

# Kishor Jothimurugan

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## Research Interests

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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

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### 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

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\* 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**,<sup>†</sup> 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**,<sup>†</sup> 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

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#### 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

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### Graduate Student Mentoring

Steve Hsu, Masters Student, University of Pennsylvania

2020–2022

Topic: Compositional reinforcement learning for multi-task generalization

## Awards

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### 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

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### 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

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### Amazon Web Services

*Applied Scientist Intern, AI Labs*

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, Automated Reasoning Group*

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

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**Conferences:** NeurIPS 2022.

**Journals:** IEEE TCAD.

## Other Achievements

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

## Technical skills

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

**Tools:**  $\text{\LaTeX}$ , Git, Linux Utilities, VSCode, Matplotlib.

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

## Languages

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