

# SAUMIL JAIN

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## EDUCATION

**Clemson University** - Greenville, SC Aug 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 Intern | 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.
- Leading the development of control software on a RTOS for the integration of 6 YASA MGUs, 6 Cascadia CM200 Inverters, 42kWh HV battery along with a Cummins R2.8 engine using a rapid control prototyping module and MATLAB C code generation.
- Designing a vehicle state supervisor to manage communication between users and subsystems, facilitating transitions to desired operational states.
- Building a CAN network involving 5 buses comprising 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. The controller caps motor torque based on max cell temperature and the average power exchanged through the battery.
- Built state machines for different HV components such as battery, on board charger, DC/DC converter to ensure proper functioning and handling of faults in a safe manner.
- 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, and their thermals in Simulink to select components that meet requirements and minimize lap time.

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

- Designed a motion controller with PI and feedforward for optimal torque distribution based on velocity and yaw.
- Improved vehicle control software which was developed on MATLAB Simulink and Stateflow for a series hybrid tracked vehicle.
- Added a safe mode to enable very precise slow maneuvers and added sensitivity adjustments to velocity and yaw demands.
- Integrated an on-board charger using J1939 CAN messages to add charging and export capabilities to the vehicle.

**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 Model Predictive Controller for a Microgrid** Dec 2023

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

**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 PI. The PI output was mapped to quadrature current which was transformed into 3 phase currents using inverse Park and Clark transforms. PWM control was achieved by comparing the reference & actual phase currents.

**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, the remainder of the torque demand is absorbed by the MGU.

**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.
- Makes use of battery peak and continuous power specifications to simulate derates and calculate lap time.

**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, self-made 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, dSPACE, RTOS Python, Java, canDB++, CANKing, GTSuite, CATIA V5, Siemens NX, Solidworks, Ansys Workbench, StarCCM+, PSIM, LTSpice, Systems Integration, Technical Reports, Literature Review