Khushant Khurana

●Phone Number ● Email ● Portfolio● GitHub ● LinkedIn

EDUCATION

The Cooper Union for the Advancement of Science and Art, New York City, NY Expected May 2025
Master Of Engineering in Mechanical Engineering GPA: 4.0/4.0

The Cooper Union for the Advancement of Science and Art, New York City, NY Aug 2020 - May 2024
Bachelor of Engineering in Mechanical Engineering GPA: 3.81/4.0

INDUSTRIAL EXPERIENCE

Aviation Systems Engineer Intern | *Garmin* May 2024 - Aug 2024

- Modelled the short period dynamics of an aircraft - linearized trim state models, servo dynamics, and structural mode filters - to design a PD controller for pitch attitude hold.
- Developed an optimization scheme to tune the gains of the PD pitch controller, in flight, using Newton Raphson method and tested it on the Hardware-in-the-loop (HIL) test bench.
- Developed an optimization scheme to tune the same PD gains in simulation using gradient descent.

Controls Intern | *Oshkosh Corporation* May 2023- Aug 2023

- Modelled and simulated Modular Battery Thermal Management System in Amesim Simcenter to help the design team with their choice of mechanical devices through various parameterized simulations.
- Integrated the Modular Battery Thermal Management System model with Simulink and co-simulation to foster the development of the model based control laws.
- Developed a Python script to automate extrapolating a Medium Duty Vehicle's E-motor's efficiencies and generate a completed 2D test dataset for easy injection into the Amesim model.
- Modelled the E-motor and the vehicle in Amesim Simcenter using the generated test data set to determine the thermal loss when subjected to UDDS drive cycle.
- Developed a Python script to automate the process of extracting CAN signals from a .mat file, removing high frequency noise, and down sampling according to the user requirements to allow easier processing for Hardware-in-the-loop systems.

RESEARCH

Using constrained sparse identification of non-linear dynamics (SINDY) to model flight dynamics and designing model predictive controller for trajectory tracking. | *Cooper Union* June 2024 - Present

LEADERSHIP EXPERIENCE

Steering Sub System Lead | *Cooper Union Formula Motorsports Team* Aug 2022 - April 2023

- Analyzed 2021's car track data for multiple laps to validate the steering geometry for 2022's car.
- Machined tie rod clevises, toe link clevises, rocker mounts, control arm clevises, wheel pegs, brake bobbins, pedal spacers, and shock end caps using mill and lathe.
- Designed the steering stops and performed an impact test to ensure its longevity.

Suspension Sub System Lead | *Cooper Union Formula Motorsports Team* Aug 2021 - May 2022

- Worked on the spring and damping mechanism of the 2020's Formula car using a quarter car model from Amesim Simcenter and analyzed vehicle's behavior under various damping coefficients.
- Conducted a tire model study using data from Tire Testing Consortium to determine the nominal loading conditions, such as lateral force and aligning moments, and wheel alignment parameters for the used tires.
- Validated the 2021's suspension geometry and chosen suspension parameters, such as castor and king pin inclination, using multibody simulations provided by Amesim Simcenter.
- Designed the control arms, rockers, and push rods for the suspension assembly and validated the linkages using Finite Element Analysis.

PROJECTS

Controlling Data Driven Systems Using System Identification and Model Reduction | *Cooper Union* Jan 2024 - May 2024

- Subjected datasets - flow over airfoil and dynamics' models - to Principle Component Analysis (PCA) and Singular Value Decomposition (SVD) for model reduction.
- Performed system id using methods such as Dynamic Mode Decomposition (DMD), Eigenanalysis Realization Algorithm (ERA), and Sparse Identification of Non Linear Dynamics (Sindy) to generate linear models for non-linear systems.
- Designed controllers such as Linear Quadratic Controller (LQR) and Model Predictive Control (MPC) to control the low dimensional systems.

Implementing Guidance, Navigation, and Control System for a Missile to have a Successful Target Interception. | *Cooper Union*
Nov 2023 - Dec 2023

- Designed a Linear Quadratic Gaussian Controller for estimating and controlling the longitudinal state of a missile to intercept a target projectile.
- Implemented a simple 2D geometric model as the guidance system of the missile and a traditional PID controller for tracking the commanded flight path angle.

Implementing a PID controller on Irobot Create for wall following while mapping an enclosed space | *Cooper Union*   Sep 2022 - Dec 2022

- Designed a PID controller for Irobot, using Robotic Operating System (ROS), to follow the external parameter of an enclosed space.
- Implemented a mapping algorithm that discretized the 2D space into a dynamic matrix and stored the robot's position as a grid point.

Simulating Dynamics and Controllers for Unmanned Aerial Vehicle | *Cooper Union*   Sep 2022 - Dec 2022

- Implemented and simulated a 12 DOF model for fixed wing dynamics with linear aerodynamic models of the control surfaces.
- Designed PID controllers for the linear roll, pitch, and yaw autopilots to follow a pre-set trajectory.
- Implemented Kalman Filters and linear quadratic regulators to do the same but for the non-linear model.

AWARDS AND CERTIFICATIONS

Summa Cum Laude Graduate | *Cooper Union*   May 2024
Tau Beta Pi Engineering Honor Society | *Cooper Union*   2023 - 2024
Half Tuition Scholarship | *Cooper Union*   2020 - 2024
Dean's List | *Cooper Union*   2020 - 2024

SKILLS

Coding: Python, MATLAB, LaTeX , Simulink, C++

Programs: Robotic Operating System (ROS), Amesim Simcenter, SOLIDWORKS,Arduino C, Ansys Workbench, Microsoft Office,

Languages: English, Hindi, Punjabi