Aniruddh G. Puranic

Curriculum Vitæ Summary

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Institute for Systems Research(ISR)
University of Maryland
College Park, MD - 20742, USA

Education

2019–2024 **Ph.D. Computer Science**
University of Southern California | Los Angeles, CA, USA
- Advisors: Jyotirmoy V. Deshmukh and Stefanos Nikolaidis
- Thesis: *"Sample-Efficient and Robust Neurosymbolic Learning From Demonstrations"*

2017–2018 **M.S. Computer Science (Intelligent Robotics)**
University of Southern California | Los Angeles, CA, USA

2012–2016 **B.E. Computer Science and Engineering**
Visvesvaraya Technological University | India
- B.M.S. College of Engineering, Bangalore

Work Experience

2024–on **University of Maryland** | College Park, MD, USA
Postdoctoral Associate – Systems Engineering
- Mentors: John S. Baras and Calin Belta
- Research in Neurosymbolic AI and model-based systems engineering
- Mentoring researchers and Ph.D. students

2022 **SRI International** | Princeton, NJ, USA
Intern: Reinforcement Learning
- Developed reinforcement learning algorithms for continual/lifelong learning in multi-agent systems to overcome catastrophic forgetting.

2019 **Toyota North America R&D - InfoTech Labs** | Mountain View, CA, USA
Researcher: Formal Methods for Connected Cars
- Intelligent Connected Systems (ICS) division.
- Formal reasoning of edge computing configurations for connected vehicle applications (V2V and V2X).

2018 **USC Keck School of Medicine** | Los Angeles, CA, USA
Researcher
- 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.
- Created automated inference of explainable performance metrics from human feedback and demonstrations.

2015 **SMERGERS Inc.** | Bangalore, India
Software Engineering Intern
- Developed a user interaction system using Python/Django framework for the initial prototype of *'Sector Watch Feature'*, providing real-time sector-wise insights of businesses.

Publications and Patents

Journal Articles

[J1] **A. G. Puranic**, J. V. Deshmukh, and S. Nikolaidis, "Learning performance graphs from demonstrations via task-based evaluations," *IEEE Robotics and Automation Letters (RA-L); Oral presentation at ICRA 2023.*, vol. 8, no. 1, pp. 336–343, 2023. DOI: 10.1109/LRA.2022.3226072.

[J2] **A. G. Puranic**, J. V. Deshmukh, and S. Nikolaidis, "Learning from demonstrations using signal temporal logic in stochastic and continuous domains," *IEEE Robotics and Automation Letters (RA-L); Presentation at IROS 2021.*, vol. 6, no. 4, pp. 6250–6257, 2021. DOI: 10.1109/LRA.2021.3092676.

[J3] **A. G. Puranic**, K. Deepak, and V. Umadevi, "Vehicle number plate recognition system: A literature review and implementation using template matching," *International Journal of Computer Applications*, vol. 134, pp. 12–16, 2016.

Peer-reviewed Conference Proceedings

[C1] R. Matheu, **A. G. Puranic**, J. S. Baras, and C. Belta, "BT2Automata: Expressing behavior trees as automata for formal control synthesis," in *Proceedings of the 28th ACM International Conference on Hybrid Systems: Computation and Control*, ser. HSCC '25, Irvine, CA, USA: Association for Computing Machinery, 2025, ISBN: 9798400715044. DOI: 10.1145/3716863.3718042. [Online]. Available: https://doi.org/10.1145/3716863.3718042.

[C2] R. Matheu, **A. G. Puranic**, J. S. Baras, and C. Belta, "OMTBT: Online monitoring of temporal behavior trees with applications to closed-loop learning," in *Proceedings of the 2025 23rd European Control Conference (ECC) – **Accepted***, 2025.

[C3] **A. G. Puranic**, J. V. Deshmukh, and S. Nikolaidis, "Signal temporal logic-guided apprenticeship learning," in *2024 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2024, pp. 11147–11154. DOI: 10.1109/IROS58592.2024.10801924.

[C4] **A. Puranic**, J. Deshmukh, and S. Nikolaidis, "Learning from demonstrations using signal temporal logic," in *Proceedings of the 2020 Conference on Robot Learning (CoRL)*, ser. Proceedings of Machine Learning Research, vol. 155, PMLR, 2021, pp. 2228–2242. [Online]. Available: https://proceedings.mlr.press/v155/puranic21a.html.

[C5] S. Mohammadinejad, J. V. Deshmukh, and **A. G. Puranic**, "Mining environment assumptions for cyber-physical system models," in *2020 ACM/IEEE 11th International Conference on Cyber-Physical Systems (ICCPS)*, 2020, pp. 87–97. DOI: 10.1109/ICCPS48487.2020.00016.

[C6] S. Mohammadinejad, J. V. Deshmukh, **A. G. Puranic**, M. Vazquez-Chanlatte, and A. Donzé, "Interpretable classification of time-series data using efficient enumerative techniques," in *Proceedings of the 23rd International Conference on Hybrid Systems: Computation and Control*, ser. HSCC '20, Sydney, New South Wales, Australia: Association for Computing Machinery, 2020, ISBN: 9781450370189. DOI: 10.1145/3365365.3382218. [Online]. Available: https://doi.org/10.1145/3365365.3382218.

[C7] A. Balakrishnan, **A. G. Puranic**, X. Qin, A. Dokhanchi, J. V. Deshmukh, H. Ben Amor, and G. Fainekos, "Specifying and evaluating quality metrics for vision-based perception systems," in *2019 Design, Automation & Test in Europe Conference & Exhibition (DATE)*, 2019, pp. 1433–1438. DOI: 10.23919/DATE.2019.8715114.

US Patents and Applications

[I1] **A. G. Puranic**, J. V. Deshmukh, and S. Nikolaidis, "System and method for robot learning from human demonstrations with formal logic," U.S. Patent 12 208 521, 2025.

[I2] **A. G. Puranic**, B. Kim, and A. Nakamura, "Extracting temporal specifications of features for functional compatibility and integration with oems," U.S. Patent 12 307 173, 2025.

[I3] **A. G. Puranic** and B. Kim, "Distributed systems and extracting configurations for edge servers using driving scenario awareness," U.S. Patent 11 394 612, 2022.

[I4] **A. G. Puranic**, B. Kim, and A. Nakamura, "Methods and systems for processing traffic data from vehicles," U.S. Patent Application 16548221 – *Pending*, 2021.

Preprints

[A1] C. Enwerem, **A. G. Puranic**, J. S. Baras, and C. Belta, *Safety-aware reinforcement learning for control via risk-sensitive action-value iteration and quantile regression*, 2025. arXiv: 2506.06954 [cs.LG]. [Online]. Available: https://arxiv.org/abs/2506.06954.

Posters

[P1] **A. Puranic**, J. Deshmukh, and S. Nikolaidis, "Poster abstract: Learning from demonstrations with temporal logics," in *25th ACM International Conference on Hybrid Systems: Computation and Control*, ser. HSCC '22, Milan, Italy: Association for Computing Machinery, 2022, ISBN: 9781450391962. DOI: 10.1145/3501710.3524914. [Online]. Available: https://doi.org/10.1145/3501710.3524914.

[P2] **A. Puranic**, J. Chen, J. Nguyen, J. Deshmukh, and A. Hung, "MP35-04 automated evaluation of instrument force sensitivity during robotic suturing utilizing vision-based machine learning," *Journal of Urology*, vol. 201, no. Supplement 4, e505–e506, 2019. DOI: 10.1097/01.JU.0000555994.79498.94. [Online]. Available: https://www.auajournals.org/doi/abs/10.1097/01.JU.0000555994.79498.94.

Thesis

[T] A. G. Puranic, "Sample-efficient and robust neurosymbolic learning from demonstrations," Ph.D. Dissertation, University of Southern California, Los Angeles, CA, USA, May 2024.

Media/Press Appearances

- Learning-from-demonstrations using temporal logics featured in many of the major Computer Science news platforms:
  - The RISKS Digest by SRI's Peter G. Neumann
  - ACM TechNews
  - USC News
  - USC Viterbi News
- TQTL for vision-based perception systems in USC Viterbi News
- ACM SIGBED blog: Robot Learning meets Formal Specifications: Designing Safer Embedded Software in the age of AI

Academic Service and Professional Activities

- Chair of *Robot Learning* selected paper oral presentation session at IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2024.
- Invited talks: MIT AeroAstro/CSAIL, Galois Inc., CMU, UCSD, UPenn, Rice
- Program Committee member (Poster and Demos) for:
  - 16th ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS) 2025
  - 26th ACM International Conference on Hybrid Systems: Computation and Control (HSCC) 2023
- Review Editor for Frontiers in Robotics and AI: Human-Robot Interaction
- Volunteer for 32nd International Conference on Computer-Aided Verification (CAV) 2020
- Refereed papers (reviewer) for the following journals and conferences (alphabetical):
  - ACM/IEEE International Conference on Human Robot Interaction (HRI): 2024
  - ACM International Conference on Hybrid Systems: Computation and Control (HSCC): 2023
  - European Control Conference (ECC): 2025
  - Frontiers in Robotics and AI (section Human-Robot Interaction): 2025
  - IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS): 2021
  - IEEE International Conference on Robotics and Automation (ICRA): 2022, 2023, 2024
  - IEEE Robotics and Automation Lettes (RA-L): 2021, 2022, 2023, 2024
  - IEEE Transactions on Computers (IEEE Trans. Comput.): 2020
  - IEEE Transactions on Cybernetics (IEEE Trans. Cybern.): 2023
  - IEEE Transactions on Intelligent Transportation Systems (T-ITS): 2020
  - International Journal of Robotics Research (IJRR): 2025
  - Learning for Dynamics & Control Conference (L4DC): 2023, 2025
  - Springer Nature - Autonomous Robots (AURO): 2022, 2023
  - Subreviewer/Delegated Reviewer:
    * 2025: ICRA
    * 2024: RSS Pioneers
    * 2023: CAV, RSS, AAAI, EAAI
    * 2022: ISRR
    * 2021: ICRA, NeurIPS, DAC, ICCPS
    * 2020: HRI, CDC, CAV, DAC, ICRA
    * 2019: ICCPS, CLOUD

Teaching Experience

Sp 2025 — **Co-Instructor** - Formal Methods for Dynamical and Hybrid Systems (ENEE 769)
University of Maryland | College Park, MD, USA
- Class instructor: Calin Belta

Fa 2022
Fa 2020 — **Teaching Assistant** - Autonomous Cyber-Physical Systems (CSCI 513)
University of Southern California | Los Angeles, CA, USA
- Class instructor: Jyotirmoy V. Deshmukh

Fa 2018 — **Course Producer** - Introduction to Robotics (CSCI 445)
University of Southern California | Los Angeles, CA, USA
- Class instructor: Nora Ayanian

Sp 2018 — **Course Producer** - Robotics (CSCI 545)
University of Southern California | Los Angeles, CA, USA
- Class instructor: Stefan Schaal