

# Andrew Zheng

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## EDUCATION

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### Clemson University

Clemson, SC

*Master of Science in Mechanical Engineer, Control Systems*, May 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

## PROFESSIONAL EXPERIENCE

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### DIRA Lab, Research Assistant, May 2021 – Present

Clemson, SC

- Integrated robot motion planning framework using C++ ROS, increasing the ease of integrating standard planning algorithms for robot navigation
- Developed and integrated novel safe navigation algorithm using analytical density functions for quadruped locomotion
- Developed linear time-varying model predictive controller in MATLAB for legged robot system, increasing the tracking capabilities.
- Developed modular physics-informed neural network using Tensorflow capable of identifying physical parameters of dynamical systems

### Clemson University, Mentor, May 2023 – Present

Clemson, SC

- Coordinated and guided robotic research theses for undergraduate honors students

### Clemson University, Teacher Assistant, August 2021-May 2023

Clemson, SC

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

### Parker TechSeal, Mechanical Engineer Intern, May 2019 – Aug 2019

Spartanburg, SC

- Performed nondestructive damage control by identifying defective rubber seal product, saving \$5000+ in product sales
- Designed and validated manufacturing process to create batches 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 newly mechanical splicing to company's traditional splicing process

## SELECTED PUBLICATIONS

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- **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". Submitted to *Model, Estimation, and Control Conference (MECC)*.

## PROJECTS

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### DIRA Lab System Setup

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

### 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

### Deep Koopman Autoencoder

- Created custom autoencoder model to learn physics informed linear operator with neural networks

## Undergraduate Research

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

## SKILLS

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

**Programming Language:** Python, Matlab, C++, LaTeX, PLC, VBA Excel

## RELEVANT COURSEWORK

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**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

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- Sriram S.K.S. Narayanan, **Andrew Zheng**, and Umesh Vaidya. "Density Functions for Safe Navigation of Robotic Systems in Dynamic Environments". Submitted to *American Control Conference (ACC)*, 2024.
- Joseph Moyalan, Sriram S.K.S. Narayanan, **Andrew Zheng**, and Umesh Vaidya. "Synthesizing Controller for Safe Navigation using Control Density Functions". Submitted to American Control Conference, 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

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- 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