

SAUMIL JAIN

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EDUCATION

Clemson University - Greenville, SC May 2024
Master of Science - *Automotive Engineering* GPA: 3.95/4
Courses: Automotive Systems Integration, Advanced and Electrified Powertrains, Automotive Electronics Integration, Advanced Estimation, Electric & Hybrid Powertrains, Automotive Control Systems, Robust Predictive Control

Savitribai Phule Pune University - Pune, India April 2020
Bachelor of Engineering – *Mechanical, First class with distinction* GPA: 8.73/10

EXPERIENCE

Lead Powertrain Engineer | Deep Orange 15, Clemson University Jan 2023 - Present

- Developing an autonomous series hybrid off-road rescue vehicle for King of the Hammers using Systems Engineering V-model.
- Developing a closed loop torque vectoring algorithm that uses suspension travel and IMU data to maximize traction.
- Leading the development of control software for the integration of 6 YASA MGUs, 6 Cascadia CM200 Inverters, 42kWh battery along with a Cummins R2.8 engine using a rapid control prototyping module and MATLAB C code generation.
- Building an energy management controller, which limits the sum of motor torques based on maximum cell temperature and absolute moving average of the power exchanged through the battery.
- Building a CAN network involving 5 buses comprising of 19 nodes, using J1939 and OEM dbc structures for communication.
- Creating a rule-based supervisory controller to maintain optimal State of Charge (SoC) throughout the race by regulating the diesel engine's power output while ensuring immediate response to the driver's power demands at any point in the race.
- Created a novel control architecture using model-based design that allowed ease in transition from MIL to HIL to vehicle testing.
- Modeled a battery, motor, engine in Simulink to select subsystem components that meet requirements and minimize lap time.

Research Assistant | VIPR-GS, Clemson University Aug 2023 - Present

- Improved vehicle control software developed on MATLAB Simulink and Stateflow for a series hybrid tracked vehicle.
- Designed a motion controller with PI and feedforward for optimal torque distribution based on velocity and yaw.
- Programmed the control module to display system states and fault codes onto a safety remote controller using CAN messages.

Associate Engineer | MAHLE Engineering Dec 2021 - July 2022

Graduate Engineer Trainee | Varroc Engineering Dec 2020 - Dec 2021

PROJECTS

Hardware in the loop testing of an Electric motor Dec 2023

- Built a test bench to test a Curtis AC-9 Induction motor using dSPACE RTI to interface a simulated vehicle model on a drive cycle.
- Used dSPACE control desk to create a dashboard to see the torque, speed and current of the motor in real-time.

Non-Linear Model Predictive Controller for an Electrically Assisted Turbocharger Dec 2023

- Modelled an electrically assisted turbocharger that recovers wasted heat for a parallel diesel hybrid on MATLAB Simulink.
- Cost function penalizes torque deviation from demand and fuel consumption, with turbo motor torque as the optimizing variable.

Stochastic planner for control of a Microgrid Nov 2023

- A scenario-based approach for implementing a stochastic MPC for an islanded microgrid that aims to minimize the energy cost.

Lane Keeping and Adaptive Cruise Control on a RC Car Dec 2022

- Implemented a simple Kalman filter along with a discrete PID to optimally control throttle and steering.
- Tuned the PID controller to achieve centering of vehicle and distance from forward object within a settling time of 1 second.

Model-based Design of an Electric Motorbike on Simulink Using Simscape May 2023

- The model consisted of a PMSM motor, controller, & battery pack. Brief analysis over FTP-75 drive cycle to simulate performance.
- Motor was speed controlled using a PID. The PID output was converted into ABC phase currents using inverse Park and Clark transforms. PWM control of inverters was achieved by comparing the output of the PID & actual phase currents of the motor.

Parallel Hybrid Powertrain Model on Simulink Dec 2022

- Modelled a parallel hybrid for a cargo van and achieved 133% increase in fuel economy compared to conventional powertrain.
- A BSFC look up map was used to find out the optimal torque for any given RPM, the remainder of the torque demand is absorbed the motor generator units. A rule-based strategy on Stateflow that minimizes the BSFC for any power demand was used.

Longitudinal Lap Time Simulator for a Series Hybrid Vehicle June 2023

- Lap time simulation by modeling simple point mass kinematics and motor curves to generate vehicle acceleration.

Formula SAE | Team Acceleracers | Vice-Captain | Powertrain head Nov 2017 - Feb 2020

- Responsible for sub-system specification of E-powertrain. Worked on component selection & integration of Motenergy ME1616, Kelly KLS motor controller and 7kWh lithium-ion battery pack made up of Samsung 30Q cells and managed by Orion BMS.
- Designed and built 4 Formula SAE cars over the tenure. Won multiple national awards and competed internationally.

SKILLS

MATLAB, Simulink, Stateflow, Simscape, C/C++, Raptor, Python, Java, canDB++, CANKing, GTSuite, CATIA V5, Siemens NX, Solidworks, Ansys Workbench, StarCCM+, Ricardo, Arduino IDE, Systems Integration, Technical Reports, Literature Review, Prototyping, Reverse Engineering, Project Management