Changdao He

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Education

University of Toronto, BSc in Computer Science, Mathematics — Sep 2022 – Present

- GPA: 3.78/4.0
- **Selected Coursework:**
  - **Algorithms & Theory:** Algorithm Design, Analysis & Complexity; Online and Other Myopic Algorithms; Theory of Computation; Data Structures & Analysis
  - **AI & ML:** Artificial Intelligence; Machine Learning; Image Understanding; Neural Networks & Deep Learning (Planned); Knowledge Representation & Reasoning (Planned)
  - **Mathematics Foundations:** Multivariable Calculus; Linear Algebra; Combinatorics; Number Theory; Groups & Symmetry; Nonlinear Optimization; Complex Variables

Research Experience

Studies in Online Throughput Scheduling Problems — Jul 2025 - Present

Supervised by Prof. Allan Borodin, University of Toronto

- Proved that no deterministic online algorithm can achieve a constant competitive ratio for the unweighted throughput scheduling problem in the preemption-revoke model, contrasting it with the preemption-restart model
- Resulting paper: **He, C.** (2025). Revoke vs. Restart in Unweighted Throughput Scheduling. *arXiv preprint arXiv:2510.15318*. Submitted to *Information Processing Letters*.
- Designing candidate algorithms and analyzing competitive ratios; constructing lower-bound adversaries to test tightness

Automated Puzzle Solving, Generation, and Difficulty Estimation — Sep 2025 - Present

Co-supervised by Prof. Jonathan Calver and Prof. Alice Gao, University of Toronto

- Exploring computational approaches to logic puzzles, with three main goals: implementing solvers, generating new puzzles, and categorizing puzzle difficulty
- Investigating SAT-based formulations of puzzle-solving, and comparing solver-based vs. human difficulty perspectives
- Studying methods for puzzle generation and evaluation to enable difficulty-controlled puzzle creation

Monte Carlo Tree Search for Othello — May 2025 - Aug 2025

Supervised by Prof. Alice Gao, University of Toronto

- Implemented a Monte Carlo Tree Search agent for Othello, focusing on randomized simulations for decision-making in complex states
- Compared MCTS against minimax-based approaches and integrated heuristic playouts to improve simulation quality

Search and Heuristic Methods for Othello — Jan 2025 - Apr 2025

Supervised by Prof. Alice Gao, University of Toronto

- Implemented an AI agent for Othello using minimax search with alpha–beta pruning

- Designed and tested multiple heuristic board-evaluation functions to enhance performance
- Analyzed trade-offs between search depth, pruning efficiency, and heuristic accuracy

Presentations

- "**Monte Carlo Tree Search for Othello**", Summer Research Poster Showcase, Department of Computer Science, University of Toronto (Aug 2025) *(Poster available at changdaohe.com)*

Internship Experience

Software Development Intern, BGI Genomics – Shenzhen, China   Jul 2023 – Aug 2023
- Enhanced CRM system modules, performed functionality testing, and explored automation strategies to streamline workflows
- Organized and led group meetings, demonstrating strong coordination and project management skills

Data Processing Intern, Shenzhen University – Shenzhen, China   Jun 2023
- Processed and visualized EEG data using Python (matplotlib)
- Collaborated with graduate students to determine effective data visualization strategies

Honours & Awards

- **Dean's List Scholar**, Faculty of Arts & Science, University of Toronto (2023, 2024, 2025)