# DHRUVAL JAVIA

Dhruval is an ingenious mechanical engineer, enthusiastic about solving global climate and energy problems through innovation and sustainability-driven outlook. With two years of experience, he is adept in thermal and electrochemical system modelling and analysis.

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### **EDUCATION**

Year	Institute	Qualification
2024 – present	Stanford University	M.S. in Mechanical Engineering
(Expected 06/2026)	(CA, United States)	(Depth in Energy Systems)
2018-2022	Indian Institute of Technology, Bhubaneswar (Odisha, India)	B. Tech. in Mechanical Engineering



# **ACADEMIC PROJECTS**

# **EFFICIENT BATTERY THERMAL MANAGEMENT SYSTEMS FOR EV**

# 2021-2022 | Final year B. Tech. thesis project | Supervisor: Dr. B. R. Pattabhi

- The project was aimed at improving the effectiveness and efficiency of the battery thermal management system by reducing the cell capacity degradation caused due to temperature effects.
- An air-cooled cylindrical battery pack was considered for this purpose and different cell arrangements and flow patterns were studied to reduce the temperature variation across the cells and the peak cell temperature.
- The degradation studies were done through numerical simulations in COMSOL software. For this, a coupled 1-D electrochemical and 2-D thermal model of the battery pack was used for the numerical simulations. This was further coupled with a capacity fade model to account for cell capacity degradation.
- A tapered cell arrangement of 26650 type of Li-ion cells was found to have the best overall performance.
- The work was published in a paper titled "Design of lithium-ion battery packs for two-wheeled electric vehicles" in the "Energy Storage" journal having an impact factor of 3.2.
- The project work was also nominated for the "Best Thesis Award" in my batch at IIT Bhubaneswar.

### MACRO-SCALE DESIGN ASPECTS OF EV BATTERY PACK

2021 | Summer research internship project | Supervisor: Dr. Sundararajan Natarajan (IIT Madras) and Dr. B. R. Pattabhi (IIT Bhubaneswar)

- Performed preliminary battery pack design calculations by initially developing a system of equations in **EXCEL** and later implementing it in a MATLAB app for a better GUI experience. The app can also be used to analyse the effect of critical battery pack design parameters on the performance of the battery pack.
- Wrote MATLAB code for generating data for single cell current variation with time based on the adopted vehicle velocity profile by using a simple vehicle dynamics equation. This was used as an input to the microscale numerical simulation of cell discharge done by the other group member.



**TECHNICAL SKILLS** 

SolidWorks

ANSYS
COMSOL
Arduino
Python
MATLAB
Cantera

# **WORK EXPERIENCE**

# THERMAX LTD. | Graduate Engineer Trainee | August 2022 – July 2024

- Gained practical experience in areas of mathematical modelling, manufacturing process, product troubleshooting, failure analysis and commissioning related to a boiler and thermic fluid heater.
- Performed tasks such as boiler furnace modelling in EXCEL using stirred reactor and plug flow models, data driven modelling of boiler in EXCEL, tracking a boiler unit on factory shop floor stage-wise end-to-end and suggesting points for manufacturing process improvement and automation, site visit & subsequent report generation for Residual Life Analysis (RLA) and Root Cause Analysis (RCA) activities.
- Lead a team project involving standardisation of the design and techno-commercial offering of a biomass-fired thermal oil heater. Activities involved include P&ID study, grate sizing & BOP/auxiliary equipment sizing, layouting and thermal & pressure drop simulations. Have used DIN 4754 and BS 845 standards for maximum film temperature and efficiency calculations.
- The project led to a 7.4% reduction in total weight and a 10.2% decrease in total footprint area as compared to the previous design.
- As part of the project, I developed a simplified thermal model of the APH, Economizer and MPA furnace in EXCEL with VBA automation to iteratively design the heater, and validated it with existing data. The model provided inlet/outlet temperature values within 2%, 6% and 10% error in APH, Economizer and MPA furnace respectively.

# **EXTRA-CURRICULAR ACTIVITIES**

- Associated with the **robotics society** and **music society** (as a drummer) at IIT Bhubaneswar (2018-2022).
- Held the position of **Student Placement Coordinator** (2022) and *coordinated with various internal and external stakeholders* such as institute's placement cell, company recruiters and students for ensuring a smooth placement process.
- Participated and lead a team of 4 members in the **annual e-yantra robotics competition** (eYRC 2019-2020) organized by IIT Bombay.
- Achieved **5th rank** out of 82 participants in the **GrabCAD shop challenge** (2020) held online on the GrabCAD community website. The challenge involved *designing an innovative product which can be 3d printed*; have made a *2-in-1 mechanical hand blender cum egg beater*, and have submitted CAD files along with a stress analysis report. **SolidWorks** and **ANSYS** was used for CAD modelling and analysis.
- Achieved **2nd rank** in the *eastern fusion group music competition* **"Sargam"** organized as a part of Spring Fest 2020 at IIT Kharagpur.