

# Nishanth Jay Kumar

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## EDUCATION

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### Massachusetts Institute of Technology

Ph.D. in Electrical Engineering and Computer Science

Cambridge, MA

2021 - 2026 (expected)

- Graduate Certificate in Technical Engineering Leadership
- Thesis advisors: Leslie Kaelbling, Tomás Lozano-Pérez

### Massachusetts Institute of Technology

S.M. in Electrical Engineering and Computer Science, GPA: 5.00/5.00

Cambridge, MA

2021 - 2024

- Selected Coursework: Computational Sensorimotor Learning, Robotic Manipulation, Theory of Computation, Leading Creative Teams.
- Thesis: Learning to Plan and Planning to Learn for Long-Horizon Robotics Tasks.

### Brown University

Sc.B. in Computer Engineering with Honors, GPA: 3.96/4.00

Providence, RI

2017 - 2021

- Selected Coursework: Machine Learning (Grad level), Computer Vision (Grad level), Learning and Sequential Decision Making (Grad level), Topics in Collaborative Robotics (Grad level).
- Activities: Brown Space Engineering, Brown STEAM Club, Brown CS Meta-Undergrad Research Assistant (MURA).

## INDUSTRY EXPERIENCE

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### FAIR at Meta

AI Research Intern

New York City, NY

May 2025 - Present

- Worked on enabling agents to autonomously improve their success rates at long-horizon computer-use tasks via value function learning.
- Enabled automated data collection, cleaning and labelling, and finetuning of a 7B VLM to serve as a value function. Resulting method demonstrates significant improvement over state-of-the-art success rate on a subset of the AgentStudio benchmark.
- Conference paper submission in preparation. Mentors: Mary Williamson, Yuandong Tian, Jimmy Yang.

### NVIDIA

Research Intern

Seattle, WA

May 2024 - Jan 2025

- Invented ‘OWL-TAMP’: a novel approach for combining foundation models with task and motion planning to solve open-world robot manipulation problems. Paper accepted at CoRL 2024 workshop, in submission to RSS ’25 [website].
- Helped develop method and write paper for ‘GPU-TAMP’: a novel task and motion planning approach accelerated on GPUs. Paper in submission to RSS ’25 [website].
- Designed experiments and downstream robot applications for ‘AHA’: a VLM trained to diagnose failures in robot manipulation policies. Paper accepted at ICLR ’25 [website].
- Mentors: Caelan Garrett, Fabio Ramos, Dieter Fox.

### RAI Institute

Research Intern

Cambridge, MA

November 2022 - May 2024

- Invented ‘EES’: a method for enabling robots to leverage planning to perform efficient reset-free online learning on long-horizon tasks. Resulting paper accepted at RSS ’24 [link].
- Mentors: Jennifer Barry.

### Vicarious AI

Research Intern

Remote

May - August 2021

- Primary developer for PGMax [link], a novel library for inference and learning on Probabilistic Graphical Models (PGM’s). Journal paper accepted at the Journal of Machine Learning Research (JMLR).
- Mentors: Stannis Zhou and Miguel Lázaro-Gredilla.

### Uber Advanced Technologies Group

Summer Research Intern

Remote

May - August 2020

- Worked on a novel method to improve active learning for joint perception and prediction models used for self-driving vehicles. Paper accepted on CoRL ’21.
- Mentors: Sean Segal, Mengye Ren, Raquel Urtasun.

## ACADEMIC EXPERIENCE

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### MIT Computer Science and Artificial Intelligence Laboratory

Cambridge, MA

Graduate Research Assistant

2021 - Present

- Advised by Professors Leslie Kaelbling and Tomás Lozano-Pérez within the Learning and Intelligent Systems (LIS) group.
- Research topics include Neuro-symbolic methods, Task and Motion Planning, Reinforcement Learning, and Imitation Learning for robotics and decision-making.

### Brown University Department of Computer Science

Providence, RI

Undergraduate Research Assistant

2017 - 2021

- Worked with Professors Stefanie Tellex, George Konidaris and Michael Littman within the bigAI initiative
- Research topics included Imitation Learning, Reinforcement Learning, Classical Planning, Model-Based Reasoning, Planning under Uncertainty, and Mixed Reality, among others.

### Brown University Department of Computer Science

Providence, RI

Meta Undergraduate Research Assistant (MURA)

2020 - 2021

- Responsible for cultivating and promoting Undergraduate Research within the Brown CS Department.
- Held “Research Office Hours”, co-ordinate with faculty to host educational events and increase research opportunities for undergrads.

## RESEARCH MENTORSHIP

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- **Mindy Zhang**, MIT Undergrad (Spring 2025)
- **Annie Feng**, MIT Masters → NVIDIA (Fall 2024 - Fall 2025)
- **Alicia Li**, MIT Undergrad (Fall 2024 - Fall 2025)
- **Jing Cao**, MIT Undergrad (Spring 2024 - Present)
- **Kathryn Le**, MIT Undergrad (Spring 2023)
- **Varun Hariprasad**, RSI → MIT Undergrad (Summer 2022)

## TEACHING

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- **Graduate Teaching Fellow**, MIT EECS  
*Representation, Inference, and Reasoning in AI (6.4110)* Spring 2025
- **Head Teaching Assistant**, Brown CS  
*Learning and Sequential Decision Making [Grad Level] (CSCI 2951-F)* Fall 2019
- **Teaching Assistant** at Brown School of Engineering  
*Honors Introduction to Engineering (ENGN 0031)* Fall 2018

## PUBLICATIONS

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### Journal Publications

1. G.Zhou\*, A.Dedieu\*, **N.Kumar**, M.Lázaro-Gredilla, S.Kushagra, and D.George, “PGMax: Factor Graphs for Discrete Probabilistic Graphical Models and Loopy Belief Propagation in JAX”, *JMLR Open-Source Software track*, 2025.

### Conference Publications

1. W. Shen, C. Garrett, **N. Kumar**, A. Goyal, T. Hermans, L.P. Kaelbling, T. Lozano-Pérez, F. Ramos. “Differentiable GPU-Parallelized Task and Motion Planning”, *Robotics: Science and Systems (RSS)*, 2025.
2. Y. Liang, **N.Kumar**, H. Tang, A. Weller, J.B. Tenenbaum, T. Silver, J.F. Henriques, K. Ellis. “Online Predicate Invention for High-Level Planning”, *International Conference on Learning Representations (ICLR)*, 2025.
3. J. Duan, W. Pumacay, **N.Kumar**, Y.R. Wang, S. Tian, W. Yuan, R. Krishna, D. Fox, A. Mandlekar, Y. Guo. “AHA: A Vision-Language-Model for Detecting and Reasoning over Failures in Robotic Manipulation”, *International Conference on Learning Representations (ICLR)*, 2025.
4. A.Curtis\*, **N.Kumar\***, J.Cao, T.Lozano-Pérez, and L.P.Kaelbling, “Trust the PRoC3S: Solving Long-Horizon Robotics Problems with LLMs and Constraint Satisfaction”, *Conference on Robot Learning (CoRL)*, 2024.
5. A.Peng, B.Z.Li, I.Sucholutsky, **N.Kumar**, J.A.Shah, J.D.Andreas and A.Bobu. “Adaptive Language-Guided Abstraction from Contrastive Explanations”, *Conference on Robot Learning (CoRL)*, 2024.
6. **N.Kumar\***, T.Silver\*, W.McClinton, L.Zhao, S.Proulx, T.Lozano-Pérez, L.P.Kaelbling, and J.Barry, “Practice makes Perfect: Planning to Learn Skill Parameter Policies”, *Robotics: Science and Systems (RSS)*, 2024.
7. A.Peng, A.Bobu, B.Z.Li, T.R.Sumers, I.Sucholutsky, **N.Kumar**, T.L. Griffiths, and J.A.Shah. “Preference-Conditioned Language-Guided Abstractions”, *Human-Robot Interaction (HRI)*, 2024.
8. **N.Kumar\***, W.McClinton, R.Chitnis, T.Silver, T.Lozano-Pérez, and L.P.Kaelbling, “Learning Efficient Abstract Planning Models that Choose What to Predict”, *Conference on Robot Learning (CoRL)*, 2023.
9. T.Silver\*, R.Chitnis\*, **N.Kumar**, W.McClinton, T.Lozano-Perez, and L.P.Kaelbling, “Predicate Invention for Bilevel Planning”, *AAAI Conference on Artificial Intelligence (AAAI)*, 2023.
10. S.Segal\*, **N.Kumar\***, S.Casas, W.Zeng, M.Ren, J.Wang, and R.Urtasun, “Just label what you need: Fine-grained Active Selection For P&P through Partially Labeled Scenes”, *Conference on Robot Learning (CoRL)*, 2021.
11. E.Rosen, **N.Kumar**, N.Gopalan, D.Ullman, G.Konidaris, and S.Tellex, “Building Plannable Representations with Mixed Reality”, *IEEE/RSJ International Conference on Intelligent Robots and Systems*, 2020.
12. A.Wandzel, Y.Oh, M.Fishman, **N.Kumar**, W.L.LS, and S.Tellex, “Multi-object Search Using Object-oriented POMDPs”, *IEEE International Conference on Robotics and Automation (ICRA)*, 2019.

## Workshop Publications

1. A. Feng, **N. Kumar**, T.Lozano-Pérez, and L.P.Kaelbling. “Guided Exploration for Efficient Relational Model Learning”, *The Multi-Disciplinary Conference on Reinforcement Learning and Decision Making (RLDM)*, 2025.
2. A. Athalye\*, **N. Kumar\***, T. Silver, Y. Liang, T.Lozano-Pérez, and L.P.Kaelbling. “Predicate Invention from Pixels via Pretrained Vision-Language Models”, *AAAI Workshop on Planning in the Era of Large Language Models (LM4Plan)*, 2025.
3. Z. Siegel, J. Mao, **N. Kumar**, T. Shu, and J. Andreas, “Language Guided Operator Learning for Goal Inference”, *CoRL Workshop on Learning Effective Abstractions for Planning (LEAP)*, 2024.
4. **N. Kumar**, F. Ramos, D. Fox, C.R. Garrett. “Open-World Task and Motion Planning via Vision-Language Model Inferred Constraints”, *CoRL Workshop on Language and Robot Learning*, 2024.
5. A. Li\*, **N. Kumar\***, T.Lozano-Pérez, and L.P.Kaelbling. “Learning to Bridge the Gap: Efficient Novelty Recovery with Planning and Reinforcement Learning”, *NeurIPS Workshop on Open-World Agents*, 2024.
6. W. Hill\*, I. Liu\*, A.D.M Koch, D. Harvey, **N. Kumar**, G. Konidaris, and S. James. “MinePlanner: A Benchmark for Long-Horizon Planning in Large Minecraft Worlds”, *6th ICAPS Workshop on the International Planning Competition*.
7. M.Fishman\*, **N. Kumar\***, C.Allen, N.Danas, M.Littman, S.Tellex, and G.Konidaris, “Task Scoping: Generating Task-Specific Simplifications of Open-Scope Planning Problems”, *IJCAI Workshop on Bridging the Gap Between Planning and Reinforcement Learning*, 2023.
8. T.Silver\*, V.Hariprasad\*, R.Shuttleworth\*, **N. Kumar**, T.Lozano-Pérez, and L.P.Kaelbling, “PDDL Planning with Pretrained Large Language Models”, *NeurIPS Foundation Models for Decision Making Workshop*, 2022.
9. **N. Kumar\***, M.Fishman\*, N.Danas, M.Littman, S.Tellex, and G.Konidaris, “Task Scoping for Efficient Planning in Open Worlds”, *AAAI Conference on Artificial Intelligence, Student Workshop*, 2019.
10. **N. Kumar\***, E.Rosen\*, and S.Tellex, “Knowledge Acquisition for Robots through Mixed Reality Head-Mounted Displays”, *The Second International Workshop on Virtual, Augmented and Mixed Reality for Human Robot Interaction*, 2019.

## Preprints and Misc. Publications

1. A. Athalye\*, **N. Kumar\***, T. Silver, Y. Liang, J. Wang, T. Lozano-Pérez, and L.P. Kaelbling. “From Pixels to Predicates: Learning Symbolic World Models via Pretrained Vision-Language Models”, *arXiv*, 2025.
2. **N. Kumar**, W. Shen, F. Ramos, D. Fox, T. Lozano-Pérez, L.P. Kaelbling, and C.R. Garrett. “Open-World Task and Motion Planning via Vision-Language Model Inferred Constraints”, *arXiv*, 2025.
3. L. Zhao, W. McClinton, A. Curtis, **N. Kumar**, T. Silver, L.P. Kaelbling, and L.S. Wong. “Seeing is Believing: Belief-Space Planning with Foundation Models as Uncertainty Estimators”, *arXiv*, 2025.
4. **N. Kumar**, W.McClinton, K.Le, and T.Silver, “Bilevel Planning for Robots: An Illustrated Introduction”, *LIS Research Group Website*, 2023.
5. J.Chang\*, **N. Kumar\***, S.Hastings, A.Gokaslan, D.Romeres, D.Jha, D.Nikovski, G.Konidaris, and S.Tellex, “Learning Deep Parameterized Skills from Demonstration for Re-targetable Visuomotor Control”, *arXiv*, 2020.

## OPEN-SOURCE SOFTWARE

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- *predicators* (Python, PyTorch; over 85 stars on GitHub)

- Codebase that implements a search-then-sample task TAMP system, as well as several methods to learn the components of a TAMP problem (predicates, operators, etc.) from a handful of demonstrations. Several forks that integrate the codebase with robots (like the Boston Dynamics Spot), and simulation platforms (like BEHAVIOR-100).
- Ongoing Ph.D. work.
- *PGMax* (Python, Jax; over 50 stars on GitHub)
  - Framework for easily creating and running efficient inference on factor graphs.
  - Internship project during my time at Vicarious AI.
- *openTAMP* (Python, Gurobi, OSQP)
  - Framework for optimization-based TAMP, along with a custom library to solve motion-planning problems via sequential convex optimization.

## ACADEMIC SERVICE

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### Workshop Organizing

- *Workshop on Data Efficient Robot Learning at CoRL* (2025)
- *Workshop on Learning Effective Abstractions for Planning (LEAP) at CoRL* (2024)

### Journal Reviewing

- *Journal of Artificial Intelligence Research (JAIR)* (2022)

### Conference Reviewing

- *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)* (2024)
- *Conference on Robot Learning (CoRL)* (2022, 2023, 2024, 2025)
- *Robotics: Science and Systems (RSS)* (2025)
- *AAAI Conference on Artificial Intelligence* (2022, 2023)
- *IEEE International Conference on Robotics and Automation (ICRA)* (2019)

### Workshop Reviewing

- *Workshop on Data Efficient Robot Learning at CoRL* (2025)
- *AAAI Workshop on Planning in the Era of Large Language Models (LLM4Plan)* (2025)
- *AAAI Workshop on Generalization in Planning (GenPlan)* (2025)
- *Workshop on Learning Effective Abstractions for Planning (LEAP) at CoRL* (2024)
- *Workshop on Learning Effective Abstractions for Planning (LEAP) at CoRL* (2023)
- *The International Workshop on Virtual, Augmented, and Mixed-Reality for Human-Robot Interactions (VAM-HRI)* (2019)

## HONORS AND AWARDS

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| • Best Paper at RSS Workshop on Learning for TAMP | 2023 |
| • Qualcomm Innovation Fellowship Finalist         | 2022 |
| • NSF Graduate Research Fellowship                | 2021 |
| • Berkeley Fellowship (declined)                  | 2021 |

- Brown Outstanding Computer Engineering Senior Award 2021
- CRA Outstanding Undergraduate Researcher Award Finalist 2021
- Barry M. Goldwater Scholarship 2020
- Member of Tau Beta Pi Engineering Honors Society 2020
- Heidelberg Laureate 2020
- CRA Outstanding Undergraduate Researcher Award Honorable Mention 2020
- 'Best Plenary Presenter', Ivy-League Undergrad Research Symposium (ILURS) 2019
- Undergraduate Teaching and Research Award, Brown University 2019
- Google Global Science Fair Regional Finalist 2015
- FIRST Tech Challenge World Championships, Special Judges' "Enabler" Award 2015