

Cambridge Yang

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Education

- 2020–2025 **Ph.D. in EECS (Minor in Computational Physics)**, *Massachusetts Institute of Technology (MIT)*, Cambridge, MA
Thesis: *On the Learnability of Reinforcement-learning Objectives*
Advisor: Michael Carbin
- 2017–2020 **S.M. in EECS**, *MIT*, Cambridge
Thesis: *Simplifying Dependent Reductions in the Polyhedral Model*
Advisor: Michael Carbin
- 2013–2017 **B.S. in EECS**, *University of California, Berkeley*
Research Mentors: Michael Lustig, Koushik Sen, Sanjit Seshia

Research Interests

AI safety and alignment; design of safe and reliable AI systems. My past research includes theoretical work on reinforcement-learning objectives, programming systems for intelligent agents, and probabilistic programming. I am especially interested in bridging these theoretical foundations with empirical research on frontier models and agents — developing frameworks and experiments that connect computability, objective design, and emergent behaviors in frontier AI systems.

Experience

- Mar 2025 **Research Scientist in AI**, *Basis Research Institute*, Cambridge, MA
- Dec 2025 Built a novel benchmark for world-model-learning agents; developed a reward-free, representation-agnostic evaluation framework.
- Summer-Fall 2019 **Research Intern**, *DeepMind*, London
Developed a graph conditional variational autoencoder for XLA tensor programs. Advisor: Dimitrios Vytiniotis.
- 2014 - 2015 **Software Researcher**, *Sellegit Inc. (Venture Startup)*, Berkeley
Research on dead code elimination on Java-to-Objective-C transpiler, reducing deployed app size by over 50%.

Research Projects

- Theory of Reinforcement-learning Objectives
- 2025 **World-Model Learning**, *Industry Research (Basis)*
Built a novel benchmark for world-model-learning agents. Developed a reward-free, representation-agnostic evaluation framework.

2020- **Tractable Reinforcement-learning Objectives**, *PhD Research*

2023 Proved formal theorems of learnability of linear temporal logic (LTL) objectives and showed a dichotomy of learnability on the LTL hierarchy. Proved the link between computability and learnability of general objectives.

2020- **Geometric Linear Temporal Logic**, *PhD Research*

2021 Formalized the semantics of geometric linear temporal logic (GLTL) and proved various properties, including convergence to LTL.

Probabilistic Programming

2021- **Affine Probabilistic Graphical Model**, *UROP Research (Mentor)*

2022 Formally defined an affine probabilistic graphical model in the polyhedral model framework. Explored compiling efficient inference procedures for probabilistic affine graphical models.

2018- **Complexity Optimization of Dependent Reductions**, *Master's Research*

2020 Developed an algorithm that reduces the complexity of dependent reductions in the polyhedral model, achieving orders-of-magnitude speedups in wall-clock time. These reductions are prevalent in probabilistic programming and scientific computing.

Machine Learning and Compilers

2020- **Neural Compilation**, *Graduate Research*

2021 Applied deep reinforcement-learning algorithms to compiler tasks including auto-vectorization, program-size minimization, and register allocation.

2019 **Graph Conditional Variational Autoencoder**, *Research Internship at DeepMind*

Designed a graph conditional variational autoencoder to generate probabilistic samplers for XLA graphs (the intermediate representation of JAX programs).

Machine Learning and Computational Physics

2024 **Simulated Fluid Sensing from Temperature Data**, *Computational Physics Research*

Simulated the heat partial differential equation to infer fluid velocity and thermal diffusivity using two temperature sensors; used probabilistic modeling and a two-layer neural network to infer fluid mixtures from the simulation.

2023 **Chaos in Classical Mechanics Simulation**, *Computational Physics Research*

Studied the boundary of chaos and orbits around equilibria in classical mechanical systems.

2022 **Gravitational Wave Detection**, *Computational Physics Research*

Confirmed gravitational waves using the NSF-LIGO open dataset.

Programming Languages and Compilers

2016- **Compiler for Actor-based Programming**, *Undergraduate Research*

2017 Researched a compiler for the P language, an actor-based concurrent programming language. Developed a model checker that uses binary decision diagrams and symbolic execution to verify program correctness.

2016- **Optimizing Singular Value Decomposition on GPU**, *Undergraduate Research*

2017 Developed an efficient algorithm for batch rolling-window SVD on GPU.

2014- **Java-to-Objective-C Transpiler**, *Research Internship at Berkeley Startup*

2015 Researched dead code elimination in a Java-to-Objective-C transpiler, reducing deployed app size by over 50%.

Teaching and Mentoring

- 2025 **Research Mentor**, *Basis Research Institute*
Mentored a research trainee at Basis.
- 2022 **Teaching Assistant**, *MIT*, 6.4110/16.420: Representation, Inference, and Reasoning in AI
- 2022 **UROP Mentor**, *MIT*
Mentored two MIT undergraduate students on affine probabilistic graphical models research.
- 2015-2017 **Undergraduate Student Instructor**, *UC Berkeley*, Programming Languages and Compilers; Discrete Mathematics and Probability Theory

Service

- Program Committee**, *AAAI*
- Reviewer**, *POPL, PLDI, NeurIPS, IJCAI, TOPLAS*
- Artifact Evaluation Committee**, *OOPSLA, PLDI*

Manuscripts in Preparation

- [1] Cambridge Yang, Evyatar Ben Asher, and Newton Cheng. From Falsification to Verification for Patch Evaluation. 2026. **In Preparation**
- [2] Cambridge Yang and Dongdong Li. Archimedean Copula Inference via Taylor-Mode AD. 2026. arXiv: 2605.23134 [cs.LG]. **In Submission**

Publications

- [3] Yichao Liang, Thanh Dat Nguyen, Cambridge Yang, Tianyang Li, Joshua B Tenenbaum, Carl Edward Rasmussen, Adrian Weller, Zenna Tavares, Tom Silver, and Kevin Ellis. ExoPredictor: Learning Abstract Models of Dynamic Worlds for Robot Planning. In: ICLR. 2026.
- [4] Archana Warriar, Dat Nguyen, Michelangelo Naim, Moksh Jain, Yichao Liang, Karen Schroeder, Cambridge Yang, Joshua B Tenenbaum, Sebastian Vollmer, Kevin Ellis, and Zenna Tavares. Benchmarking World-Model Learning with Environment-Level Queries. In: ICML. 2026.
- [5] Cambridge Yang, Michael L Littman, and Michael Carbin. Computably Continuous Reinforcement Learning Objectives are PAC-learnable. In: AAAI. 2023. **Long Oral**
- [6] Cambridge Yang, Michael L Littman, and Michael Carbin. On the (In)Tractability of Reinforcement Learning for LTL Objectives. In: IJCAI. 2022. **Long Oral**
- [7] Cambridge Yang, Eric Atkinson, and Michael Carbin. Simplifying Dependent Reductions in the Polyhedral Model. In: POPL. 2021. **Talk**
- [8] Charith Mendis, Cambridge Yang, Yewen Pu, Saman Amarasinghe, and Michael Carbin. Compiler Auto-vectorization with Imitation Learning. In: NeurIPS. 2019. **Poster**
- [9] Eric Atkinson, Cambridge Yang, and Michael Carbin. Verifying Handcoded Probabilistic Inference Procedures. In: arXiv eprint. 2018.

- [10] Ankush Desai, Indranil Saha, Jianqiao Yang, Shaz Qadeer, and Sanjit A Seshia. Drona: A Framework for Safe Distributed Mobile Robotics. In: ICCPS. 2017.

Skills

Languages Python, C++, Haskell, Java, JavaScript, C#, Mathematica
ML JAX, TensorFlow, PyTorch, NumPy
Frame-works

Other

Programmer

I code for fun. Among many projects, here are some fun highlights:

- AlphaZero-style Chinese dark chess AI.
- Software that uses computer vision to help me complete a 10000-piece jigsaw puzzle.
- Slack plugin for displaying LaTeX equations.

I also regularly contribute to various open-source projects. Some samples:

- JAX implementation of Taylor-mode automatic differentiation (jet).
- Happy-Hare, a 3D printer firmware for multi-material printing.

Please visit my GitHub page for more details.

Maker

I build 3D printers and use them to print for various projects, including a complete indoor hydroponics plant growing system in my apartment. I wrote software that fully automates the growing system. It has been producing fruits and veggies for my home for a few years.

Member of HKN

Eta Kappa Nu, the honor society of IEEE