

JONATHAN LI

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RESEARCH INTERESTS

- Studies the interplay between incentives (economics), algorithms (computer science), and learning (statistics), notably in: algorithmic game theory, online learning, sequential decision making, market design for data and AI, multi-agent reinforcement learning, autonomous agents
- My current work focuses on foundation models for decision making that integrates the generalization of foundation models with the planning and reasoning of interactive sequential decision making. We aim to create agents adept at communication and collaboration with both humans and other autonomous agents, starting in game environments.

EDUCATION

RENSELAER POLYTECHNIC INSTITUTE **Troy, NY**
Doctorate of Philosophy in Computer Science **Aug 2023 - Present**

The University of Chicago **Chicago, IL**
Master of Science in Financial Mathematics (GPA: 3.82/4.0) **Aug 2021 - Mar 2023**

REED COLLEGE **Portland, OR**
Bachelor of Science in Mathematics and Economics (GPA: 3.93/4.0) **Aug 2017 – May 2021**

- Exceeded the graduation requirement by completing 39 credits, surpassing the mandated 30 credits

SELECTED HONORS AND AWARDS

Member of Phi Beta Kappa, 2021
Reed Commendation for Excellence in Scholarship, 2018, 2019, 2020, 2021
Reed Science Research Fellow, 2020
Reed Financial Services Fellow, 2019

PUBLICATIONS

1. “[AvalonBench: Evaluating LLMs Playing the Game of Avalon](#)”. Jonathan Light*, Henry Cai*, Sheng Shen, Ziniu Hu. *NeurIPS 2023 Foundation models for decision making workshop*. [Codebase](#).
2. “[A Data-Centric Online Market for Machine Learning: From Discovery to Pricing](#)”. Sainyam Galhotra*, Minbiao Han*, Jonathan Light*, Steven Xia*, Raul Castro Fernandez, and Haifeng Xu. *Under review*

RESEARCH EXPERIENCE

RPI COMPUTER SCIENCE – ZINIU HU **Troy, NY**
LLMs and Gameplay Project **Jul 2023 - Present**

- Introduced a new benchmark based on the social deduction game Resistance Avalon for LLMs
- Demonstrated that SOTA LLMs do not possess deduction and persuasion capabilities to play Avalon well yet
- Developing stronger LLM agents by combining memory and planning techniques such as [MCTS search](#)
- We hope to enable foundation models to learn new skills on how to collaborate and reason through self-play

UCHICAGO COMPUTER SCIENCE – HAIFENG XU AND RAUL CASTRO FERNADEZ **Chicago, IL**
Market and Mechanism Design Research Project **Aug 2022 – Jun 2023**

- Developed the mathematical model for the optimal pricing of machine learning algorithms
- Designed the optimal incentive structure for data markets and worked on the implementation of such a market

BOOTH SCHOOL OF BUSINESS – DACHENG XIU **Chicago, IL**
Econometrics and Statistics Research Project **Aug 2021 - Present**

- Converted and optimized time series ML data simulation functions from Python to C++, with 95% less runtime
- Developed online algorithms for asset pricing using MC methods, outperforming the benchmarks by 700%

THESIS PROJECT – FELIPE CARRERA AND JONATHAN WELLS **Portland, OR**
Title: Coalition Formation in Dynamic Stochastic Cooperative Games under Uncertainty **Aug 2020 – May 2021**

- Formulated a novel, generalizable model of a repeated cooperative game under different types of uncertainty
- Simulated coalition bargaining and formation of reinforcement learning agents across time using Python

- Conducted data analysis on the collective behavior of agents concerning changes to initial parameters

REED RESEARCH REACTOR

Portland, OR

Supervisor and Senior Reactor Operator (NRC Licensed)

Sep 2017 – May 2021

- Supervised operations and handled emergencies at the only reactor in the US operated by undergraduates
- Ensured safety compliance by systematizing operation procedures and administering oral examinations
- Directed and planned research projects that involved neutron irradiation and gamma spectroscopy

RANDOM MATRIX THEORY RESEARCH – JONATHAN WELLS

Portland, OR

Mathematics and Statistics Research Project

Jun 2020 – Aug 2020

- Developed Monte Carlo methods for efficiently simulating random exterior algebra forms in Sagemath
- Formulated and empirically and analytically proved multiple theorems like the hyper Sylvester's identity
- Discovered algorithms that stabilized forms recursively for random sampling of invertible forms

TEACHING EXPERIENCE

UNIVERSITY OF CHICAGO (PHYSICAL SCIENCES AND BOOTH SCHOOL OF BUSINESS)

Chicago, IL

Teaching Assistant

Mar 2022 - Mar 2023

Courses: AI and Blockchain, Decoding Fintech, Options Pricing, Bayesian Statistical Inference and ML

- Developed assignments and lectures for Booth executive MBA students

REED MATHEMATICS AND ECONOMICS DEPARTMENT

Portland, OR

Teaching Assistant

Sep 2018 – May 2021

Courses: Introduction to Analysis, Probability, Mathematical Statistics, Macroeconomics, Econometrics

- Developed and led an online team-problem-solving based class format for 30 students
- Designed and taught weekly supplementary lectures and workshops for 3 sections of the class

WORK EXPERIENCE

DELOITTE CONSULTING

Guangzhou, China

Tax Consultancy Intern

Jul 2019 – Aug 2019

- Built and compared financial models under different taxation scenarios, researching the relevant regulations
- Uncovered unscrupulous accounting practices while conducting a field study at the client's factory

SIEMENS MANAGEMENT CONSULTING

Beijing, China

Analyst Intern

Jul 2018 – Aug 2018

- Identified key information for potential partnerships, leading to success two weeks ahead of schedule
- Researched and educated consultants on new data management and analysis methods as a substitute for Excel

SELECTED COURSES

- **Math Courses:** Real Analysis, Abstract Algebra, Probability Theory, Linear Algebra, Multivariable Calculus
- **Statistics Courses:** Mathematical Statistics, Statistical Learning, Data science, Modern Methods in Statistics, Generalized Linear Models, Stochastic Processes
- **Computer Science Courses:** Data Structures and Algorithms, Computer Systems, Approximation Algorithms, Artificial Intelligence, Computability and Complexity, Discrete Structures
- **Machine Learning Courses:** Reinforcement Learning, Deep Learning, Machine Learning Fundamentals, Theory of ML, Representation Learning, ML and Game Theory
- **Economics and Finance Courses:** Decision and Strategy, Option Pricing, Market Microstructures, Portfolio Theory, Data economics, Information Economics, Econometrics, Microeconomics, Macroeconomics

SKILLS AND INTERESTS

Computer languages: C++ - Advanced, Python - Advanced, R - Advanced, Golang, SQL, Mathematica, Pytorch

Human languages: English (native speaker), Chinese (native speaker)

Interests: Board games, strategy games, card games, hidden identity games, tabletop RPGs, game design, fencing, archery, squash, music composition, Ultimate Frisbee, badminton