

Samuel Yang-Zhao

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Summary

I am interested in the design of practical and theoretically sound Machine Learning systems with a particular focus on Reinforcement Learning. I have recently focused on approximating the AIXI agent, a theoretically optimal Bayesian Reinforcement Learning agent, through the use of tools from machine learning, online learning, data compression and knowledge representation. I am also interested in the ethical considerations surrounding the wider adoption of Machine Learning systems and have investigated ensuring data privacy for Reinforcement Learning systems via differential privacy.

Research Interests: Reinforcement Learning, Decision Making Under Uncertainty, Online Learning, Artificial Intelligence, Non-stationary Sequence Prediction, Deep Learning, Data Compression, Planning, Differential Privacy.

Education

The Australian National University, Canberra, ACT, Australia

(Anticipated Graduation Jul 2024)

Doctor of Philosophy in Computer Science

Jul 2019 - Current

- Supervisors: Dr. Kee Siong Ng, Prof. Hanna Kurniawati, Prof. Marcus Hutter

The Australian National University, Canberra, ACT, Australia

1st Class Honours

Bachelor of Science, Mathematics (Honours)

Feb 2018 - Nov 2018

- Thesis: Sufficient Conditions for Divergence in Projected Bellman Equation Methods
- Supervisors: Prof. Marcus Hutter, Prof. Markus Hegland

The University of Melbourne, Melbourne, VIC, Australia

1st Class Honours

Bachelor of Science, Computing and Software Systems

Feb 2014 - Nov 2017

- Diploma in Mathematical Sciences (Statistics and Stochastic Processes)

Academic Publications

PUBLISHED

- Yang-Zhao S.**, Ng K.S., Hutter M., *Dynamic Knowledge Injection for AIXI Agents*, AAAI 2024
- Yang-Zhao S.**, Wang T, Ng K.S., *A Direct Approximation of AIXI Using Logical State Abstractions*, NeurIPS 2022
- Hutter M., **Yang-Zhao S.**, Majeed S. *Conditions on features for temporal difference-like methods to converge*, IJCAI 2019

PRE-PRINTS/UNDER REVIEW

- Yang-Zhao S.**, Ng K.S., *Privacy Preserving Reinforcement Learning Over Population Processes*, under review 2024
- Chen D., **Yang-Zhao S.**, Ng K.S., Lloyd J., *Factored Conditional Filtering: Tracking States and Estimating Parameters in High-Dimensional Spaces*, arXiv pre-print 2022, under review

Work Experience

Data Scientist (Part-time)

Canberra, Australia

Diversity Arrays Technology

Feb 2022 - Present

- Developing novel machine learning and statistical algorithms for genome wide discovery of DNA signatures linked to agricultural traits.
- Commercial application is to facilitate better data-driven crop breeding programs for clients.

Associate Training Officer

Canberra, Australia

National Computational Infrastructure

Jan 2023 - December 2023

- Developing and teaching training courses to teach Australian scientific researchers how to make use of parallel computation using multi-threading/processing and GPUs.
- Topics covered include parallel computing in Python, Cython, PyTorch, and CUDA.

Sequential Monte-Carlo Methods - Research Assistant

Canberra, Australia

The Australian National University

Feb 2019 - June 2019

- Developed a sequential Monte-Carlo algorithm to simultaneously track the simulated spread of an epidemic process across graphs representing contact networks and learn the epidemic's spread parameters.
- Work done during this period resulted in the pre-print [4] that is currently under review.

Course Tutor

The Australian National University

- COMP4260 - Advanced Topics in Artificial Intelligence (Head tutor)
- COMP3600/6466 - Algorithms (tutor)
- MATH3512 - Matrix Computations (tutor)

Canberra, Australia

July 2019 - December 2019

Course Tutor

The University of Melbourne

- COMP10002 - Algorithms (tutor)
- COMP20003 - Algorithms and Data Structures (tutor)

Melbourne, Australia

July 2016 - December 2017

Technical Skills

Programming	Python (Adv.), Cython (Adv.), C/C++ (Adv.), CUDA (Inter.), Java (Inter.), R (Inter.), OCaml (Basic), Haskell (Basic)
Machine Learning	PyTorch (Adv.), NumPy (Adv.), Pandas (Adv.), Scikit-learn (Adv.), JAX (Inter.), Tensorflow (Inter.)
Other	TeX (Adv.), Git (Adv.), Bash (Adv.), Docker (Inter.)

Achievements

2019 **Scholarship**, Australian Government Research Training Program

Australia

Other

Citizenship Australian.

References Available upon request.