Aniruddh G. Puranic

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Institute for Systems Research
University of Maryland
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Current Position

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

Education

- **University of Southern California** — Los Angeles, CA, USA
  Ph.D. Computer Science — *Aug 2019 – May 2024*
  - Advisors: Jyotirmoy V. Deshmukh and Stefanos Nikolaidis
  - Thesis: Sample-Efficient and Robust Neurosymbolic Learning From Demonstrations
    - Deep reinforcement learning and demonstrationimitation learning with temporal logics.
    - Probabilistic modeling of human behaviors via neurosymbolic reward functions.
    - Inference of explainable performance metrics from human feedback and demonstrations.
- **University of Southern California** — Los Angeles, CA, USA
  M.S. Computer Science (Intelligent Robotics) — *Jan 2017 – Dec 2018*
- **Visvesvaraya Technological University** — India
  B.E. Computer Science and Engineering — *Sep 2012 – Aug 2016*
  - B.M.S. College of Engineering, Bangalore

Work Experience

- **SRI International** — Princeton, NJ, USA
  Reinforcement Learning Research Intern — *May 2022 – Jul 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).

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. G., Deshmukh, J. V. & Nikolaidis, S. *Signal Temporal Logic-Guided Apprenticeship Learning* in *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)* (To Appear, 2024).
2. 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.
3. 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.
4. 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).
5. 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)