Neil Janwani

Doctoral Student, Georgia Institute of Technology, Atlanta, Georgia, USA
njanwani@gatech.edu — (989) 423-4188 — https://njanwani.github.io

TECHNICAL INTERESTS

Broadly, my interests are in **robotics and human robot interaction (HRI)**. I am interested in working towards one or more of the following questions during my PhD:

1. How can we design robots and algorithms that *collaborate* with a person, especially someone who depends on that robot for their well-being?
2. How can we *interpret* qualitative objectives into well-defined robot tasks?
3. How do we maintain the *performance* of HRI systems without losing formal safety guarantees?

My technical interests are grounded in **robotics, AI, ML, and control theory**. I am eager to expand my knowledge in these areas through HRI research.

EDUCATION

Georgia Institute of Technology, Atlanta, Georgia, USA — AUG 2026 — JUN 2029
Ph.D. in Robotics

- Research Group: Dynamic Mobility Lab
- Research Advisor: Prof. Maegan L. Tucker
- Thesis: **TBD!**

Georgia Institute of Technology, Atlanta, Georgia, USA — AUG 2024 — AUG 2026
M.S. in Robotics

California Institute of Technology, Pasadena, California, USA — SEP 2020 — JUN 2024
B.S. in Computer Science

- Overall GPA: **4.0/4.3**

RESEARCH

Publications:

- **Janwani, N. C.**, Daş, E., Touma, T., Wei, S. X., Molnar, T. G., & Burdick, J. W. (2023). "A Learning-Based Framework for Safe Human-Robot Collaboration with Multiple Backup Control Barrier Functions." *IEEE International Conference on Robotics and Automation (ICRA), 2024* [Paper]

Patents:

- Shaikewitz L., Tucker M., **Janwani N.**, Ames A., "Front-leg assistive exoskeleton" *US20240245569A1*

AWARDS

NSF Graduate Research Fellowship — APR 2024
Awarded during my senior year at Caltech for my PhD at Georgia Tech. — Atlanta, Georgia

IRIM Graduate Research Fellowship — APR 2024
Fellowship offered by Georgia Tech's Institute of Robotics and Intelligent Machines. — Atlanta, Georgia

Thomas A. Tisch Prize for Undergraduate Teaching in Computing and Mathematical Sciences — APR 2024
Awarded for development and instruction of new robotics course at Caltech. — Pasadena, California

Kiyo and Eiko Tomiyasu Research Fellowship — JUL 2023
Awarded a fully funded summer undergraduate research at the Burdick Group. — Pasadena, California

Housner Fund — DEC 2023
Granted $3300 to develop a Caltech robotics course, supporting increased student interest. — Pasadena, California

PROFESSIONAL EXPERIENCE

Burdick Group, Caltech Pasadena, California
Research Fellow: Kiyo and Eiko Tomiyasu Named Scholar JUN 2023 — Present

- Applied backup control barrier functions (BCBFs) to driver assistance by leveraging driver intention to choose between multiple BCBFs with different backup controllers.
- Fused LSTM architecture for intention estimation with BCBFs without losing theoretical safety guarantees.
- Implemented algorithms on hardware and showed experimentally that human-robot alignment and general reachability of the robot was enhanced.
- Developed graphical and haptic user interface for 20+ DARPA team in accordance with team meetings and deadlines.

AMBER Lab, Caltech Pasadena, California
Research Fellow JAN 2021 — Present

- Developed a novel ankle exoskeleton built from a shin-mounted hand-shearing auxetic elastic actuator.
- Devised accurate LSTM and DNN regressors for gait state estimation from ankle-mounted IMUs.
- Designed PCBs to house electronic components, optimally placed biometric sensors, and prioritized user safety.
- Programmed field oriented control and controller communication protocol for Maxon motors using SimpleFOC.

MIT: Lincoln Laboratory Lexington, Massachusetts
Research Intern JUN 2022 — SEP 2022

- Formulated additions to linear time-invariant control methodology for sensorless control of gimbal motor.
- Refactored Simulink and Jupyter API for experimentation of sensorless control algorithms on gimbal testbed.
- Achieved accurate sensorless estimation of steady-state electrical phase in under 20 seconds.

TEACHING EXPERIENCE

Single Board Computers in Research, Caltech CS 12 Course Pasadena, California
Course founder and instructor JAN 2023 — Present

- Developed 10-week course on prototyping robotic and computing systems for research applications.
- Taught 50 students in concurrent software and circuit design, sensor interfacing, microcontroller communication.
- Wrote hands-on labs in basic circuitry, hardware input, motor control and coached groups through final projects.
- Hired and trained an undergraduate teaching assistant to assist with course activities and grading.
- Granted $3000 from Caltech in funding for larger iteration of the course for the 2024 cycle

Caltech Robotics and Computer Science Pasadena, California
Teaching Assistant JAN 2022 — Present

- Designed a differential drive robot as Robotics Head Teaching Assistant for a 35 student diversity, equity and inclusion program.
- Held office hours and wrote exam materials for classes of 100+ students in Experimental Robotics (ROS2: Python), Kinematics (ROS2: Python), Data Structures (Java), Software Design (C), and Computing Systems (x86 Assembly).

VOLUNTEER OUTREACH

Caltech Y Pasadena, California
Tutor OCT 2021 — JUN 2023

- One-on-one tutored secondary school students in math, physics, and robotics

GENERAL SKILLS

- **Programming Languages:** `Python, C/C++, x86 Assembly, OCaml, Haskell, Java`
- **Software:** ROS1&2, Linux, Git, Catkin, (Ignition) Gazebo, OpenCV, PyTorch, TensorFlow, CVXPY, MuJoCo, Scipy, Scikit-learn, OpenAI API, Matplotlib, Bokeh, Numpy, Pandas, Selenium, BeautifulSoup, MATLAB/Simulink, Solidworks, SimpleFOC