Karthik Valmeekam

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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.

Education

Fall 2021 – Spring 2026 (Expected)
Arizona State University, Tempe, AZ, United States
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

Publications and Manuscripts

AAAI 2024
Subbarao Kambhampati, **Karthik Valmeekam**, Matthew Marquez, 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.

AAAI 2021 Demos **Karthik Valmeekam**, Sarath Sreedharan, Sailik Sengupta, Subbarao Kambhampati. RADAR-X: An interactive interface pairing contrastive explanations with revised plan suggestions. In Proceedings of the AAAI Conference on Artificial Intelligence (Vol. 35, No. 18, pp. 16051-16053), 2021.

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 and sampled belief states. 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.

Teaching & Service

Teaching Assistant 2021: **CSE471-Intro to Artificial Intelligence** by Prof. Subbarao Kambhampati.

Reviewer/PCM 2024: **ICLR, 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, SAP-ABAP, SQL, PDDL

Frameworks Pytorch, Transformers (HuggingFace), PyTorch Lightning, Scikit-Learn, Numpy, Pandas, OpenAI gym, Keras, NLTK, Flask, JQuery, Bootstrap

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

Honors

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