# Aniruddh G. Puranic

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Institute for Systems Research
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## Current Position

- **University of Maryland** — College Park, MD, USA
  *Postdoctoral Associate* — *June 2024 – Present*
  - Institute for Systems Research (ISR)
  - Advisors: John S. Baras and Calin Belta

## Education

- **University of Southern California** — Los Angeles, CA, USA
  *Ph.D. Computer Science* — *2019 – 2024*
  - Thesis: Sample-Efficient and Robust Neurosymbolic Learning From Demonstrations
  - Advisors: Jyotirmoy V. Deshmukh and Stefanos Nikolaidis
- **University of Southern California** — Los Angeles, CA, USA
  *M.S. Computer Science (Intelligent Robotics)* — *2017 – 2018*
- **Visvesvaraya Technological University** — Bangalore, India
  *B.E. Computer Science and Engineering* — *2012 – 2016*
  - B.M.S. College of Engineering

## Work Experience

- **University of Southern California** — Los Angeles, CA, USA
  *Graduate Research Assistant* — *Aug 2019 – May 2024*
  - Neuro-symbolic deep reinforcement learning and demonstrationimitation learning with temporal logics.
  - Probabilistic modeling of human behaviors via neuro-symbolic reward functions.
  - Inference of explainable performance metrics from human feedback and demonstrations.
- **SRI International** — Princeton, NJ, USA
  *Reinforcement Learning Research Intern* — *Summer 2022*
  - Developed reinforcement learning algorithms for continual/lifelong learning in multi-agent systems to overcome catastrophic forgetting.
- **Toyota North America R&D - InfoTech Labs** — Mountain View, CA, USA
  *Researcher* — *Jan 2019 – Jul 2019*
  - Intelligent Connected Systems division.
  - Formal reasoning of edge computing configurations for connected vehicle applications (V2V and V2X).

- **USC Keck School of Medicine** Los Angeles, CA, USA
  *Researcher* *Jun 2018 – Dec 2018*
  - Center for Robotic Simulation and Education (CRSE).
  - Developed a tool using computer vision to estimate the deviation of surgical needle entry/exit points in dry-lab from images obtained from the Da Vinci surgical robot.
  - Inference of explainable performance metrics from human feedback and demonstrations.

- **SMERGERS Inc.** Bangalore, India
  *Software Engineering Intern* *Feb 2015 – May 2015*
  - Developed a user interaction system using Python/Django framework for the initial prototype of *'Sector Watch Feature'* which would provide a lot of insight about the businesses in a sector to the users in real time.

## Publications

### Ph.D. Thesis

. Puranic, A. G. *Sample-Efficient and Robust Neurosymbolic Learning From Demonstrations* Ph.D. Dissertation (University of Southern California, Los Angeles, CA, USA, May 2024).

### Preprints

1. Puranic, A. G., Deshmukh, J. V. & Nikolaidis, S. *Signal Temporal Logic-Guided Apprenticeship Learning* 2023.

### Journals

1. Puranic, A. G., Deshmukh, J. V. & Nikolaidis, S. Learning Performance Graphs From Demonstrations via Task-Based Evaluations. *IEEE Robotics and Automation Letters (RA-L); Oral presentation at ICRA 2023.* **8,** 336–343 (2023).
2. Puranic, A. G., Deshmukh, J. V. & Nikolaidis, S. Learning From Demonstrations Using Signal Temporal Logic in Stochastic and Continuous Domains. *IEEE Robotics and Automation Letters (RA-L); Presentation at IROS 2021.* **6,** 6250–6257 (2021).
3. Puranic, A. G., Deepak, K. & Umadevi, V. Vehicle Number Plate Recognition System: A Literature Review and Implementation using Template Matching. *International Journal of Computer Applications* **134,** 12–16 (2016).

### Refereed Conferences

1. Puranic, A., Deshmukh, J. & Nikolaidis, S. *Learning from Demonstrations using Signal Temporal Logic* in *Proceedings of the 2020 Conference on Robot Learning (CoRL)* **155** (PMLR, 2021), 2228–2242.
2. Mohammadinejad, S., Deshmukh, J. V. & Puranic, A. G. *Mining Environment Assumptions for Cyber-Physical System Models* in *2020 ACM/IEEE 11th International Conference on Cyber-Physical Systems (ICCPS)* (2020), 87–97.

3. Mohammadinejad, S., Deshmukh, J. V., Puranic, A. G., Vazquez-Chanlatte, M. & Donzé, A. *Interpretable Classification of Time-Series Data Using Efficient Enumerative Techniques* in *Proceedings of the 23rd International Conference on Hybrid Systems: Computation and Control* (Association for Computing Machinery, Sydney, New South Wales, Australia, 2020).
4. Balakrishnan, A., Puranic, A. G., Qin, X., Dokhanchi, A., Deshmukh, J. V., Ben Amor, H. & Fainekos, G. *Specifying and Evaluating Quality Metrics for Vision-based Perception Systems* in *2019 Design, Automation & Test in Europe Conference & Exhibition (DATE)* (2019), 1433–1438.

### Posters

1. Puranic, A., Deshmukh, J. & Nikolaidis, S. *Poster Abstract: Learning from Demonstrations with Temporal Logics* in *25th ACM International Conference on Hybrid Systems: Computation and Control* (Association for Computing Machinery, Milan, Italy, 2022).
2. Puranic, A., Chen, J., Nguyen, J., Deshmukh, J. & Hung, A. MP35-04 Automated Evaluation of Instrument Force Sensitivity During Robotic Suturing Utilizing Vision-based Machine Learning. *Journal of Urology* **201,** e505–e506 (2019).

## US Patents and Applications

| *Status* | *Title* | *Organization* |
|---|---|---|
| Issued (2022) | Distributed systems and extracting configurations for edge servers using driving scenario awareness. | Toyota |
| Pending | Methods and systems for processing traffic data from vehicles. | Toyota |
| Pending | Extracting temporal specifications of features for functional compatibility and integration with OEMs. | Toyota |
| Pending | Undisclosed (Submitted 2021) | USC |
| Pending | Undisclosed (Submitted 2023) | USC |

## Academic Service and Professional Activities

- Invited talks: MIT AeroAstro/CSAIL, Galois Inc., CMU, UCSD, UPenn, Rice
- Poster and demo program committee member for 26th ACM International Conference on Hybrid Systems: Computation and Control (HSCC) 2023
- Review Editor for Frontiers in Robotics and AI: Human-Robot Interaction
- IEEE Student Member
- Volunteer for 32nd International Conference on Computer-Aided Verification (CAV) 2020
- Refereed papers (reviewer) for the following journals and conferences:
  - ACM/IEEE International Conference on Human Robot Interaction (HRI): 2024
  - Learning for Dynamics & Control Conference (L4DC): 2023
  - IEEE Transactions on Cybernetics (IEEE Trans. Cybern.): 2023
  - Springer Nature - Autonomous Robots (AURO): 2022, 2023
  - IEEE Robotics and Automation Lettes (RA-L): 2021, 2022, 2023
  - IEEE International Conference on Robotics and Automation (ICRA): 2022, 2023

- ACM International Conference on Hybrid Systems: Computation and Control (HSCC): 2023
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS): 2021
- IEEE Transactions on Intelligent Transportation Systems (T-ITS): 2020
- IEEE Transactions on Computers (IEEE Trans. Comput.): 2020
- Subreviewer:
  * 2023: CAV, RSS, AAAI, EAAI
  * 2022: ISRR
  * 2021: ICRA, NeurIPS, DAC, ICCPS
  * 2020: HRI, CDC, CAV, DAC, ICRA
  * 2019: ICCPS, CLOUD

## Teaching Experience

- **Autonomous Cyber-Physical Systems (CSCI 513)** University of Southern California
  *Teaching Assistant* *Fall 2022, Fall 2020*
  - Class instructor: Jyotirmoy V. Deshmukh
- **Introduction to Robotics (CSCI 445)** University of Southern California
  *Course Producer* *Fall 2018*
  - Class instructor: Nora Ayanian
- **Robotics (CSCI 545)** University of Southern California
  *Course Producer* *Spring 2018*
  - Class instructor: Stefan Schaal

## Technical Skills

- Languages
  - Python, MATLAB, LaTeX, HTML
- Tools
  - PyTorch, Nvidia Isaac (Sim and Gym), PyBullet, MuJoCo, Gazebo, OpenCV, Signal Temporal Logic (RT-AMT, Breach)