

# SHIYU FENG

Atlanta, GA • Phone: 5102298611 • [shiyufeng@gatech.edu](mailto:shiyufeng@gatech.edu) • [Website: shiyuf.github.io](https://shiyuf.github.io) • [LinkedIn: shiyu-feng](https://www.linkedin.com/in/shiyu-feng)

## RESEARCH INTERESTS & SUMMARY

---

- Engages in research involving Vision-based Navigation, Perception, Motion Planning, Optimal Control, Collision Avoidance, Robot Safety, and Autonomy. Additionally, interested in exploring the combination of control, motion planning, and deep learning as a prospective avenue for future research beyond the existing scope.
- Created real-time hierarchical navigation systems through C++ and Python in ROS/Gazebo simulation and real robots.
- Extensively worked with real-time cameras, quadrupedal and mobile robots, autonomous vehicles, etc.

## TECHNICAL SKILLS

---

Robotics Skills: perception, computer vision, sample- and optimization-based motion planning, visual servo, collision avoidance, trajectory optimization, linear and nonlinear control, model predictive control, robot localization and mapping, kinematics and dynamics modeling, optimal control, real-time system, machine learning, geometry, linear algebra, calculus

Programming Languages: C/C++, Python, MATLAB, LabVIEW

SDKs: ROS, Gazebo Simulation, Eigen, PyTorch, TensorFlow, OpenCV, PCL, CasADi, ACADOS

Hardware: Turtlebot, PyRobot/LoCoBot, Stretch, Unitree A1, Kinect Depth Camera, RealSense D435i

Tools: Linux, GitHub, Jira, Weka, SolidWorks

Languages: Chinese, English

## EDUCATION

---

### Ph.D. Candidate in Mechanical Engineering, focused on Robotics

August 2016 – Expected December 2024

Georgia Institute of Technology, Atlanta, GA, USA

- The George W. Woodruff School of Mechanical Engineering GPA: 4.00/4.00
- Advisor: Dr. Patricio A. Vela (ECE Department); Co-advisor: Dr. Jun Ueda (ME Department)

### Master of Engineering in Mechanical Engineering

August 2015 – May 2016

University of California at Berkeley, Berkeley, CA, USA

- Department of Mechanical Engineering, Controls GPA: 3.43/4.00

### Bachelor of Science in Mechanical Engineering

September 2011 – July 2015

Chongqing University (CQU), Chongqing, China

- Department of Mechanical Engineering GPA: 3.73/4.00 (Ranked in the top 1%)
- Graduated as an Outstanding College Graduate

## SELECTED PUBLICATIONS

---

- [1] S. Feng, Z. Zhou, J. S. Smith, M. Asselmeier, Y. Zhao, and P. A. Vela. "GPF-BG: A Hierarchical Vision-Based Planning Framework for Safe Quadrupedal Navigation," IEEE International Conference on Robotics and Automation (ICRA). 2023.
- [2] S. Feng, A. Abuaish, and P. A. Vela. "Safer Gap: Safe Navigation of Planar Nonholonomic Robots with a Gap-Based Local Planner." in IEEE Robotics and Automation Letters, 2024.
- [3] S. Feng, Z. Wu, Y. Zhao, and P. A. Vela, "Image-Based Trajectory Tracking Through Unknown Environments Without Absolute Positioning," in IEEE/ASME TMECH, vol. 27, no. 4, pp. 2098-2106, 2022.
- [4] S. Feng, F. Lyu, J. Ha Hwang, and P. A. Vela, "Ego-centric Stereo Navigation Using Stixel World," IEEE International Conference on Robotics and Automation (ICRA), Xi'an, China, 2021, pp. 13201-13207, 2021.
- [5] R. Xu, S. Feng, and P. A. Vela, "Potential Gap: A Gap-Informed Reactive Policy for Safe Hierarchical Navigation," in IEEE Robotics and Automation Letters, vol. 6, no. 4, pp. 8325-8332, 2021.

## RESEARCH & WORK EXPERIENCE

---

### Graduate Research Assistant

May 2017 – Present

*Intelligent Vision and Automation Lab, Georgia Tech* | **Advisor:** Dr. Patricio A. Vela

**Project:** Hierarchical Stereo Navigation with Sparse Representation

- Created a sparse ego-centric perception space using stereo cameras with varying levels of features to describe local environments and track temporal sensing information for real-time motion planning and collision checking, which offers five times faster computational efficiency and scalability across workstations and lightweight embedded devices.
- Designed safety-guaranteed motion planning methods to achieve 0% collision rates for holonomic and nonholonomic dynamics involving model predictive control (MPC), potential fields, and control barrier functions, which improves safety performance of classical planning techniques in configuration space, such as A\* and RRT.
- Established an image-based trajectory tracking method with SLAM and visual servo to improve accuracy by 28%.
- Implemented a vision-based navigation framework (GPF-BG) for quadrupedal robots to obtain 10% more success rates.
- Developed real-time navigation system architectures containing perception, planning, SLAM localization, and control modules for different platforms: mobile robots, mobile manipulation robots, snake-like robots, and quadrupedal robots.
- Conducted quantitative research on navigation performance in ROS/Gazebo simulation and real robots (Turtlebot, LoCoBot, Stretch, Unitree A1) with stereo cameras, depth cameras, laser scanners, and LiDAR.
- Trained deep learning neural networks to intelligibly select ego-centric collision-free trajectories from stereo images, which involves machine learning and computer vision.
- Research to deploy reinforcement learning models for navigation and object searching in a mobile manipulation task.

### Perception Engineer Intern

May 2018 – August 2018

*ADAS Team, Seres (SF Motors), Santa Clara, CA* | **Supervisors:** Chongyu Wang, Fan Wang

- Implemented C++ OpenCV algorithm to achieve stop-line and traffic light detection through classical computer vision.
- Contributed to deep learning traffic detection and data preparation.
- Deployed classical and learning-based algorithms in autonomous driving field tests.
- Assisted in completing camera installation, sensor calibration, and real-time image acquisition.

### Graduate Researcher

September 2015 – May 2016

*MPC Lab, University of California at Berkeley* | **Advisor:** Dr. Francesco Borrelli

**Project:** Fault Tolerant Control in Autonomous Driving, Perception

- Developed the main sensor data association algorithm in Python with an external optimization solver.
- Tested the sensor association algorithm in simulation and on a real autonomous driving car.

## LEADERSHIP & TEACHING EXPERIENCE

---

### ORS and VIP Undergraduate Research Mentor

August 2019 – May 2024

*School of Electrical and Computer Engineering, Georgia Tech*

- Supervised and organized 8+ undergraduate research projects on vision-based navigation with SLAM, perception, planning, teleguidance, human-robot interaction, control, deep learning, software, hardware design, etc. Offering help and support to undergraduate researchers.

### Teaching Practicum

August 2021 – December 2021

*School of Mechanical Engineering, Georgia Tech* | **Supervisor:** Dr. Jun Ueda

Course ME 3017: System Dynamics

- Participated in the creation of course materials, assignments, and exams while also offering guidance through office hours. Delivered portions of lectures and supported undergraduate students in addressing their academic inquiries.

### Graduate Teaching Assistant

August 2016 – August 2018

*School of Mechanical Engineering, Georgia Tech* | **Supervisors:** Dr. Thomas Kurfess, Dr. Christopher Saldana

Course ME 2110: Creative Decisions and Design

- Worked in collaboration to create course materials, assignments, and exams while offering office hours.
- Instructed on mechatronics and machining training while overseeing machining open labs.
- Acted as the lead TA for a semester, organizing TA training and open labs, and coordinating the final competition.