

# Rohit Sengar, MASc

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## Highlights

- Fast Learner
- Always Curious about learning new things
- Diverse Knowledge
- Highly Motivated and Work Enthusiastic
- Punctual and Smart Worker
- Good Communication Skills and Experienced in Team Lead

## Employment History

Jan 2021 - May 2021	General Labour. Topline Farms
May 2021 - September 2021	General Labour. Exkkor Manufacturing
September 2021 - May 2022	Graduate Assistant, University of Windsor.
	Research Assistant at BMS Lab, University of Windsor.
July 2022- Dec 2022	Research Assistant at BMS Lab, University of Windsor.
Feb 2023 - Oct 2023	Systems Engineer at Stellantis (Fiat Chrysler Automobiles)
Oct 2023 - June 2024	State Estimation Data Engineer at Stellantis(Fiat Chrysler Automobiles)

## Education

Jan 2021 – May 2022	M.A.Sc., Electrical and Computer Engineering, University of Windsor. Thesis title: <i>Analysis and Improvement of Electrochemical Impedance Spectroscopy.</i>
Sept 2015 – July 2019	B.E., Mechanical Engineering, Aligarh Muslim University. CGPA: 8.3/10.
Sept 2012 – July 2015	Diploma, Mechanical Engineering, Aligarh Muslim University. Percentage: 83/100.

## Skills

Design and Simulation Softwares	IBM Rhapsody, AutoDesk 360, SOLIDWORKS, Ansys, Solid EDGE, NX Unigraphics
Manufacturing Skills	PCB Printing, Soldering, and 3D Printing (Ender 3 v2)
Software Skills	PLC Programming (Allen Bradley and Siemens), Proteus, Xlink, MatLab, Simulink and State Flow, Python, C, Latex, HDL, Mits Pro by Arbin, Gamry Framework.
Hardware Skills	Aurdino, Raspberry Pi, ESP32
Technical Skills	Data Analysis, Data Collection, Experiment Design, Machine Learning, Mathematical Techniques for Estimation, Frequency Domain Analysis, Time Domain Analysis, Control Techniques
Communication Skills	CAN communication, LIN Communication, Ethernet communication and I2C

# Projects

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## State Estimation Data Engineer Projects

- **Enhancement of 2RC model of Battery** Added Hysteresis Component on top of normal 2RC Model Implemented that in the Prototype and Production Software
- **Handling bugs related to Battery Management System Software** minor bugs which affect the estimation were captured using vehicle data and corrected
- **Development of Model in Loop Environment for testing SOX estimation algorithm** Matlab (Simulink) model was developed for estimating State of Charge, State of Health, State of Power in noise scenarios by injecting noise to the plant model

## Systems Engineer Projects

- **Implementation of Secure Idle feature**  
Broke Down requirements to secure the vehicle whenever Power Panel is used
- **Select Speed Control feature**  
Implementation of Select Speed Control feature for low speed off-road functions
- **Limiting vehicle Speed When Power Frunk is left open**  
Identifying the Scenarios when Power Frunk is open or popped up  
Generation of CAN Signals to identify both conditions  
Limiting the Speed when both scenarios are open
- **Radio based Park and Neutral gear shifting of Vehicle**  
Taking inputs from Radio for Park and Neutral Conditions  
Generating Control Strategies to use inputs from vehicle when Gear Shifter is faulted

## Control Projects

- **Control System of Tesla for the study of regenerative braking** (Jan 2021 - April 2021)  
Used a PID controller to account for acceleration and braking  
Used a simple and effective braking control strategy to switch between regenerative and friction braking  
Made a Simulink-Simscape model  
Compared the energy and range (with or without regenerative braking)
- **Optimised Control system of 2 gear transmission for effective torque-speed performance** (May 2021 - September 2021)  
Study the effect of Single and 2 gear transmission system  
Optimization of transmission system based on acceleration, grading and top speed constraints using Genetic Algorithm  
Comparison of Optimized and Non-Optimized Gear Ratios
- **Control System Design for Antilock Braking System** (Jan 2022 - April 2022)  
Designed an LQR controller for braking of vehicle  
Compared LQR controller with rule based controller

## Design Projects

- **Design and Fabrication of Autonomous Underwater Vehicle for SAUVC 2018**  
Designed an Autonomous Underwater Vehicle (AUV) in SOLIDWORKS  
Fabricated two custom battery packs with 22.2 V and 9.9 Ah power.  
Leak proofing of AUV such that all electronics doesn't get damaged.  
Programming of thrusters, IMU, Pressure Sensor using Raspberry Pi  
**Designing and fabricating PCBs using iron- printing and ferric chloride technique**  
Tested the Vehicle at controlled performance tests in swimming pool
- **Remotely Operated Underwater Vehicle**  
Fabricated a Remotely Operated Underwater Vehicle for demonstration purposes in order to gather funds for SAUVC competition  
Used two thrusters and programmed using Arduino.

## Projects (continued)

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- **Design and Simulation of Underwater Torpedoes**  
Used hit and try methods to design and simulate the torpedo in ansys fluent

### Power Electronics Projects

- **Development of battery charger using PI control of Tapped-inductor Cuk converter (24V 4 Amp)**  
(September 2022-Dec 2022)  
Used the equations of Tapped-inductor bi-directional Cuk converter to write its transfer function  
Designing a PI controller to have current and voltage control  
Programming the charging logic in simulink and converting it to HDL.  
Designing and testing of Circuit in Proteus followed by printing PCB and soldering of components.

### Diploma

- **Remotely Operated Underwater Vehicle with Rotatable Thrusters**  
Fabricated our own thrusters using brushless motor and CPU fans  
Controlled the thrusters and servo motors using Servo Testers  
Make a full control board of 2 thrusters and two servo motors for multiple motions

### Projects for fun

- Piano in Matlab operated using keyboard
- Python app for managing details of Multiple Projects
- HDL code generation of SOC Estimation in batteries using Matlab and Simulink

## Research Publications

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### Journal Articles

- 1 M. Abaspour R. Sengar, P. K. B. S. B. B. (2022). Robust approach to battery equivalent circuit model parameter extraction using electrochemical impedance spectroscopy. *IEEE -TMECH (Under Review)*.
- 2 R. Sengar, S. S., B. Balasingam. (2022). Battery parameter analysis through electrochemical impedance spectroscopy at different state of charge levels. *MDPI-JLPEA (Under Review)*.

### Patents Publications

- 1 6 PIN UNDERWATER ELECTRICAL CONNECTOR. (2018, September 14) 201811027144 A.
- 2 A LOW COST AUTONOMOUS UNDERWATER VEHICLE (AUV) HAVING FIVE DEGREES OF FREEDOM AND MINIMUM OF TWO THRUSTERS. (2018, September 14) 201911014948 A.
- 3 CLUTCH CUM ACCELERATOR. (2018, September 7) 201811027149 A.

## Achievements

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**Won People's Choice Award in SAUVC 2018**

## Most Proud Of

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**Founding Member of MTS AUV ZHCET Club (<https://www.mtsauvzhcet.com/>)**