

Karthik Valmeekam

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🎓 Scholar profile

Research Interests

My current research primarily focuses on the intersection of Large Language Models (LLMs) and reasoning, with a special emphasis on examining the planning capabilities of LLMs. This research involves two key aspects:

- Identifying the inherent limitations of LLMs in generating plans, particularly in classical planning, and
- Demonstrating the constructive applications of LLMs as complementary tools alongside the robust planners developed in the AI Planning community.

Experience

May 2024 – August 2024 **Amazon Science**, *Applied Scientist Intern*, Palo Alto, CA, United States.

Education

Fall 2021 – Dec 2025 **Arizona State University**, Tempe, AZ, United States

(Expected) **Ph.D. in Computer Science**, Advisor: *Prof. Subbarao Kambhampati*

Research: Large Language Models, Automated Planning, Reinforcement Learning

GPA: 4.0/4.0

Fall 2019 – Spring 2021 **Arizona State University**, Tempe, AZ, United States

M.S. in Computer Science, Advisor: *Prof. Subbarao Kambhampati*

Thesis: A Study of Explainable Decision Support for Longitudinal Sequential Decision Making

GPA: 4.0/4.0

Fall 2015 – Spring 2019 **Vellore Institute of Technology**, Vellore, TN, India

B.Tech. in Computer Science and Engineering

GPA: 9.19/10.0

Selected Publications and Manuscripts

As per google scholar, my papers have received a total of 1634 citations; I have an h-index of 13 and an i10-index of 16.

NYAS 2025 Subbarao Kambhampati, Kaya Stechly, **Karthik Valmeekam**. (How) Do reasoning models reason?. Annals of the New York Academy of Sciences, 2025.

TMLR 2025 **Karthik Valmeekam***, Kaya Stechly* (equal contribution), Atharva Gundawar, Subbarao Kambhampati. A Systematic Evaluation of the Planning and Scheduling Abilities of the Reasoning Model o1. Transactions on Machine Learning Research, 2025.

- ICLR 2025 Kaya Stechly*, **Karthik Valmeekam*** (equal contribution), Subbarao Kambhampati. On the self-verification limitations of large language models on reasoning and planning tasks. arXiv preprint arXiv:2402.08115, 2024.
- NeurIPS 2024 Kaya Stechly*, **Karthik Valmeekam*** (equal contribution), Subbarao Kambhampati. Chain of thoughtlessness: An analysis of cot in planning. arXiv preprint arXiv:2405.04776, 2024.
- ICML 2024 (Spotlight) Subbarao Kambhampati, **Karthik Valmeekam**, Lin Guan, Kaya Stechly, Mudit Verma, Siddhant Bhambri, Lucas Saldyt, Anil Murthy. LLMs Can't Plan, But Can Help Planning in LLM-Modulo Frameworks. In Forty-first International Conference on Machine Learning, 2024.
- Arxiv Preprint (Under Review) **Karthik Valmeekam***, Kaya Stechly* (equal contribution), Atharva Gundawar, Subbarao Kambhampati. Planning in Strawberry Fields: Evaluating and Improving the Planning and Scheduling Capabilities of LRM o1. arXiv preprint arXiv:2410.02162, 2024.
- AAAI 2024 Subbarao Kambhampati, **Karthik Valmeekam**, Lin Guan. On the role of large language models in planning. Tutorial at the AAAI Conference on Artificial Intelligence, 2024.
- NeurIPS 2023 **Karthik Valmeekam**, Matthew Marquez, Sarath Sreedharan, Subbarao Kambhampati. On the Planning Abilities of Large Language Models—A Critical Investigation. In Thirty-seventh Conference on Neural Information Processing Systems, 2023.
Spotlight paper (Top 3%).
- NeurIPS 2023 Lin Guan*, **Karthik Valmeekam*** (equal contribution), Sarath Sreedharan, Subbarao Kambhampati. Leveraging Pre-trained Large Language Models to Construct and Utilize World Models for Model-based Task Planning. In Thirty-seventh Conference on Neural Information Processing Systems, 2023.
- NeurIPS 2023 **Karthik Valmeekam**, Matthew Marquez, Alberto Olmo, Sarath Sreedharan, Subbarao Kambhampati. PlanBench: An Extensible Benchmark for Evaluating Large Language Models on Planning and Reasoning about Change. In Thirty-seventh Conference on Neural Information Processing Systems Datasets and Benchmarks Track, 2023.
- FMDM @ NeurIPS 2023 **Karthik Valmeekam***, Matthew Marquez* (equal contribution), Subbarao Kambhampati. Can Large Language Models Really Improve by Self-critiquing Their Own Plans?. In NeurIPS 2023 Foundation Models for Decision Making Workshop, 2023.
- ICAPS 2023 Subbarao Kambhampati, **Karthik Valmeekam**, Matthew Marquez, Lin Guan. On the role of large language models in planning. Tutorial at the International Conference on Automated Planning and Scheduling (ICAPS), 2023.

ICLR 2023 Lin Guan, **Karthik Valmeekam**, Subbarao Kambhampati. Relative Behavioral Attributes: Filling the Gap between Symbolic Goal Specification and Reward Learning from Human Preferences. In The Eleventh International Conference on Learning Representations, 2023.

ICAPS 2022 **Karthik Valmeekam**, Sarath Sreedharan, Sailik Sengupta, Subbarao Kambhampati. RADAR-X: An Interactive Mixed Initiative Planning Interface Pairing Contrastive Explanations and Revised Plan Suggestions. In Proceedings of the International Conference on Automated Planning and Scheduling (Vol. 32, pp. 508-517), 2022.

Teaching & Service

Teaching Assistant 2022: **CSE574-Planning and Learning** by Prof. Subbarao Kambhampati.
2021: **CSE471-Intro to Artificial Intelligence** by Prof. Subbarao Kambhampati.

Reviewer/PCM 2025: **ICLR, ACM-TIST, CACM, AAAI-Student Program**.
2024: **ICLR, NeurIPS, AAAI-Student Program, ICRA**.
2023: **ICLR, NeurIPS, ICAPS, HAXP@ICAPS, GenPlan@NeurIPS**.
2022: **XAIP@ICAPS**.

Student Volunteer 2021: **AAAI, ICAPS**.

Skills

Programming Python, C++, HTML/CSS, JavaScript, Bash, SQL, PDDL

Frameworks verl (GRPO and FSDP SFT), Pytorch, Transformers (HuggingFace), Docker, Kubernetes, Scikit-Learn, Numpy, Pandas, Flask, JQuery, Bootstrap

Misc Adobe Premiere Pro, Lightroom, Photoshop, Git, Latex

Projects

2021 **Reinforcement Learning for Imperfect Information Games**
On a two-player imperfect information game (Sequence), an agent was trained offline by *approximation in value and policy space* using neural networks. In the test phase, the agent used one-step look-ahead using the trained network to make a move. This improved win percentage (upto 60%) with more training against a random agent.

2020 **High-Speed Autonomous Drifting using Deep Reinforcement Learning**
An end-to-end drift controller which utilizes a state-of-the-art model-free reinforcement learning algorithm is modelled using *Pytorch*. This RL problem is devised as a trajectory following problem. The resulting agent was able to generate the required behavior.

Honors

2024-2025 IBM PhD Fellowship Award

2025 SCAI Doctoral Fellowship (Merit-Based), Arizona State University.

- 2024 SCAI Doctoral Fellowship (Merit-Based), Arizona State University.
- 2021 CIDSE Doctoral Fellowship (Merit-Based), Arizona State University.
- 2018 Vice Chair Management of the student chapter CODECHEF-VIT, Vellore Institute of Technology