DEEPAK KUMAR

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EDUCATION

Ph. D. in Chemical Engineering $Aug\ 2022 - present$

Indian Institute of Technology (IIT) Delhi, India (CGPA: 8.91/10)

M. Tech. in Chemical Engineering $Jul\ 2019 - Jun\ 2021$

Indian Institute of Technology (IIT) Delhi, India (CGPA: 9.233/10)

B. Tech. in Chemical Engineering $Jul\ 2014 - May\ 2018$

Indian Institute of Technology (Indian School of Mines) (IIT ISM) Dhanbad, India (CGPA: 7.25/10.0)

RESEARCH EXPERIENCE

Doctoral Researcher $Aug\ 2022 - present$

Department of Chemical Engineering, IIT Delhi

- Developing a novel Model Predictive Control based on real-time model update.
- Proposed and executed a real-time fault detection mechanism with variance capturing.

Research Scientist $Feb\ 2022 - Jul\ 2022$

Deeppro Pvt. Ltd., New Delhi, India

- Utilized Bayesian Design of Experiments (DOE) and implemented Gaussian process and LSTM-based hybrid models for chemical process optimization, improving RMSE value by 95%.
- Conducted anomaly detection in chemical processes using LSTM autoencoders and Graph Neural Network.
- Implemented DDPG-based Deep Reinforcement Learning for optimal performance tracking.

Research Associate $Jul\ 2021 - Jan\ 2022$

Supervisor: Prof. Anurag S Rathore

- Collaborated on predicting acute decompensated heart failure using machine learning.
- Conducted extensive data analysis, including univariate and multivariate analysis on medical datasets.
- Implemented a Generalized fast Recursive Feature Elimination algorithm to enhance feature selection efficiency.

Graduate Researcher $Jan\ 2020 - Jul\ 2021$

Supervisors: Prof. Anurag S Rathore and Prof. Manojkumar C Ramteke

- Developed a kinetic model for protein production in bioreactors.
- Implemented Genetic Algorithm (GA), Particle Swarm Optimization (PSO) and Gradient Descent for model parameter estimation and multi-objective optimization.

PUBLICATIONS

1. **D Kumar**, U Goswami, M Ramteke, H Kodamana, "VFFAE: A Variance-capturing Forward-forward Autoencoder for Fault Detection and Isolation in Chemical Processes." Process Safety and Environmental Protection 178, 176–194. (2023) DOI: 10.1016/j.psep.2023.07.083 (PDF)
2. **D Kumar**, N Gangwar, AS Rathore, M Ramteke, "Multi-objective optimization of monoclonal antibody production in bioreactor." Chemical Engineering and Processing-Process Intensification 180, 108720. (2022) (PDF)

SKILLS

Computer skills
- Languages: Python, Java, MatLab
- Developed software for Design of Experiments for Pharma Industries.
- Developed android app for heart failure prediction which is used by AIIMS Delhi surgeons.

Organisational skills
- Volunteered in largest Chemical Engineering conference of India, ChemCon 2019.
- Organized Aqua Rocket and Chem Hydraulica events annual tech fest 2015 of IIT(ISM).

AWARDS AND HONORS

- Prime Minister's Research Fellowship (2022)
- Top 1% in IITJEE 2014 and Top 2% in GATE 2019
- Best Sports Person of the Year, 2016 and 2017 at IIT(ISM)