Dev Patra

Chemical Engineering –Polymer and Materials Engineering Minor

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https://devpatra07.github.io/ (Visit Personal Website for More Info.)

About Me

Technical Palette	Python, MATLAB, DWSIM, CATIA, R, ChemDraw 3D, Plotdigitizer, Endnote, Windows, Excel.
Languages	Full Professional Proficiency – English; Elementary Proficiency- Hindi, Marathi Native Proficiency – Bengali
Work Domain	Neural Network Model Predictive Control & Control Systems (PID), Fault Detection & Diagnostics, GUI Development, Mathematical Modelling, Thermodynamic Modelling, Artificial Neural Networks, Optimization & Algorithms, AI/ML.
Skills	Critical thinking, communication, problem-solving, management, leadership
Interests	Designing & Reading,

Education

Institute of Chemical Technology, Mumbai Marathwada Campus, Jalna (2021 – Present)

- Integrated Master of Technology in Chemical Engineering (Major)
  Polymer and Materials Engineering (Minor): Current CGPA – 9.91/10 (Upto 10th Trimester)

Chhatrapati Shivaji Junior College (2019-2021)

- Physics, Chemistry, Mathematics, Biology (HSC Board): Grade – 89.83 %

St. Teresa Convent School (2006-2019)

- SSC Board: Grade – 86.80 %

Work Experience

Reliable Process Design Solution (RPDS) (Pune, Maharashtra)
Data Analytics Intern *March 2024 – June 2024*

- Applied Neural Network Model Predictive Control **(NN-MPC)**, conventional MPC, and **optimized PID controllers** for **industrial batch polymerization reactors**, achieving **40% faster process completion** while delivering a comprehensive cost-utility trade-off analysis for optimal control strategies.
- Implemented and optimized PID controllers using **differential evolution algorithms**, achieving a **70% reduction in setpoint settling** and significantly improving process responsiveness.
- **Developed robust Python-based applications**, including **intuitive GUIs using Tkinter** and **dynamic web apps with Streamlit**, streamlining data processing and user interaction.
- **Identified 20 distinct faults** in the **Tennessee Eastman Process (TEP)** using **AI, statistical analysis, and machine learning**, enhancing **fault detection and diagnostics** with advanced analytical techniques.

Defence Institute of Advanced Technology, DRDO **(**Pune, Maharashtra)
Research Intern *September 2023- October2023*

- Actively involved in developing an Artificial Neural Network-based metaheuristic model for predicting the potential of biochar to remove heavy metal pollutants from industrial wastewater effluent.
- Working with different nature-inspired algorithms, including Particle Swarm Optimization (PSO), Cuckoo Search Algorithm, Teaching Learning-Based Optimization (TLBO), Genetic Algorithms and many more.

Bombay Technologist **(**Jalna, Maharashtra)
Research Intern *March 2023-April 2023*

- Performed an extensive literature review, established a database of relevant properties, and developed code for various thermodynamic models.
- Completed the manuscript and conducted a comprehensive literature survey, in addition to developing crucial code for the project's success.

PUBLICATIONS

Research Article:

Dev K Patra, Debashis Kundu*, Generalized Pitzer-Debye-Hückel (PDH) framework for the deep eutectic solvent assisted extraction of europium (III), americium (III), and uranium (VI), Taylor and Francis.

Dev K Patra, Debashis Kundu*, Systematic Exploration of COSMO-SAC-PDH and EXT-UNIQUAC-PDH* Models for Rare-Earth Element Leaching in Deep Eutectic Solvents, American Chemical Society (ACS)

Book Chapter:

Dev K Patra, Debashis Kundu*, Deep eutectic solvent in dissolution of lanthanide, actinide and recovery of value-added materials from electronic waste, Elsevier

Conference

Presented a paper titled *Predictive Models for Removing Heavy Metal Water Pollutants with Biochar: Exploring Neural Networks and Machine Learning* at the **International Conference on Machine Learning and Data Engineering (ICMLDE 2024)** in Dehradun.

PROJECTS

Smart Biochar Modeling: AI and ML Approaches for Heavy Metal Removal from Water

- Developed and tested **12 Metaheuristic-ANN models**, including frameworks like *Cuckoo Search Algorithm-ANN (CSA-ANN), Teaching-Learning-Based Optimization ANN (TLBO-ANN), Particle Swarm Optimization ANN (PSO-ANN), Grey Wolf Optimization ANN (GWO-ANN), Krill Herd Algorithm-ANN (KHA-ANN), Firefly Algorithm, and Harmony Search*
- Explored **22 ML models** featuring traditional techniques like Support Vector Machines (SVM), Gaussian Process Regression (GPR), kernels and advanced *custom ensemble models* with *boosted trees, bagged tress as well as LS Boost* for robust and interpretable predictions.
- Collaborated with Defence Institute of Advanced Technology (DIAT-DRDO) under the guidance of Dr. Amrita Nighojkar, and with Vellore Institute of Technology (VIT), partnering with co-authors Rajdeep Chaudhuri and Jayashree Paul to enhance the scope and impact of this research.

Work Under Review:

Polymer Structure Builder Software

Developed a software tool (GUI-Based) designed to construct large polymer structures in **1D, 2D, and 3D** through innovative replication and manipulation techniques.

- Features include **replication**, **merging**, **axis swapping**, and **linking** functionalities to create intricate polymeric architectures.
- Integrated a comprehensive **repository of structures**, offering pre-designed and customizable templates for quick access and modification.

Extracurricular

Web Design Head & Treasurer – Techfest AAKRITI 1.0

Led the web design team, creating an interactive digital platform, while managing finances to ensure smooth planning and execution of the tech festival.

Editor – MARJAL (ICT Mumbai, MARJ Campus)

Edited *MARJAL*, the biannual magazine of ICT Mumbai, MARJ Campus, for two years. Oversaw content creation, managed a team of writers, and ensured high-quality publications.

CERTIFICATIONS

- Quantum chemistry Thermodynamic approach — ZastraInnovations
- National Programme On Technology Enhanced Learning (Python for Data Science) — IIT Madras
- National Intellectual Property Rights — Ministry of Commerce and Industry, Government of India