

Andrew Zheng

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EDUCATION

Clemson University

Clemson, SC

Master of Science in Mechanical Engineer, Dynamics & Control Systems, December 2023

Cumulative GPA: 3.87/4.00

Bachelor of Science in Mechanical Engineering, Minor in Math, May 2021

Cumulative GPA: 3.86/4.00

Honors: Magna Cum Laude

SKILLS

Software: ROS1, Gazebo, Linux, Git, CoppeliaSim, CasADi, Oracle VM Virtualbox, Tensorflow, Anaconda, Simulink, Solidworks

Programming Language: C++, Python, Matlab, LaTeX, VBA Excel, Shell Script, CMake

PROFESSIONAL EXPERIENCE

DyCo AI Lab, Research Specialist, Clemson, SC

Jan 2024 - Present

- Developed a real-time perceptive legged locomotion adaptation module for off-road navigation for quadruped, resulting in legged robot to walk through terrains such as ramps, stairs, and stepping stones.
- Documentation of project workflow to ensure traceability and development of future roadmaps.

Clemson University, Teacher Assistant, Clemson, SC

August 2021-May 2023

- Enhanced knowledge and critical thinking of students by highlighting key concepts covered in course.

Parker Hannifin TechSeal, Mechanical Engineer Intern, Spartanburg, SC

May 2019 – Aug 2019

- Performed nondestructive damage control by identifying defective rubber seal product, saving \$5000+ in product sales.
- Designed and validated manufacturing process to create military gaskets of up to \$50,000 for Staver Hydraulics.
- Conducted ASTM D142 Tensile Test to ensure product meet customer quality.
- Programmed data searching algorithm to analyze runtime/downtime of company's vulcanizers.
- Identify strengths and weakness of new mechanical splicing to company's traditional splicing process.

RESEARCH EXPERIENCE

DyCo AI Lab, Graduate Research Assistant, Clemson, SC

May 2021 – Dec 2023

- Designed robot motion command interface using C++ ROS, increasing the ease of utilizing and integrating high-level motion commands such as joystick control, target poses, and motion planning trajectories.
- Developed novel navigation algorithm that guaranteed safety and convergence, which was integrated in real-time onto a quadruped robot.
- Modeled a hybrid switched system and implemented a model predictive control law to track trajectories for legged robots in MATLAB.

DyCo AI Lab, Undergraduate Research Mentor, Clemson SC

May 2022 – Dec 2023

- Coordinated and guided robotic research theses for undergraduate honors students, leading to successful research in motion planning and state estimation.

SELECTED PUBLICATIONS

- **Andrew Zheng**, Sriram S.K.S. Narayanan, and Umesh Vaidya. "Safe Navigation Density: Analytical Construction". *IEEE Robotics and Automation Letters (RA-L)*, 2023.
- Joseph Moyalan, **Andrew Zheng**, et. al. "Off-Road Navigation of Legged Robots using Linear Transfer Operators". *Model, Estimation, and Control Conference (MECC)*, October 2023. Awarded Best Robotics Paper

PROJECTS

DIRA Lab Motion Capture System

- Setup localization system using Phasespace Motion Capture system for accurate robot navigation.

Deep Koopman Autoencoder

- Developed custom physics-informed autoencoder using Tensorflow capable of identifying physical parameters of dynamical systems.

Quadruped Robot Challenge

- Participated in Quadruped Robot Challenge hosted in IEEE Robotics and Automation Society (ICRA) 2023
- Integrated high-level density algorithm for legged robot to traverse through a disaster environment

Tail Landing Controller

- Designed a multi-linked tail controller algorithm to aid locomotion underactuated quadruped on contact-critical terrain

Undergraduate Research

- Integrate sensor fusion algorithm utilizing 2d lidar and camera for navigation of mobile vehicle in Gazebo simulator

RELEVANT COURSEWORK

Mechanical Design: Fundamentals of Machine Design

Thermodynamics: Foundation of Thermal and Fluid Systems, Heat Transfer

Dynamic & Controls: Modern Control, Modeling & Analysis of Dynamic Systems, Classical Controls, Vibrations, Advanced Controls, Applied Optimal Control

Fluid Flow: Fluid Mechanics, Compressible Flow

Mathematics: Linear Algebra, Numerical Methods, Statistical Analysis, Complex Variables

Computer Science: Applied Deep Learning

PUBLICATIONS

- Joseph Moyalan, Sriram S.K.S Narayanan, **Andrew Zheng**, and Umesh Vaidya. "Synthesizing Controller for Safe Navigation using Control Density Functions". Accepted at *American Control Conference (ACC)*, 2024.
- Sriram S.K.S. Narayanan, **Andrew Zheng**, and Umesh Vaidya. "Safe Motion Planning for Quadruped Robots Using Density Functions". *Indian Control Conference (ICC)*, 2023.
- **Andrew Zheng**, Sriram S.K.S. Narayanan, and Umesh Vaidya. "Safe Navigation Density: Analytical Construction". *IEEE Robotics and Automation Letters (RA-L)*, 2023.
- Joseph Moyalan, **Andrew Zheng**, et. al. "Off-Road Navigation of Legged Robots using Linear Transfer Operators". *Model, Estimation, and Control Conference (MECC)*, October 2023.
- Sarang Sutavani, **Andrew Zheng**, et. al. "Artificial Neural Network Based Terrain Reconstruction for Off-Road Autonomous Vehicles Using LiDAR". *Ground Vehicle Systems Engineering and Technology Symposium (GVSET)*.
- Alex Krolicki, Dakota Rufino, **Andrew Zheng**, et al. "Modeling Quadruped Leg Dynamics on Deformable Terrains using Data-driven Koopman Operators". *Modeling Estimation and Control Conference (MECC)*, September 2022, Conference Presentation

AWARDS & SCHOLARSHIPS

- 2023 Best Robotics Paper Award from ASME DSC
- President's List (4.0 GPA)
- Dean's List (3.50+ GPA)
- Clemson Scholars
- Lancaster Endowed Memorial Scholarship
- SC Palmetto Fellows Enhancement
- SC Palmetto Fellows Scholarship