

Nishanth Jay Kumar

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EDUCATION

Massachusetts Institute of Technology Cambridge, MA
Ph.D. in Electrical Engineering and Computer Science 2021 - 2027 (expected)

- Activities: MIT-Harvard Humanist Association.

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).

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.

INDUSTRY EXPERIENCE

NVIDIA

Research Intern

Seattle, WA

May 2024 - Present

- Working with Senior Research Scientist Caelan Garrett, and Research Managers Fabio Ramos and Dieter Fox on combining internet-scale foundation models with planning and learning approaches to enable a mobile manipulation robot to complete real-world, long-horizon kitchen tasks. Conference submission(s) in preparation.

The AI Institute

Research Intern

Cambridge, MA

November 2022 - May 2024

- Worked with Research Lead Jennifer Barry on combining learning and planning to solve real-world long-horizon tasks. Resulted in an accepted conference paper at RSS 2024 [link].

Vicarious AI

Research Intern

Remote

May - August 2021

- Research Project on building a toolkit for Probabilistic Graphical Models (PGM's) with Stannis Zhou and Miguel Lázaro-Gredilla.
- Second-author journal paper accepted at the Journal of Machine Learning Research (JMLR). Open-source project code release can be found here [link].

Uber Advanced Technologies Group

Summer Research Intern

Remote

May - August 2020

- Research Project on Active Learning under Chief Scientist Prof. Raquel Urtasun.
- First-author conference publication accepted to the Conference on Robot Learning (CoRL) 2021.

Paragon.school

Co-Founder

Providence, RI

February 2020 - December 2021

- Paragon.school was a mentorship and college-consulting company for high-performance high school students.

TEACHING

- **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)

HONORS AND AWARDS

- 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

INVITED TALKS

Industry

- *Planning to Learn Skill Parameter Policies*
 - Invited talk at The AI Institute's Manipulation and Learning Reading Group.

Universities and Research Laboratories

- *Inventing Plannable Abstractions from Demonstrations*
 - Invited talk at the Brown Robotics Group Meeting, May 2023.
- *Task Scoping: Generating Task-Specific Abstractions for Planning*
 - Invited talk at the MIT LIS Group Meeting. February, 2021.
- *What I'm working on now: Task Scoping and Parameterized Imitation Learning*
 - Short talk at Intelligent Robot Lab meeting, Brown University. November, 2019.

Conferences and Symposia

- *Building Intelligent, Collaborative Robots*
 - Invited talk at the second Machine Intelligence Conference (MIC), Boston University. September, 2019
- *Action-Oriented Semantic Maps via Mixed Reality*
 - 1 of 8 Plenary Presenters speakers at the Second Ivy League Undergrad Research Symposium, UPenn. April, 2019

Miscellaneous

- *Let's Talk about AI and Robotics*
 - Invited interview for an episode of the interSTEM YouTube channel. November, 2019.1

ACADEMIC SERVICE

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)
- *AAAI Conference on Artificial Intelligence* (2022, 2023)
- *IEEE International Conference on Robotics and Automation (ICRA)* (2019)

Workshop Reviewing

- *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)*

PUBLICATIONS

Conference Publications

1. **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.
2. 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.
3. **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.
4. 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.
5. 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.
6. 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.
7. 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. 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.
2. 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.
3. **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.
4. **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.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”, *arxiv*, 2024.
2. **N.Kumar***, W.McClinton, K.Le, and T.Silver, “Bilevel Planning for Robots: An Illustrated Introduction”, *LIS Research Group Website*, 2023.
3. G.Zhou*, A.Dedieu*, **N.Kumar**, M.Lázaro-Gredilla, Shrinu Kushagra, and D.George, “PGMax: Factor Graphs for Discrete Probabilistic Graphical Models and Loopy Belief Propagation in JAX”, *arXiv*, 2022.

4. 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.
 - Ongoing Ph.D. work.
- *predicators_behavior* (Python, PyTorch)
 - Integrating learning for TAMP with the iGibson simulator and the BEHAVIOR benchmark.
 - 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.