SOUMYORAJ MALLICK

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RESEARCH INTEREST

Theory: Control Systems, Machine Learning, Heat Transfer, Fluid Mechanics
Applications: Lithium Ion Batteries, Photorechargeable Batteries, Energy Storage Systems

EDUCATION

Texas Tech University — Lubbock, TX
Doctor of Philosophy (Ph.D.) in Mechanical Engineering — Aug 2024 - Present

Queen's University Belfast — Belfast, UK
Master of Science (MSc.) in Mechanical Engineering with Management — Sep 2019 - Dec 2020

Heritage Institute of Technology — Kolkata, India
Bachelor of Technology (B.Tech.) in Mechanical Engineering — Jul 2015 - Jul 2019

PUBLICATIONS

Published Journals

1. P. K. Singh*, **S. Mallick***, G. A. Kaur, S. Balayan, A. Tiwari, John B. Goodenough's pioneering contributions towards advancements in photo-rechargeable lithium batteries. Nano Energy, 128 (A) (2024), p. 109792.
2. N. Soni, P. K. Singh, **S. Mallick**, Y. Pandey, S. Tiwari, A. Mishra, A. Tiwari, Advancing sustainable energy: Exploring new frontiers and opportunities in the green transition. Advanced Sustainable Systems, (2024), 2400160.
3. **S. Mallick**, D. Gayen, Thermal behaviour and thermal runaway propagation in lithium-ion battery systems – a critical review. Journal of Energy Storage, 62 (2023), p. 106894.

Under Review/ In Preperation

1. S. Ghosh*, **S. Mallick***, T. Roy, Estimation of Short Circuit Current in Batteries using Koopman Operator. American Control Conference, (2024) *[Submitted]*.

Academic Presentations

1. "Future Prospects of Energy Storage: Beyond Lithium-Ion Battery," *European Advanced Materials Congress (EAMC)*, Sep 2023.
   (a) Received the best poster presentation award.
2. "Recent Advances in Photo-rechargeable Batteries: A Comprehensive Review," *International Conclave on Materials, Energy & Climate (ICMEC)*, Dec 2022.

TECHNICAL SKILLS

Programming Language: Python
Numerical Analysis: ANSYS, MATLAB
Design Tools: SolidWorks, AutoCAD
Platforms: MS Office, LaTeX

AWARDS & ACHIEVEMENTS

1. Distinguished Graduate Student Assistantship (DGSA) fellowship at the Texas Tech University, 2024.
2. Best Poster Presentation Award at the European Advanced Materials Congress (EAMC), 2023.
3. International Postgraduate Taught Scholarship worth 3000 GBP at the Queen's University Belfast, 2019.

RESEARCH EXPERIENCE

Research Centre in Sustainable Energy — Queen's University Belfast 2019 - 2020
Thesis: Design study to minimize/eliminate shunt currents from Vanadium Redox Flow Battery with CFD exploration/validation of designs – Potentially Sponsored by Horiba MIRA.

- Investigated and developed solutions to minimize shunt currents in Vanadium Redox Flow Battery (VRFB), focusing on innovative manifold designs and reducing leakage currents under static and dynamic conditions.
- Introduced bubble forming device, reed valves, earthing devices, incorporated to enhance energy density of VRFB systems, thereby improving capacity and efficiency for grid-level storage applications.
- Utilized SolidWorks for design, simulation and validation of design innovations, contributing to the development of high-performance flow battery systems.

Queen's University Belfast 2019 - 2020
Project I: Low Density Polyethylene oriented tape production.

- Processed Low Density Polyethylene (LDPE) films using a film-forming process with an extruder and stretched using a film stretching unit at varying temperatures.
- Investigated the effects of molecular structure in both machine and transverse directions, analyzed fracture points of LDPE tapes utilizing the INSTRON 5564 universal testing machine.

Project II: Topology optimization of a cantilever beam.

- Utilized MATLAB's fmincon function to solve non-linear equations to plot and understand optimal solutions for a cantilever beam.
- Executed Finite Element Analysis (FEA) using ABAQUS to predict the cantilever beam's shape and performance under continuous loading conditions, ensuring durability after a 60% volume reduction.

Project III: Design and failure analysis of a CubeSat model.

- Engineered the various parts of a CubeSat and solar panel, integrated the assembly using SolidWorks.
- Conducted modal and harmonic response analysis to evaluate the fatigue and damage tolerance of the assembly in ANSYS.

Heritage Institute of Technology 2018 - 2019
Project: Fabrication & experimentation of a small-scale anaerobic bio-digester using domestic biodegradable solid waste.

- Developed two floating drum type bio-digester designs using SolidWorks, focusing on automatic pressure control and minimizing losses in the second design compared to the initial design.
- Fabricated the complete bio-digester design, estimating that monthly consumption of a cylinder liquefied petroleum gas (LPG) could be replaced by approximately two cylinders of biogas using the proposed setup.

PROFESSIONAL EXPERIENCE

Graduate Part-Time Instructor — Texas Tech Univeristy, *Lubbock, TX* Aug 2024 - Present

- Assisted in instructing and guiding students through lab exercises, ensuring understanding of control system concepts and practical applications.
- Provided support during lab sessions, helped students troubleshoot issues, and assist in grading lab reports and assignments to evaluate student performance.

Seller Partner Support Associate — Amazon Development Centre, *India* Jun 2022 - Jul 2024

- Provided prompt, efficient service to Sellers through clear, effective communication by managing sensitive issues to ensure a seamless selling experience.
- Proposed improvements through logical reasoning and data interpretation, while collaborating with internal teams to resolve complex seller issues, maintaining high performance metrics, and delivering high standards.

Seller Identity Verification — Amazon Development Centre, *India* Apr - Jun 2023

- Demonstrated expertise and trust in handling sensitive seller information and contributing to the development of improved verification processes.

INTERNSHIP & TEAMWORK EXPERIENCE

Pre - Ph.D. — Institute of Advanced Materials, *Sweden* Jun - Dec 2022

- Investigated cutting-edge techniques, materials and and performance of photorechargeable lithium-air batteries to enhance the efficiency, contributing to the development of sustainable energy solutions.

Intern — Calcutta Metropolitan Development Authority, *India* Jun - Jul 2018

- Learned about production of drinking water from river water, critical steps including chlorination, filtration, and other essential methods to ensure safe and clean drinking water.

EXTRA CURRICULAR ACTIVITIES

Volunteer — Anthony Nolan's Belfast Marrow, *Belfast, UK* Nov 2019 - Feb 2020

- Raised awareness and engaged with the community to promote the importance of stem cell donations and supported efforts to advance bone cancer treatment.

Member — Queen's Robotic Society, *Belfast, UK* Oct 2019 - Feb 2020

- Organized events, mentored participants by fostering a collaborative, innovative environment and contributed to weekly robotic competitions.

CERTIFICATIONS AND WORKSHOPS

1. Participated at Advanced Materials World Congress (Online), Oct 2022.
2. Participated at European Assembly Advanced Materials (Online), Aug 2022.
3. Participated at European Advanced Materials Congress (Online), Jul 2022.
4. Composite Design Workshop XXII (Online), Stanford University, Jan 2022.
5. Awarded Graduate Plus for Master Your Leadership Skills, Queen's University Belfast, Dec 2020.
6. Accomplished Leadership in Practice course, Royal Military Academy Sandhurst Group, Jan 2020.
7. Attended Automobile and IC Engine Design Workshop, Indian Institute of Technology Indore, Nov 2018.
8. Attended Introduction to Automobile Engineering, Jadavpur University, Mar 2018.
9. Attended Automobile and IC Engine Workshop, Indian Institute of Technology Kharagpur, Mar 2018.

REFERENCES

References available upon request.