

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

Thesis Topic: Specification-guided Reinforcement Learning

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.....

- **K. Jothimurugan**, S. Bansal, O. Bastani and R. Alur. Specification-Guided Learning of Nash Equilibria with High Social Welfare. *International Conference on Computer Aided Verification (CAV)*, 2022.
- R. Alur, S. Bansal, O. Bastani and **K. Jothimurugan**[†]. A Framework for Transforming Specifications in Reinforcement Learning. *Henzinger-60 (Invited Contribution)*, 2022.
- **K. Jothimurugan**, S. Bansal, O. Bastani and R. Alur. Compositional Reinforcement Learning from Logical Specifications. *Neural Information Processing Systems (NeurIPS)*, 2021.
- R. Ivanov*, **K. Jothimurugan***, S. Hsu, S. Vaidya, R. Alur and O. Bastani. Compositional Learning and Verification of Neural Network Controllers. *International Conference on Embedded Software (EMSOFT)*, 2021.
- **K. Jothimurugan**, O. Bastani and R. Alur. Abstract Value Iteration for Hierarchical Reinforcement Learning. *Artificial Intelligence and Statistics (AISTATS)*, 2021.
- R. Alur, Y. Chen, **K. Jothimurugan**[†] and S. Khanna. Space-efficient Query Evaluation over Probabilistic Event Streams. *Logic in Computer Science (LICS)*, 2020.
- **K. Jothimurugan**, R. Alur and O. Bastani. A Composable Specification Language for Reinforcement Learning Tasks. *Neural Information Processing Systems (NeurIPS)*, 2019.

Refereed Workshop Papers and Posters.....

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

Unpublished Work.....

- **K. Jothimurugan**, S. Hsu, O. Bastani and R. Alur. Robust Option Learning for Adversarial Generalization. *Under review*.
- **K. Jothimurugan**, M. Andrews, J. Lee and L. Maggi. Learning Algorithms for Regenerative Stopping problems with Applications to Shipping Consolidation in Logistics. *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

UPenn Mentorship Program

Participated as a mentor for first-year PhD students 2022

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

Fall 2021

Title: Reinforcement Learning from Logical Specifications

Simons Institute (UC Berkeley)

Spring 2021

Workshop on Games and Equilibria in System Design and Analysis

Title: Abstract Value Iteration for Hierarchical Reinforcement Learning

Internships

Amazon Web Services

Applied Scientist Intern, AI Labs

Summer 2022

Topic: Incorporating execution semantics in transformer-based code generation models

Nokia Bell Labs

Research Intern

Summer 2020

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

Amazon Web Services

Software Development Engineer Intern, Automated Reasoning Group

Summer 2019

Topic: Using machine learning to improve usability of taint analysis

ENS Cachan

Research Intern

Summer 2017

Topic: Models for distributed reactive synthesis

Review Service

Conferences: NeurIPS 2022.

Journals: IEEE TCAD.

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: \LaTeX , Git, Linux Utilities, VSCode, Matplotlib.

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

Languages

Fluent: English, Hindi.

Native: Tamil.