MANAV KULSHRESTHA

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EDUCATION

Ph.D. in Computer Science, Purdue University — Expected 2027

- Specializing in scene understanding and representations for robot decision making and control through machine learning, advised by Prof. Aniket Bera.
- Current project, targetting IROS 2025, utilizes multi-modal transformers for success prediction for robotic stow in a large-scale production setting.

B.S. in Computer Science, *Summa Cum Laude* — 2018 - 2022
University of Massachusetts, Amherst

B.S. in Mathematics, *Summa Cum Laude* — 2018 - 2022
University of Massachusetts, Amherst

Relevant Graduate Level Coursework: Machine learning; Robot Learning; Robotics: Perception Dynamics, and Control; Large Language Models; Advanced Algorithms; Algorithms for Data Science; Advanced Linear Algebra; Regression Analysis...

PATENTS AND SELECTED PUBLICATIONS

- **(P88220-US01 Provisional) Machine Learning Based Selection of Item Manipulation Positions Executed by Robotic Manipulators**. Joshua Hooks, Lillian Ratliff, Bhavana Chandrashekhar, Nicholas Hudson, Hillel Baderman, Amanda Bouman, *Manav Kulshrestha*, Che Wang
- **Structural Concept Learning via Graph Attention for Multi-Level Rearrangement Planning**. Conference on Robot Learning (CoRL) 2023. *Manav Kulshrestha*, Ahmed H. Qureshi.
- **PROVES: Establishing Image Provenance using Semantic Signatures**. Winter Conference on Applications of Computer Vision (WACM) 2022. Mingyang Xie, *Manav Kulshrestha*, Jinghan Yang, Shaojie Wang, Ayan Chakrabarti, Yevgeniy Vorobeychik.

SKILLS

Languages	Python, Java, C, C++, Arduino, MATLAB, Javascript, Dafny, Coq, ARM Assembly
Tech & Frameworks	PyTorch, PyG, ROS/2, Numpy, Pandas, TensorFlow/tflite, sklearn, JAX, CoreML, Gymnasium, Sagemaker, OpenCV, AWS, ONNX, Caffe, Anaconda, Jupyter, Docker, CUDA, Matplotlib, Google NNAPI, PyBullet, MuJoCo

INDUSTRY RESEARCH EXPERIENCE

Applied Science Intern, Amazon Robotics. — May 2024 - Jan 2025

Leveraging foundation models for downstream tasks in application to robotic stowing of unknown objects into cluttered bins under high data-imbalance and object occlusion. Working with Prof. Lillian Ratliff and targeting IROS 2025.

ACADEMIC RESEARCH EXPERIENCE

Research Assistant, Purdue University, IDEAS Lab — Aug 2022 - Present

- Working on scene understanding for robotics with Prof. Aniket Bera. Current project, targeting IROS 2025, involves learned multi-agent dynamics in application to herding.
- Worked on rearrangement manipulation planning using structural concept learning with Prof. Ahmed Qureshi (published in CoRL 2023).

Research Assistant, University of Massachusetts Aug 2021 - May 2022

- Worked on persistent movement tracking for computer vision systems through the lens of perspective tracking with Prof. Erik Learned-Miller at *UMass Computer Vision Lab*.
- Honors Thesis (Improving Object Recognition and Tracking through Alignment and Optical Flow) available at UMass SCAU.

Robotics Institute Summer Scholar, Carnegie Mellon University Jun 2021 - Sep 2021

- Worked on modeling "trust" between human operators and robots working towards a common goal from an interpretability and performance perspective with Prof. Katia Sycara at the *Advanced Agent-Robotics Technology Lab*.
- Inverse Reinforcement Learning and Bayesian Probabilistic modeling for trust inference in a multi-agent system. Project presented and published at RISS 2021.

Research Intern, Washington University May 2020 - May 2021

- Worked on combating deepfakes by establishing image provenance which is robust to black-box adversarial attacks and permissive of benign transformations, with Prof. Yevgeniy Vorobeychik. Project published and presented at WACV 2022.
- Implemented a server pipeline to demonstrate proof of concept which ensures and quantifies image authenticity using its provenance.
- Trained CNN models to detect facial regions and extract feature vectors. Derived and used homography estimation to detect affine transformation between pair of images using face correspondence.

INDUSTRY EXPERIENCE

Engineering Intern, Neurala Inc. May 2019 - Aug 2019

- Implemented (from the ground up) a Android interface for an ML framework, which allows for training, inference, combining pre-trained neural nets and more – either locally (hardware accelerated) or seamlessly on a remote server machine.
- Created a prototype/demo for showcasing inference for cashier-less checkout using a camera.

INVITED TALKS

- Concept Learning for Interpretable and Efficient Robotic Agents,
  University of Washington (Robotics Colloquium), Nov 2024.
- Transfer learning for Robotics,
  Amazon Robotics (Knowledge Transfer Series), Oct 2024.
- Learning Multi-Agent Dynamics for Herding,
  Purdue University (Computer Vision and Friends), Oct 2023.
- Deep learning with PyTorch,
  University of Massachusetts at Amherst (HackUMass), Nov 2021.

AWARDS AND HONORS

Bay State Fellowship, Commonwealth Honors College Recognition, UMass Departmental Statistics Award, Vice President for ACM Machine Learning Club, Dean's List (all semesters), Outstanding UCA Award, MIT Blueprint Creativity Award, FTC World Championship, FTC Design award, FTC Innovation Award