

Neha G. Pusalkar

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Education

Oregon State University, Corvallis, OR, USA 2026 (Expected)
Doctor of Philosophy, Robotics and Artificial Intelligence (3.85/4.0)
Advisor: [Prof. Julie A. Adams](#) ([Human Machine Teaming Lab](#))

University of Michigan, Ann Arbor, MI, USA 2021
Master of Science, Robotics (GPA: 3.60/4.0)
Advisor: [Prof. Chad Jenkins](#) ([The Laboratory For Progress](#))
Project PI :[Prof. Ram Vasudevan](#) [UM Ford Center for Autonomous Vehicles \(FCAV\)](#)

Visvesvaraya National Institute of Technology, Nagpur, India 2018
Bachelor of Technology, Electronics and Communication Engineering (GPA: 8.78/10.0)

Technical Skills

- Programming Languages: C/C++, Python, Basic Javascript and C#, MATLAB, Embedded C.
- Software and Libraries: Pytorch, ROS, RViz, Gazebo, OpenCV, SolidWorks, EagleCAD, Git, Docker, Linux, SLURM
- Heterogeneous Multi-Robot Task Allocation, Game Theory, Distributed A.I, Model-based Planning, Multi-Objective Optimization, Multi-Robot Planning and Reinforcement Learning, Non-Parametric Statistical Analysis.

Publications

- [P1] **Neha G. Pusalkar**, Julie A. Adams, *Dynamic Multiple Robot Task Allocation: A Literature Review*, IEEE Access, 2026 (*In Review*)
- [P2] **Neha G. Pusalkar**, Julie A. Adams, *Preemptive Multiple Robot Coalition Reformation*, International Symposium on Distributed Autonomous Robotic Systems (DARS), 2026
- [P3] **Neha G. Pusalkar**, Julie A. Adams, *Extremely Large Collective Coalition Formation: Scalability*, International Conference on Autonomous Agents and Multi-agent Systems (AAMAS), 2026
- [P4] **Neha G. Pusalkar**, Julie A. Adams, *Leader-based Coalition Formation for Extremely Large Scale Collectives*, 2025 IEEE Conference on Artificial Intelligence, pp. 701-706, May 2025 (**Best Paper Award in Robotics/UAV**).
- [P5] **Neha G. Pusalkar**, Mark-Robin Giolando, Julie A. Adams, *Decision Support System for Autonomous Underwater Grasping*, Late Breaking Report, Companion of 2023 ACM/IEEE International Conference on Human-Robot Interaction (HRI), 2023
- [P6] **Neha G. Pusalkar**, Mark-Robin Giolando, Julie A. Adams, *Autonomous Underwater Robot Grasping Decision Support System*, Videos and Demos, Companion of 2023 ACM/IEEE International Conference on Human-Robot Interaction (HRI), 2023
- [P7] Alphonsus Adu-Bredu, Zhen Zeng, **Neha Pusalkar**, Odest Chadwicke Jenkins, *Elephants Don't Pack Groceries: Robot Task Planning for Low Entropy Belief States*, IEEE Robotics and Automation Letters (RA-L), 2022
- [P8] Xiaoxiao Du, **Neha Pusalkar**, Ram Vasudevan, Matthew Johnson-Robertson, *Angle-Regulated Transformer Network for Pedestrian Trajectory Prediction*, AI for Autonomous Driving (AI4AD) Workshop, International Joint Conference on Artificial Intelligence (IJCAI), 2021.
- [P9] **Pusalkar, N.***, Karmakar*, S., Aggrawal, R., Mali, P., Singh, A., Sarkar A., Krishna M.K., *SMA Actuated Dual Arm Flexible Gripper*, In Proceedings of the Advances In Robotics (AIR), 2019
- [P10] Banerjee, H.*, **Pusalkar, N.***, and Ren, H., *Preliminary Design and Performance Test of Tendon-Driven Origami-Inspired Soft Peristaltic Robot*, 2018 IEEE International Conference on Robotics and Biomimetics (ROBIO) 2018.
- [P11] Banerjee, H., **Pusalkar, N.**, and Ren, H., *Single-Motor Controlled Tendon-Driven Peristaltic Soft Origami Robot*, ASME Journal of Mechanisms and Robotics 10(6), 064501.
- [P12] Dharmadhikari V., **Pusalkar, N.**, Ghare, P., *Path loss exponent estimation for wireless sensor node positioning: Practical approach*, IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS), 2018.
- [P13] Patent for Humanoid Robot Swayat – Granted by The Patent Office, Government of India (Patent No.: 517158)

Research Experience

Human Machine Teaming Lab | Graduate Research Assistant

2021 – Present

Oregon State University, Corvallis, OR (Advisor: Prof. Julie A. Adams)

- Developed an event-triggered priority-driven and preemptive coalition reformation framework for heterogeneous multi-capability multi-robot systems (< 100 robots) to facilitate coalition reallocations for dynamic new tasks [P2].
- Formulated coalition reformation as a multi-objective optimization problem that was solved using lexicographic lookahead beam search resulting in $> 95\%$ successful new task assignments with $< 5\%$ coalition disruptions [P2].
- Developed LN-GRAPE-S, a scalable hedonic game-based coalition formation algorithm for up to 10,000-robot simulated heterogeneous collectives with sub-linear time and communication complexity in collective size, and theoretical guarantees on Nash stability [P3].
- Abstracted the coalition formation problem as a leader-level hedonic game, achieving ≈ 50 MB communication overhead for 10,000 robots with optimal solutions, demonstrating an average 110x communication reduction and 29x runtime improvement over GRAPE-S baseline [P3].
- Developed a collective coalition formation algorithm, LeaderGRAPE-S, that integrated a leader-follower hierarchy with hedonic game properties resulting in an average 11x lower communication and 7x faster runtime than an existing baseline (GRAPE-S) for 10,000-robot simulated heterogeneous collectives [P4].
- Conducted non-parametric statistical analysis with effect size measures to establish statistical significance of algorithmic performance differences for GRAPE-S, LeaderGRAPE-S, and LN-GRAPE-S [P3][P4].
- Reviewed > 100 papers on dynamic multi-robot task allocation and team reformation techniques, and proposed 13 classification criteria representing real-world conditions and algorithm characteristics [P1].
- Developed a Decision Support System and a User Interface using Unity that provided contextual information and assisted human operator's decision making in autonomous underwater grasping missions [P5].
- Integrated a Bravo 7 manipulator, a Trisect RGB-D camera, and a custom grasp synthesis framework via ROSbridge, and conducted field deployment in a wave pool to demonstrate successful operator-assisted grasping [P5].

Honda Research Institute (HRI), Ann Arbor, USA | Student Intern

Jan 2024 - March 2024

Supervisor: Dr. Vaishnav Tadiparthi

- Implemented a double-round auction mechanism for dynamic coalition formation for tasks with 2 different priorities and stochastic arrival times using a multi-objective utility function that consider robot's current task assignment.
- Demonstrated $\approx 29\%$ increase in task assignment success rate and $\approx 11\%$ improvement in resource utilization for prioritized dynamic task allocation over the baseline.

Laboratory for Progress | Graduate Researcher

2020 – 2021

University of Michigan, Ann Arbor, MI (Advisors: Dr. Zhen Zeng, Prof. Chad Jenkins)

- Implemented baseline POMCP using Monte Carlo Tree Search (MCTS) for the multi-object search while maintaining beliefs over object locations via Bayesian updates, and graphically visualized belief propagation and belief state entropy throughout the simulation.
- Developed a dynamic graph visualizer to visualize the supporting relations among cluttered objects as received from a ROS message, and integrated it via ROSbridge with the pose estimation module.

UM Ford Center for Autonomous Vehicles | Graduate Research Assistant

2020 – 2021

University of Michigan, Ann Arbor, MI (Advisors: Dr. Xiaoxiao Du, Prof. Ram Vasudevan)

- Developed angle-regulated transformer models that accounted for shape and smoothness of trajectories to improve pedestrian trajectory prediction. [P8]
- Implemented SOTA pedestrian trajectory prediction methods like SGAN, Social LSTM, Next Prediction, DAGnet, Social-STGCNN, and created a data loader for evaluating these methods on the Stanford Drone Dataset (SDD).

Taxi Fleet Management using a Dense Reward Structure | OSU Class Project

2023

- Developed a decentralized MARL framework for taxi fleet management in a stochastic urban environment, using a dense reward function with coverage, path length, and congestion penalties for learning optimal coverage policies.
- Demonstrated convergence of Q-learning policies to distinct coverage points across a fleet of up to 10 taxis in a 5x10 grid, with taxis learning congestion-minimizing paths without explicit coordination.

Multi-robot control using VLA | OSU Class Project

2026

- Created a custom VLA by finetuning HuggingFace's SmolVLM-256M-Instruct model using LoRA (rank 16) to predict Boids parameter weights and average velocity for 8 multiple robots moving through an office environment.

Smooth Motion Planning for Serial Manipulators with Velocity Constraints | UM Class Project

2021

- Extended RRT* and BiRRT for velocity-constrained serial manipulators by formulating a velocity-biased weighted distance metric that biases the planner to minimize trajectory execution time under joint velocity impediments.
- Proposed a minimum-time cubic spline path smoothing algorithm achieving up to 13.66% reduction in trajectory execution time over standard shortcut smoothing for BiRRT.

Medical Mechatronics Lab | Intern

May 2017 - July 2017

National University of Singapore, Singapore (Advisor: Prof. Hongliang Ren)

- Fabricated a prototype of origami-inspired soft robot using Yoshimura Origami Fold pattern and demonstrated peristaltic movement using a compression spring mechanism.
- Designed corrugated origami-inspired support structures to mitigate buckling-induced non-axial deformation.

IvLabs, Visvesvaraya National Institute of Technology, Nagpur, India | Core Member

2015 - 2016

Advisor: Prof. Shital Chiddarwar

20 DOF Kid-sized Humanoid Robot

- Generated offline walking gaits for a 20 DOF self-assembled humanoid robot using inverse kinematics and the Linear Inverted Pendulum Model while ensuring stability of Center of Mass (COM) and Zero Moment Point (ZMP).
- Developed a ROS-based decision-making algorithm for Sprint Event at the Hurocup Competition organized by the Federation of International Robot Sport Association (FIRA) in Beijing in December 2016, being the only team to represent India.

Dual Robotic Writing and Grasping Arms

- Built a 3 DOF robotic writing arm capable of writing six English alphabets and 3 DOF robotic grasping arm which could grasp and move objects using Dynamixel AX-12A motors and controlled by OpenCM-9.04.
- Generated trajectories using inverse kinematics for writing alphabets and manipulating objects while considering the arm's dextrous workspace.

Awards and Honors

- Selected as a Future Leader of AI at the ACM AI Leadership Summit 2026 with NSF Travel Grant.
- Awarded the AAMAS 2026 Student Scholarship.
- Received the Best Paper Award in Robotics/UAV vertical for the paper titled *Leader-based Coalition Formation for Extremely Large Scale Collectives* at IEEE Conference on Artificial Intelligence (CAI), 2025.

Professional Service

• Reviewer:

- AAAI Student Abstract & Poster Program Reviewer (2026) and Program Committee (2027)
- AAMAS ALA Workshop 2026, IEEE RA-L 2026, ICAPS 2025, IROS 2025, CASE 2023

• Leadership: President, Artificial Intelligence Graduate Student Association, OSU, 2024-2025

• Mentor:

- AI Application Support Program Mentor: Reviewed resumes and SOPs of students applying to graduate programs at OSU, 2024, 2025.
- Participated in a student panel with 5 other mentors to provide graduate school-related advice to approximately 25 undergraduate REU students at OSU.
- Graduate and Undergraduate Student Mentor at University of Michigan, High school student mentor at Oregon State University.

• Volunteer:

- IROS 2026, ACM AI Leadership Summit 2026, ICRA 2017
- IvLabs: Conducted robotics and basic electronics workshops for freshmen and sophomore students.