

Overview

- AI scientist and applied mathematician with diverse interests including: deep reinforcement learning, causal inference, functional programming, epistemology, education, and game design
- Looking for creative work, tackling open-ended problems by bridging theoretical tools with novel approaches
- World-class performance record in algorithmic computing competitions
- Proficient in C++, Java, Rust, Python, Keras and TensorFlow (github.com/EbTech)
- Canadian citizen fluent in English, French and Farsi; elementary knowledge of Spanish, Mandarin, Japanese

Work Experience

- 2016 – current
- **AI Researcher/Engineer at Waymo:** designing fast optimization algorithms to predict other agents on the road. I also coordinate and teach at a deep reinforcement learning study group based on UC Berkeley course materials.

Education

Lifelong Learning

- 2016 – present
- Independent study of Mandarin Chinese, phonetics, finance theory, stochastic calculus, variational calculus, deep learning, deep reinforcement learning, and Rust programming

Carnegie Mellon University

- 2012 – 2015
- Ph.D. candidate in Computer Science (dropped with M.S.)
 - Teaching Assistant for 15-451/651 (Algorithms) taught by Avrim Blum and Anupam Gupta
 - Completed the 2012 Summer School in Algorithmic Economics
 - NSERC Alexander Graham Bell Canada Graduate Scholarship
 - Memberships: Graduate Student Assembly departmental representative, Ballroom Dance Club, School of Computer Science musical performances

University of British Columbia

- 2008 – 2012
- B.Sc. Combined Honours in Computer Science and Mathematics with Distinction
 - 92% (A+) GPA, Dean's Honour List and Science Scholar standing
 - President's Entrance Scholarship (top tier), Trek Excellence Scholarship, CPSC Scholarship
 - 8-month game development internship at Electronic Arts, working on Need For Speed: World

Research and Personal Projects

- 2017
- **Rust Algorithm Cookbook:** A collection of classic algorithms written in Rust, serving as a proof of concept of the language's compile-time safety discipline as applied to contest programming. On June 20, it was the **#1 trending GitHub repository across all categories**
- 2015
- **Elo-R rating system:** derived a Bayesian model and implemented a simple rating system for competitions in which the outcome is a total ordering among players, proposed as an improvement over the systems used to track players' skill in online programming competitions

Research and Personal Projects (continued)

- 2015 • **Cooperative multi-agent planning**: proved NP-hardness of planning with very simple constraints on visitation order, then proposed two heuristic search algorithms to handle a more general set of constraints with guarantees on the suboptimality factor of the path length; advised by Prof. Maxim Likhachev
- 2014 • **Parallel A* framework**: developed a theoretical framework that generalizes A* search; applications include anytime dynamic multi-heuristic or multi-processor search; advised by Prof. Maxim Likhachev
- 2013 • **Dynamic Łukasiewicz Game Logic**: generalized hybrid games with binary outcomes to a formal specification of zero-sum hybrid games with extended real outcomes, and derived its sequent calculus for semi-automated theorem proving; advised by Prof. André Platzer
- 2012 • **Linking population dynamics**: proposed a new population model to represent social interactions in the context of natural selection; theoretical and experimental analyses found the emergence of a nontrivial form of cooperation in scenarios resembling the Prisoner's Dilemma
- 2012 • **U! Robot!**: lead programmer in a team of 8 developers, completing a platformer game that was showcased at the end of the 48-hour Global Game Jam
- 2011 • **Equitable clustering**: derived an approximation algorithm for quantizing distributions on Euclidean space, with applications to image stippling; advised by Profs. David Kirkpatrick and William Evans
- 2011 • **AIspace.org contributions**: developed practice exercises and sample solutions to reinforce key concepts for students in undergraduate artificial intelligence courses
- 2008 • **Cybersword Duels**: a pair of sword-dueling video game engines, one in 2D and one in 3D, that map mouse movements intuitively into fully controllable sword motions, with collision physics; the 2D game has an opponent trained to beat humans by reinforcement learning

Contest Achievements

- 2015 • **61st place** among over 50,000 registrants in the Google Code Jam
- 2015 • **57th place** in the TopCoder Open Algorithm Competition
- 2015 • **6th place** in the North American Invitational Programming Contest's Open Division, competing solo against teams of up to three
- 2015 • Achieved Codeforces **Grandmaster** title, peak rating 2400+ on both Codeforces and TopCoder
- 2012 • **18th place** in the **ACM ICPC World Finals** in Warsaw, Poland
- 2011 • Top 250, Team Honorable Mention in the William Lowell Putnam Mathematical Competition
- 2010 – 2011 • Member of the UBC Thunderbots, which placed **9th** in the **RoboCup** SSL international robot soccer competition; I developed some AI algorithms, e.g. filters for ball and robot tracking

Sample Coursework (grad-level marked with *)

- Math • Statistical Inference*; Evolutionary Dynamics*; Number Theory*; Intro Topology; Advanced Linear Algebra; Mechanics; Algebra, Coding Theory and Cryptography
- Theory • Computational Complexity Theory*; Type Systems for Programming Languages*; Advanced Algorithm Design and Analysis; Graph Theory; Functional and Logic Programming
- AI • Statistical Machine Learning*; Multimedia Databases and Data Mining*; Kinematics, Dynamic Systems and Control*; Intelligent Systems
- Misc • Advanced Distributed Operating Systems*; RPG Writing Workshop*; Computer Graphics
- Audits • Adaptive Control & Reinforcement Learning*; Planning, Execution & Learning*; String Algorithms*; Information Theory*; Design Educational Games*; Experimental Game Design

Volunteering

- 2015 • **ACM ICPC problem setter:** authored the problems J,L,N in the Pacific Northwest regional programming contest, and helped with additional writing/reviewing/testing; our aim is to raise the bar for programming contest quality in North America, for experts and novices alike
- 2013, 2015 • **FIRST Lego League research judge:** judged and gave feedback on research project presentations by teams of children aged 9-14 aimed at solving global issues using STEM principles
- 2006 • **Science AL!VE summer camp assistant:** helped run activities to encourage scientific curiosity in young children