

Nishanth Jay Kumar

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EDUCATION

Massachusetts Institute of Technology

Cambridge, MA

Ph.D. in Electrical Engineering and Computer Science

2021 - 2026 (expected)

- Thesis advisors: Leslie Kaelbling, Tomás Lozano-Pérez

Massachusetts Institute of Technology

Cambridge, MA

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

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

Providence, RI

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

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

NVIDIA

Seattle, WA

Research Intern

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

Cambridge, MA

Research Intern

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

Remote

Research Intern

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

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

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

TEACHING

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

PUBLICATIONS

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. 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.
2. 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.
3. 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.
4. 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.
5. **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.
6. 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.
7. **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.
8. 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.
9. 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”, in *Conference on Robot Learning (CoRL)*, 2021.
10. E.Rosen, **N.Kumar**, N.Gopalan, D.Ullman, G.Konidaris, and S.Tellex, “Building Plannable Representations with Mixed Reality”, in *IEEE/RSJ International Conference on Intelligent Robots and Systems*, 2020.
11. 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. **N.Kumar**, W.McClinton, K.Le, and T.Silver, “Bilevel Planning for Robots: An Illustrated Introduction”, *LIS Research Group Website*, 2023.
2. 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

- *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

Workshop Organizing

- *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)
- *Robotics: Science and Systems (RSS)* (2025)
- *AAAI Conference on Artificial Intelligence* (2022, 2023)
- *IEEE International Conference on Robotics and Automation (ICRA)* (2019)

Workshop Reviewing

- *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* (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 |