PRANAV GOYAL

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RESEARCH INTERESTS

Human-Aware Planning, Robot Learning, Multimodal Perception, Human–Robot Interaction.

EDUCATION

University of Michigan – Ann Arbor *Aug 2024 – Present*
Ph.D. Candidate in Robotics *CGPA: 4.12/4.00*
Expected graduation: Aug 2029
Advisor: Dr. Christoforos Mavrogiannis, Fluent Robotics Lab

BITS Pilani, K. K. Birla Goa Campus *Aug 2019 – Mar 2023*
B.E. in Electronics and Instrumentation Engineering *CGPA: 8.58/10*

PUBLICATIONS

Journal and Conference Papers

1. **Intent Representation and Human Distraction Modulate the Effects of Legible Robot Motion in Hallway Navigation.**
Pranav Goyal, *Andrew Stratton, Christoforos Mavrogiannis.*
ACM Transactions on Human-Robot Interaction (**THRI**), 2026. **Accepted.**
2. **How Human Motion Prediction Quality Shapes Social Robot Navigation Performance in Constrained Spaces.**
Andrew Stratton, Phani Teja Singamaneni, **Pranav Goyal**, *Rachid Alami, Christoforos Mavrogiannis.*
ACM/IEEE International Conference on Human-Robot Interaction (**HRI**), 2026.
3. **Bi3: A Biplatform, Bicultural, Biperson Dataset for Social Robot Navigation.**
Andrew Stratton, Phani Teja Singamaneni, **Pranav Goyal**, *Rachid Alami, Christoforos Mavrogiannis.*
IEEE International Conference on Robotics and Automation (**ICRA**), 2026.
4. **SocRATES: Language-Driven Scenario Generation for Evaluating Social Navigation Algorithms.**
Shashank Rao Marpally, **Pranav Goyal**, *Harold Soh.*
IEEE Robotics and Automation Letters (**RA-L**), 2026.
5. **LTLDoG: Satisfying Temporally-Extended Symbolic Constraints for Safe Diffusion-Based Planning.**
Zeyu Feng, Hao Luan, **Pranav Goyal**, *Harold Soh.*
IEEE Robotics and Automation Letters (**RA-L**), 2024.
6. **Towards Automated Void Detection for Search and Rescue with 3D Perception.**
Ananya Bal, Ashutosh Gupta,* **Pranav Goyal***, *David Merrick, Robin Murphy, Howie Choset.*
IEEE/RSJ International Conference on Intelligent Robots and Systems (**IROS**), 2023.
** Equal contribution.*
7. **A Comparison of Point Cloud Registration Techniques for On-Site Disaster Data from the Surfside Structural Collapse.**
Ananya Bal, Robert Ladig, **Pranav Goyal**, *John Galeotti, Howie Choset, David Merrick, Robin Murphy.*
IEEE International Symposium on Safety, Security, and Rescue Robotics (**SSRR**), 2022.

Manuscripts Under Review

8. **Alpaca: An Interactive Platform for Social Robot Navigation.**
Pranav Goyal, *Jiamu Liu, Andrew Stratton, Tisha Jain, Christoforos Mavrogiannis.*
Under review at HRI 2027.

9. **ACME: A Multi-Cultural, Multi-Embodiment Social-Navigation Dataset.**
Shashank Rao Marpally, Allan Wang, Atharva Ghotavadekar, Renato Alexandre Ribeiro, Nhat Le, Pilar Bachiller-Burgos, **Pranav Goyal**, *et al.*
Under review at The International Journal of Robotics Research (IJRR), 2026.

Workshop Papers and Late-Breaking Reports

10. **Rethinking Legibility in Social Robot Navigation: Impact of Intent Representation and Human Attention.**
Pranav Goyal, *Andrew Stratton, Christoforos Mavrogiannis.*
HRI Companion, 2026. Late-breaking report. *Extended in the THRI article above.*

11. **Towards Automated Scenario Testing of Social Navigation Algorithms.**
Shashank Rao Marpally, **Pranav Goyal**, *Harold Soh.*
RSS Workshop on Unsolved Problems in Social Robot Navigation, 2024.
Runner-up Best Paper Award. Extended in SocRATES (RA-L 2026) above.

RESEARCH EXPERIENCE

Fluent Robotics Lab, University of Michigan — Ann Arbor, USA
Graduate Research Assistant; Advisor: Dr. Christoforos Mavrogiannis — *Aug 2024 – Present*

- **Legible robot navigation:** Developed MPPI-based intent-expression algorithms in PyTorch and deployed them on Stretch 2. Evaluated intent representation and pedestrian distraction in two controlled studies ($N = 45$ each). First-author paper accepted to **THRI 2026**. [Code]
- **Prediction for decision-making:** Evaluated how human motion prediction quality affects navigation across planners and predictors in constrained spaces, linking prediction metrics to robot performance and human experience (**HRI 2026**).
- **Integrated robot systems:** Developing Alpaca, an interactive social-navigation platform integrating pedestrian tracking, prediction, navigation, and conversational interaction in ROS 2. First-author manuscript **under review at HRI 2027**.
- **Data for social navigation:** Contributing to Bi3, spanning two robot platforms and two cultural contexts (**ICRA 2026**), and ACME, a multi-cultural, multi-embodiment dataset (**under review at IJRR**).

CLeAR Lab, National University of Singapore — Singapore
Research Assistant; Advisor: Dr. Harold Soh — *Aug 2023 – Aug 2024*

- **Diffusion planning on hardware:** Deployed LTLDoG, a diffusion-based planner with temporal-logic constraints, as a global planner for Unitree Go2 navigation experiments (**RA-L 2024**).
- **Scenario-based evaluation:** Developed an LLM-driven ROS 2/Gazebo tool to generate social navigation scenarios for benchmarking planners and identifying failure cases (**SocRATES, RA-L 2026**; runner-up best paper, RSS 2024 workshop). [Code]
- Integrated and deployed quadrupedal navigation systems for experiments and data collection in dense, unstructured human environments, including university canteens.

Mercedes-Benz Research and Development India — Bengaluru, India
Computer Vision / Deep Learning Intern — *Mar 2023 – May 2023*

- Developed trajectory planning and a reconstruction pipeline for autonomous 3D face scanning with a WidowX robot arm.
- Developed an ArUco-marker system to measure ground-truth head position and orientation of seated vehicle occupants, supporting validation of in-cabin perception.

Biorobotics Lab, Carnegie Mellon University — Pittsburgh, USA
Research Intern / Bachelor's Thesis; Advisor: Dr. Howie Choset — *Jun 2022 – Jan 2023*

- **Legged–wheeled locomotion (DARPA VeRT):** Built a HEBI-based robot prototype and implemented kinematic control and convex model predictive control for locomotion. [Video]
- **Search-and-rescue perception (NSF):** Developed a Hierarchical Localization / COLMAP pipeline to align 3D reconstructions of multi-day Surfside drone imagery for semi-automated void detection (**SSRR 2022; IROS 2023**).
- **Contact-rich manipulation (Northrop Grumman):** Worked on hardware-in-the-loop validation of peg-insertion control using Universal Robots arms, including contact-force estimation and impedance control.

TECHNICAL SKILLS

Languages: Python, C/C++, MATLAB, R, Bash
Frameworks: PyTorch, ROS 1/2, Gazebo, OpenCV, Open3D
Planning & Learning: MPPI, convex MPC, diffusion-based planning, temporal-logic constraints, reinforcement learning, human motion prediction
Perception: 3D reconstruction (SfM, point-cloud registration), human detection and tracking
Robot Platforms: Hello Robot Stretch 2, Unitree Go2, Universal Robots, WidowX, AgileX Ranger Mini 3.0, OptiTrack

HONORS & AWARDS

- **Robotics PhD Departmental Fellowship:** First-year PhD support, University of Michigan.
- **Rackham Graduate Student Travel Grant:** University of Michigan; international conference travel.
- **Runner-up Best Paper:** RSS 2024 Workshop on Unsolved Problems in Social Robot Navigation.

TEACHING AND VOLUNTEERING EXPERIENCE

Graduate Student Instructor, ROB 204 — *Fall 2026*
Introduction to Human-Robot Systems, University of Michigan
Course Developer, ROB 498/599: Computational HRI — *Jul – Oct 2025*
Developed course assignments, Department of Robotics, University of Michigan
Teaching Assistant, Software for Embedded Systems — *Jan – Jun 2022*
BITS Pilani, Goa; Instructor: Dr. Neena Goveas
Teaching Head, Electronics and Robotics Club — *Aug 2021 – Apr 2022*
Organized courses and competitions at BITS Pilani, Goa

PROFESSIONAL SERVICE & MENTORSHIP

- **Review Service:** THRI, RA-L, ICRA, IROS, HRI, Autonomous Robots, RO-MAN.
- **Mentoring:** Jiamu Liu (University of Michigan Robotics M.S.); Atharva Ghotavadekar (BITS Pilani Goa B.E.; subsequently Research Assistant, CLeAR Lab, National University of Singapore).