Utkarsh Dogra

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Education

- **Indian Institute of Technology Delhi** — *New Delhi, DEL*
  Bachelor and Master of Technology in Chemical Engineering — Oct. 2020 - Jun. 2025
  - Master of Technology in Chemical Engineering — 9.592/10
  - Bachelor of Technology in Chemical Engineering — 8.942/10
- **DAV Public School** — *Nadaun, HPR*
  Central Board for Secondary Education (CBSE), New Delhi — Apr. 2006 - Apr. 2020
  - AISSCE (Class XII) — 97.20%
  - AISSE (Class X) — 96.67%

Research Experience

- **Modeling Instabilities for Taylor Couette Flow over Elastic Surface** — *Aug. 2024 - Present*
  Prof. Paresh P Chokshi, Indian Institue of Technology Delhi — New Delhi, DEL
  - Analytically solved the instability problem for simpler case of **2-D Gel-Fluid** Problem using Cartesian Coordinates
  - Numerically solved the problem using **Chebyshev Collocation** | Validated both the results against Literature Plots
  - Working on **Taylor Couette Flow** for **2** cases | Treated **Interior** and **Exterior** Cylindrical Surfaces as **Gel** separately
  - Understanding the **Neo-Hookean** behavior of Gel over **Linear** to check for any Quantitative Changes in prediction
- **Stabilising High Proportion of Nanoemulsion in Skin Cleansers** — *May 2024 - Jul. 2024*
  *Research and Development Intern, **R&D Center Hindustan Unilever Limited*** — Mumbai, MAH
  - Devised a novel way to boost Nanoemulsion Proportion using **Acrylate Polymers** | Increased quantity by **3 times**
  - Employed **Natural Thickeners** and **Acrylate Blends** to evaluate suitable Rheology Modifier | Created **12** Samples
  - Stability Testing: Used **Freeze/ Thaw,** $50°C$ and **Centrifugation** techniques, pointing to the use of **Acrylate Blends**
  - Utilized **Lifshitz-Slyozov Surface Force Model** to verify results | Discerned **Acrylate Blends** as better Thickeners
- **ML Based Simulation of Direct Reduced Iron (DRI) Producing Plant** — *May 2023 - Jul. 2023*
  Prof. Hariprasad Kodamana, CAPS Lab (Indian Institute of Technology Delhi) — New Delhi, DEL
  - Engineered an Optimization Technique, augmenting **DRI Yield** by integrating Downstream and Upstream Models
  - Simulated Direct Reduction **MIDREX** process using **Extreme Gradient Boosting** and **Gaussian Process Modeling**
  - Digitized Temperature, Flow and Concentration Profiles data to generate **Sample Data Set** for feeding ML models
  - Skills: Numpy, Pandas, Sklearn, Web Plot Digitizer, Regression Algorithms, Numerical Techniques, Data Analysis

Master's Thesis

- **Modeling of Dye Sensitized Solar Cells (DSSCs) using Impedance Spectroscopy** — *Jan. 2024 - Present*
  Prof. Ashok N Bhaskarwar, Adsorption and Ion Exchange Laboratory (Indian Institute of Technology Delhi) — New Delhi, DEL
  - Conducted **6** week-long experiments to understand the **DSSC** mechanism | Acquired data for validation of model
  - Electrochemical Impedance Spectroscopy (EIS): Analytically derived the **EIS Equations**, absent in known literature
  - Single Diode Model: Developed a **First Principle Model** to predict characteristics drawing similarities from **Diode**
  - Working to refine the *First Principle Method* | Comparing it with the existing models present in the current literature

Scholastic Achievements

Indian Institute of Technology Delhi

- **Institute Silver Medal:** Ranked 1 among **51** ChemE Students | Maintained **9.3+ SGPA** for **4** straight Semesters (2024)
- **Teaching Assistance:** Mentored **105+** sophomores in Transport Phenomena and **100+** juniors in Mass Transfer (2024)
- **Semester Merit Award:** Conferred Semester Merit Award for being among **Top 7%** for **6** consecutive semesters (2024)
- **INOX Fellowship: 1 of 4** students recognized with **INR 25K** by Alumni Affairs, IITD for Academic Excellence (2024)
- **Endowment Merit Scholarship:** Received **INR 100K** among **130+** 4^{th} year students for securing highest CGPA (2023)

Early Academic Achievements

- **Mukhyamantri Protsahan Yojana:** Bestowed with **INR 75K** by GoHPR for top **5%** State Rank in JEE Advanced (2023)
- **Joint Entrance Examination (JEE):** Secured **99.81** percentile in JEE Main | Among top **1.79%** in JEE Advanced (2020)
- **CBSE Academic Recognition:** Granted **0.1% Merit Certificate** for a **100%** score in Science and Math in Class X (2018)
- **Olympiads:** State Rank **6**, International Rank **140** in the 1^{st} Stage; State Rank **15** in the 2^{nd} Stage of the SOF IMO (2016)

Skills

- **Languages and Software:** Python, Mathematica, Aspen HYSYS, MATLAB, LaTeX, Autolab NOVA, Advanced Excel
- **Laboratory Work/ Instrumentation:** Cyclic & Linear Sweep Voltammetry (LSV), Tensiometer, Viscometer, pH Meter

University Course Projects

- **Graphical Analysis of Pollutants in diferent Zones of India** *Mar. 2024 - Apr. 2024*
  Prof. Hariprasad Kodamana, Statistical Methods for Chemical Engineering
  ◦ Cleaned Dataset having **3000+** data points to eliminate unnecessary data regarding **Real Time** levels of pollutants
  ◦ Ascertained the alarming pollutants **PM10** and **PM2.5** within National Capital Region | **Skills:** Python, Power BI

- **Efficient Energy Consumption Prediction Model** *Feb. 2024 - Mar. 2024*
  Prof. Manojkumar Charandas Ramteke, Process Data Analytics
  ◦ Utilized **3** distinct ML techniques to determine how various conditions influence energy consumption in a location
  ◦ Determined that **Random Forest Algorithm** yields best model | Appraised through **RMSE** and **Confusion Matrix**

- **Business Models by Manufacturers for EV Penetration** *Oct. 2023 - Nov. 2023*
  Prof. Anil Verma, Electrochemical Conversion and Storage Devices
  ◦ Overviewed business models for **E-Mobility** | Implementation classified by Organizational and Technical factors
  ◦ Studied market share of several firms in **India** | Compared **Battery Leasing** and **Collaborative Charging Models**

- **Simulation of Cyclohexane Production from Benzene and Hydrogen** *Apr. 2023 - May 2023*
  Prof. Abhijeet Raj, Chemical Process Technology and Economics
  ◦ Recreated Cyclohexane Production Process using Aspen HYSYS, integrating **13** Unit Operations in modeled plant
  ◦ Amplified overall process conversion to **99.97%** from **99.7%** by replacing single reactor with two reactors in series

- **Analytical and Preparative Scale Chromatographic Techniques** *Mar. 2023 - Apr. 2023*
  Prof. Anurag Singh Rathore, Introduction to Industrial Biotechnology
  ◦ Led a group of 10 students to analyze the working principles of Analytical and Preparative Scale Chromatography
  ◦ Explored **Green Analytical Chromatography** for revamping traditional techniques | **62%** solvent waste reduction

- **Investigating Crystallization of Anti-Freeze Protein (AFP) Found in Biological Systems** *Oct. 2022 - Nov. 2022*
  Prof. Manjesh Kumar, Crystal Growth and Engineering
  ◦ Investigated time-varying synthesis of AFP present in Snow Fleas and the Anti Freezing Mechanism of the protein
  ◦ Studied a significant application of lowering the freezing point by $6°C$, extending the Shelf Life of Human Organs

- **Accumulator Design for Steady-State Boiler Operation using Numerical Methods** *Apr. 2022 - Mar. 2022*
  Prof. Gaurav Goel, Chemical Engineering Thermodynamics
  ◦ Conquered complex problem by a simple implementation of Linear Interpolation to find the Accumulator Volume
  ◦ Accurately predicted results over pressure range of **800 to 950 Pa**, with possibility of operational regime expansion

- **Mathematical Modelling of Anaerobic Transformation of Biomass to Biogas** *Oct. 2021 - Nov. 2021*
  Prof. Jayati Sarkar, Numerical Methods in Chemical Engineering
  ◦ Exploited the kinetic data to construct a mathematical model consisting of Kinetic System of Differential Equations
  ◦ Implemented Modified Adomian Decomposition Method to predict concentrations for **5** days while solving model

Positions of Responsibility

- **SAC Secretary, Vindhyachal House** *Jun. 2022 - May 2023*
  Student Affairs Council, Indian Institue of Technology Delhi
  ◦ Oversaw PG Mentorship Project with BSW, compiled **15+** responses from PhD Scholars for executing Mentor's role
  ◦ Collaborated with HODs to improve Project Portal visibility | Resolved infrastructure issues of **400** hostel students

- **QC Representative, Vindhyachal House** *Jul. 2021 - May 2022*
  Quizzing Club (BRCA), Indian Institute of Technology Delhi
  ◦ Promoted **"The Great Wave of Quizzes"**, annual QC event, inviting 50+ students from various colleges across NCR
  ◦ Organized Institute-Level Freshers Workshops, yielding **3 Podium Winners** from Vindhyachal hostel during tenure

Social Endeavors and Extra Curricular Activities

- **Viaan Teaching Project Volunteer** *Oct. 2023 - Nov. 2023*
  National Service Scheme, Indian Institute of Technology Delhi
  ◦ **1 of 11** volunteers selected to make Science/ Math Assignments for Afghan Refugees, focusing on core Math topics

- **Contactless Switch Mechanism for Tulsi-Bead Making Device** *May. 2023 - Jul. 2023*
  Rural Technology Action Group (RuTAG), Indian Institute of Technology Delhi
  ◦ Promoted **"The Great Wave of Quizzes"**, annual QC event, inviting 50+ students from various colleges across NCR
  ◦ Organized Institute-Level Freshers Workshops, yielding **3 Podium Winners** from Vindhyachal hostel during tenure

- **Blood Connect Volunteer** *May. 2022 - Jun. 2022*
  Blood Connect Foundation, Indian Institute of Technology Delhi
  ◦ Worked as team of **5** members to motivate people for donating blood | Handled **50+** helpline requests as Volunteer
  ◦ Interacted with **10+** Educational Institutions to hold **"Awareness Sessions"** and organize **"Blood Donation Camps"**