate Teaching Assistant**
UBC · Math 152: Linear Systems

- Designed and graded homework assignments and exam questions for 2D and 3D geometry, vectors and matrices, eigenvalues and vibration, physical applications
- Hosted lab sessions to demonstrate computer solutions of large systems using Matlab

Jan. 2017 - Apr. 2018 **Undergraduate eaching Assistant**
UBC · CPSC 121: Models of Computation

- Hosted weekly tutorials on physical and mathematical structures of computation, sets and relations and proof techniques
- Directed weekly lab sessions on Boolean algebra and combinations logic circuits, functions and sequential circuits, finite state machines and sequential instruction execution

July. 2017 - Aug. 2017 **Undergraduate Teaching Assistant**
UBC · Math 102: Integral Calculus

- Graded homework assignments and exams on functions, derivatives, optimization, growth and decay and discrete probability

Jan. 2017 - Apr. 2017 **Mathematics Mentor**
Windermere Secondary School

- Mentored around 25 high-school students with math or science homework

Competitions

Dec. 2018 **Putnam Competition, Mathematical Association of America**
Ranked top 1500 in North America

Sep. 2014 **Chinese Physics Olympiad, CPhO**
Guangdong provincial secondary prize

Presentations

Oct. 2022	**Language Models are Few Shot Learners (GPT-3)** *UBC · Machine Learning Reading Group*
June 2022	**Active Learning and Image Segmentation** *UBC · Machine Learning Reading Group*
Mar. 2022	**Oops I Took a Gradient: Scalable Sampling for Discrete Distributions** *UBC · Machine Learning Reading Group*
Dec. 2021	**Understanding The Origins of Bias in Word Embeddings** *UBC · Machine Learning Reading Group*
Dec. 2021	**Reinforcement Learning and Autonomous Driving** *UBC · CPSC 340: Machine Learning and Data Mining*
Nov. 2021	**Probabilistic Topic Modeling** *UBC · CPSC 503: Computational Linguistics*

Additional Work Experience

May. 2022 - Present	**Research Developer** *UBC-AWS Cloud Innovation Center* - Advised undergraduate students with machine learning knowledge to build an innovation dashboard for the Office of the Vice-President, Research and Innovation of UBC - Processed NSERC and CIHR data with AWS Glue Studio, developed web application to display researchers' profiles and contributions to assist grant resource allocation
Sept. 2019 - Apr. 2021	**Software Engineer** *Magnitude - Simba Technologies* - Developed JDBC driver releases for Amazon Redshift Database using Java and SQL - Designed customer test packages and its website BigSight using React.js and HTML/CSS - Implemented installation package file directory and test automation Python scripts
July. 2018 - Aug. 2018	**Research Intern** *Bank of China International, London* - Trained a US Treasury Prediction Model using Linear Regression, analyzed the company's earning calls, and composed financial reports on futures and options predictions
May. 2018 - June. 2018	**Research Intern** *China CITIC Bank International Limited, Shanghai* - Processed and analyzed companies financial statement data, investigated backgrounds of their competitors, buyers, and suppliers and assessed future market value and risks
July. 2016 - Aug. 2016	**Customer Manager Intern** *Guotai Junan Securities Co., Ltd, Shanghai* - Constructed personalized securities investment portfolios, calculated and visualized expect rate of return and risk levels

Certificates

Dec. 2018	**Instructional Skills Workshop Completion Certificate** *UBC Centre for the Integration of Research, Teaching, and Learning (CIRTL)*

Volunteering and Extracurricular Activities

Apr. 2022	Volunteer, Graduate Student Orientation
Jan. 2022 - Persent	Member, UBC Mathematics of Information, Learning and Data research group
Dec. 2021	Student Helper, Graduate Recruiting Committee
Sept. 2018	Volunteer, UBC Computer Science Tri-Mentoring Program
Sept. 2015 - Apr. 2019	Member, UBC Math Club
Sept. 2017 - Present	Representative, UBC Dance Horizon Club
Apr. 2017	Volunteer, Greater Vancouver Regional Science Fair (GVRSF) Lab Tour