Ardalan Aryashad

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Education

University of Southern California   *Los Angeles, CA*
Ph.D in Mechanical Engineering   *August 2023 – Present*

- GPA: 3.9/4.0

Sharif University of Technology   *Tehran, Iran*
B.Sc in Mechanical Engineering   *Sep 2018 – August 2023*

- GPA: 3.80 (18.18/20.0)

Publications

Aryashad, A and Jin, Y. "VLAG: Graph-Based Planning for Vision-Language-Action Models in Long Horizon Manipulation Tasks," to appear in *Proceedings of ASME 2025 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference*, IDETC2025, Aug 17-20, 2025, Anaheim.

Experience

Impact Laboratory   *Los Angeles, CA*
Research Assistant   *August 2023 – Present*

- Designed and implemented a new robotic manipulation task in *CausalWorld*, utilizing the PyBullet physics engine in Python to simulate the task.
- Implemented customized reward functions for reinforcement learning (PPO2) in the new task.
- Developing a novel graph-based method for vision-language-action models using the CALVIN dataset.
- Developing an AI agent to assist engineers in Model-Based Systems Engineering (MBSE), Based on SysML.
- Responsible for integrating the AI agent with MBSE tools; currently developing a plugin for Visual Paradigm that enables automatic diagram design via a chat interface with the agent.

Formula Student Racing (FSAE)   *University of Southern California*
Suspension and DAQ Member   *August 2024 – Present*

- Built a Raspberry Pi NAS (Network Attached Storage) to make sharing log files easy for the team members during test days and competition.
- Simulated the response of the wheel package to various bump inputs, analyzing the impact on tire grip using linear tire and damper models.
- Conducted an optimization study to determine the optimal sprung-to-unsprung mass ratio, maximizing traction for improved vehicle performance.
- Assisted in the manufacturing of suspension components, including A-arms, upright assemblies, and spring-damper assemblies.

Peer Reviewer   *Professional Service*

- Reviewer for IDETC-CIE 2025: International Design Engineering Technical Conferences & Computers and Information in Engineering Conference.
- Reviewer for International Journal of Computer Integrated Manufacturing.

Teaching Assistant   *Sharif University of Technology*

- Applied Finite Element: Instructing students in Abaqus software for FEA simulations, and mentored student groups through semester project development and simulation.
- Fundamental of Automatic Control Design: Provided guidance and mentorship to student groups in Simulink MATLAB for simulating semester projects.

Skills

Software: Simulink, Simscape, SolidWorks, Abaqus, NX.

Programming languages: Matlab, Python, C/C++, Java, LaTeX.

Prototyping: Arduino, Raspberry Pi , 3D Print, Lathe, Soldering.

Projects

Simulation and Control of Biped Robot *Project Website*

- Developed a 2D biped robot model in MATLAB Simscape, incorporating physical constraints, dynamics, gravity and contact modeling for accurate and realistic simulation.
- Designed and implemented PD controllers for joint actuators, ensuring stable control over biped robot movements during simulations.
- Applied linear quadratic regulator (LQR) control to optimize robot performance in standing and balancing.
- Implemented Model Predictive Control (MPC) for dynamic tasks such as walking forward and backward, while integrating gait scheduling to manage foot placement and body trajectory.

Inwardly Folding Umbrella Design

- Conducted an ethnographic study analyzing user interactions with umbrellas to identify key design improvements such as water management, ergonomics, and compact storage.
- Analyzed multiple morphological variants, leading to the selection of an inwardly folding umbrella for enhanced convenience and water containment.
- Designed an integrated sliding handle mechanism for smooth umbrella operation, and created a detailed CAD model of the umbrella design using SolidWorks.
- Constructed two prototype iterations using 3D printing and existing umbrella components to validate the mechanical performance of the linkage mechanism.

Automotive Predictive Maintenance Application *Project Website*

- Preprocessed a Kaggle dataset with over 19,000 data points, handling outliers and normalizing features for improved model accuracy.
- Implemented and tested multiple classification algorithms and models, including Naïve Bayes, SVM, Decision Trees, and MLP.
- Developed an interactive UI using the Flet package, allowing users to input vehicle parameters and receive maintenance predictions.
- Integrated a maintenance scheduler with interactive calendar features, enabling users to accept or decline suggested service dates.

Optimal Control of Semi-Active Suspension System

- Developed and simulated a quarter-car suspension model in MATLAB/Simulink to analyze vehicle ride dynamics, incorporating variable damper for semi-active systems.
- Designed a PID controller to regulate the semi-active suspension response, optimizing ride comfort and stability via key ride quality metrics such as settling time, peak overshoot, and damping ratio.
- Applied Genetic Algorithm (GA) parameter optimization to fine-tune the controller parameters; minimizing body displacement and suspension deflection while maintaining tire contact force.

Honors and Awards

- **Andrew and Erna Viterbi Graduate Student Fellowship**, Department of Aerospace & Mechanical Engineering, University of Southern California, 2023.
- **Ranked 146th out of 144,000 students** in the National University Entrance Exam, Mathematics branch, Iran, 2019.