

Kishor Jothimurugan

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Research Interests

My areas of interest include *Deep Reinforcement Learning*, *Formal Methods* and *Machine Learning*. In particular, I am interested in applying formal methods to improve reinforcement learning, verification of neural networks, and machine learning for program synthesis and analysis.

Education

University of Pennsylvania

Philadelphia, USA

PhD candidate in Computer and Information Science, Current GPA 4.0/4.0

2017–present

Advised by Prof. Rajeev Alur

Chennai Mathematical Institute

Chennai, India

B.Sc. (Honors) Mathematics and Computer Science, CGPA 9.77/10

2014–2017

Ranked among top 3 students

All Publications

* equal contribution, † authors in alphabetical order

Refereed Conference Publications.....

- **Specification-Guided Learning of Nash Equilibria with High Social Welfare**, Kishor Jothimurugan, Suguman Bansal, Osbert Bastani, Rajeev Alur. *International Conference on Computer Aided Verification (CAV)*, 2022.
- **A Framework for Transforming Specifications in Reinforcement Learning**,[†] Rajeev Alur, Suguman Bansal, Osbert Bastani, Kishor Jothimurugan. *Henzinger-60 (Invited Contribution)*, 2022.
- **Compositional Reinforcement Learning from Logical Specifications**, Kishor Jothimurugan, Suguman Bansal, Osbert Bastani, Rajeev Alur. *Neural Information Processing Systems (NeurIPS)*, 2021.
- **Compositional Learning and Verification of Neural Network Controllers**, Radoslav Ivanov*, Kishor Jothimurugan*, Steve Hsu, Shaan Vaidya, Rajeev Alur, Osbert Bastani. *International Conference on Embedded Software (EMSOFT)*, 2021.
- **Abstract Value Iteration for Hierarchical Reinforcement Learning**, Kishor Jothimurugan, Osbert Bastani, Rajeev Alur. *Artificial Intelligence and Statistics (AISTATS)*, 2021.
- **Space-efficient Query Evaluation over Probabilistic Event Streams**,[†] Rajeev Alur, Yu Chen,

Kishor Jothimurugan, Sanjeev Khanna. *Logic in Computer Science (LICS)*, 2020.

- **A Composable Specification Language for Reinforcement Learning Tasks**, Kishor Jothimurugan, Rajeev Alur, Osbert Bastani. *Neural Information Processing Systems (NeurIPS)*, 2019.

Refereed Workshop Papers and Posters.....

- **Specification-Guided Learning of Nash Equilibria with High Social Welfare**, Kishor Jothimurugan, Suguman Bansal, Osbert Bastani, Rajeev Alur. *Workshop on Safe and Robust Control of Uncertain Systems, NeurIPS 2021*.
- **Compositional Reinforcement Learning from Logical Specifications**, Kishor Jothimurugan, Suguman Bansal, Osbert Bastani, Rajeev Alur. *Workshop on Synthesis (SYNT), co-located with CAV 2021*.
- **Abstract Value Iteration for Hierarchical Reinforcement Learning**, Kishor Jothimurugan, Osbert Bastani, Rajeev Alur. *Deep RL Workshop, NeurIPS 2020*.

Unpublished Work.....

- **Robust Option Learning for Adversarial Generalization**, Kishor Jothimurugan, Steve Hsu, Osbert Bastani, Rajeev Alur. *Under review*.
- **Learning Algorithms for Regenerative Stopping problems with Applications to Shipping Consolidation in Logistics**, Kishor Jothimurugan, Matthew Andrews, Jeongran Lee, Lorenzo Maggi. *Intern research report*.

Teaching Experience

Guest Lecturer.....

- Computer-Aided Verification (CIS 673) Fall 2021

Teaching Assistant.....

- Principles of Embedded Systems (CIS 540) Spring 2019
- Automata, Computability and Complexity (CIS 262) Fall 2018
- Discrete Mathematics (Undergraduate) Spring 2017
- Design and Analysis of Algorithms (NPTEL MOOC) Fall 2016

Mentoring

Graduate Student Mentoring

Steve Hsu, Masters Student, University of Pennsylvania

2020–2022

Topic: Compositional reinforcement learning for multi-task generalization

Awards

CTL Teaching Certificate

Awarded by Center for Teaching and Learning, University of Pennsylvania

Spring 2022

CMI Undergraduate Scholarship

Awarded by CMI to undergraduate students for excellence in academics

2014—2017

Invited Talks

IST Austria

Title: Reinforcement Learning from Logical Specifications

Fall 2021

Simons Institute (UC Berkeley)

Workshop on Games and Equilibria in System Design and Analysis

Title: Abstract Value Iteration for Hierarchical Reinforcement Learning

Spring 2021

Internships

Amazon Web Services

Applied Scientist Intern

Topic: Incorporating execution semantics in code generation models

Summer 2022

Nokia Bell Labs

Research Intern

Topic: An application of deep reinforcement learning to regenerative stopping problems

Summer 2020

Amazon Web Services

Software Development Intern

Topic: Using machine learning to improve usability of taint analysis

Summer 2019

ENS Cachan

Research Intern

Topic: Models for distributed reactive synthesis

Summer 2017

Reviewer

- NeurIPS 2022

Other Achievements

- Placed among **top 3 students** in CMI
- Qualified for **ACM ICPC India Regionals 2016** (Chennai and Coimbatore)

Technical skills

Programming Languages: C++, Python, Java, Coq, MATLAB.

Tools: L^AT_EX, Git, Linux Utilities, VSCode, Matplotlib.

Frameworks: Tensorflow, Pytorch, HuggingFace, StableBaselines, OpenAI Gym, Pandas, Soot, Flow*.

Languages

Fluent: English, Hindi, **Native:** Tamil.