

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 creating plans, particularly those requiring the resolution of subgoal interactions through combinatorial search, 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 **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

Publications and Manuscripts

- AAAI 2024 Subbarao Kambhampati, **Karthik Valmeekam**, Matthew Marquez, Lin Guan. On the role of large language models in planning. Tutorial to be presented 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 CSE 471: **Intro to Artificial Intelligence**, with Prof. Subbarao Kambhampati, Fall 2021.
- 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

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