Gaurav Budhwani

Junior Undergraduate
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ACADEMIC DETAILS

Degree	Specialization	Institute	Year	CPI/%
B.Tech. (Dual Majors)	*Chemical and Computer Science Engineering*	IIT Gandhinagar	2022-Present	8.59
Class XII	*Physics, Chemistry, Maths*	All Saints School, Ajmer	2020-2022	94.2
Class X		All Saints School, Ajmer	2006-2022	93.8

PROJECTS

- **Modeling and Parameter Estimation for Pyrolysis of Wood Particles** [Mar '25 - Apr '25]
  (Advisor - Prof. Karthik S. Pushpavanam, IIT Gandhinagar) | *Project Link*
  - Developed a multiphysics simulation in COMSOL for wood pyrolysis under inert conditions, coupling heat transfer, mass transport, and chemical kinetics using anisotropic material properties.
  - Conducted parameter estimation using nonlinear least squares to optimize kinetic and thermal parameters, improving alignment with experimental temperature and mass loss data.
  - Performed parametric studies varying porosity, particle size, reaction kinetics, and ambient temperature to analyze their impact on thermal degradation, volatile release, and internal transport mechanisms.

- **Energy-Efficient Process Design and Simulation for Cumene Production** [Feb '25 - Apr '25]
  (Advisor - Prof. Hari S. Ganesh, IIT Gandhinagar) | *Project Link*
  - Designed a complete cumene production process in Aspen Plus and MATLAB, integrating reaction, separation, and heat recovery units for sustainable and optimized performance.
  - Modeled a plug flow reactor with primary and secondary reactions using mass and energy balances, and validated the results against Aspen simulations with <2% error for key components.
  - Performed multi-variable optimization using MATLAB's `fmincon`, achieving an optimal benzene-to-propylene ratio and inlet temperature that maximized cumene yield while minimizing side-product formation.

- **Optimization of Heat Loss and Boundary Layer Thickness in Laminar Airflow** [Oct '24 - Nov '24]
  (Advisor - Prof. Hari S. Ganesh, IIT Gandhinagar) | *Project Link*
  - Modeled and optimized thermal boundary layer thickness and heat loss using Pyomo and MATLAB, enhancing convective heat transfer efficiency for laminar airflow over a heated plate.
  - Analyzed trade-offs between heat dissipation and boundary layer control under constrained flow conditions, demonstrating optimal configurations for improving thermal performance in engineering applications.

- **Modeling and Experimental Study of Saffman-Taylor Instability Using Hele-Shaw Cells** [Oct '24 - Nov '24]
  (Advisor - Prof. Kartik Subramaniam, IIT Gandhinagar) | *Project Link*
  - Simulated viscous fingering patterns through numerical modeling (Darcy's Law, Diffusion-Limited Aggregation) to analyze the Saffman-Taylor instability, emphasizing computational approaches at the chemical-engineering interface.
  - Designed and conducted controlled experiments with Hele-Shaw cells to validate simulations, investigating the interplay of viscosity, surface tension, and flow dynamics for interfacial instability.

- **Quiz App as Attendance Taking App** [May '24 - June '24]
  (Advisor - Prof. Balgopal Komrath, IIT Gandhinagar) | *Project Link*
  - Developed a comprehensive Quiz and Attendance Web Application using Flask, Jinja2, JavaScript, and SQLite, with features including interactive quizzes, real-time grading, and anti-cheating mechanisms, all hosted locally.
  - Implemented advanced security measures using random number generation and student location tracking for attendance verification, along with an admin approval system and detailed user report generation.

- **Efficiency and effectiveness calculation of Helical Fins in a Double Heat Exchanger** [Jan '24 - May '24]
  (Advisor - Prof. Biswajit Saha, IIT Gandhinagar) | *Project Link*
  - Conducted comprehensive calculations to determine the heat transfer coefficient of circular finned pipes, taking into account various parameters such as fluid properties, flow rates, and temperature gradients.
  - Evaluated the thermal efficiency and effectiveness of the fin by analyzing its ability to enhance heat transfer and improve overall system performance.
  - Developed a detailed comparative analysis between the circular finned pipe and a standard double heat exchanger.

- **Transient Thermal Analysis of a Car Brake System** [Aug '23 - Nov '23]
  (Advisor - Prof. Dilip Srinivas Sundaram and Prof. Akshaa Vatwani, IIT Gandhinagar) | *Project Link*
  - Executed detailed numerical simulations to assess the transient thermal behavior of a car brake system during braking, analyzing heat distribution and temperature changes over time to evaluate system performance.
  - Utilized advanced computational tools and finite element analysis (FEA) to model the heat distribution and dissipation patterns across brake components, including the rotor, pads, and calipers.

- **Increasing Efficiency of Rankine Cycle** [Oct '23 - Nov '23]
  (Advisor - Prof. Atul Bhargav, IIT Gandhinagar) | *Project Link*
  - Implemented thermodynamic analysis and simulation techniques to identify and adjust key cycle parameters, such as turbine inlet temperature and condenser pressure, to maximize thermal efficiency and overall power output.

- Developed graphical representations to illustrate the relationship between cycle adjustments and performance metrics, providing clear visual insights into how different parameters influence efficiency and steam quality.

- **Analysis of Datasets using Probability, Machine Learning, and Statistics** [Jan '23 - April '23]
  (Advisor - Prof. Shanmugathan Raman, IIT Gandhinagar) | *Project Link*
  - Conducted analysis of Airbnb hosts' data, implementing comprehensive data cleaning to ensure dataset accuracy. Extracted valuable insights into host performance and guest interactions.
  - Applied advanced statistical techniques, including correlation analysis, regression models, and clustering, to uncover significant trends related to pricing, location, and guest reviews.

- **Personal Portfolio Website** [May '24 - June '24]
  (Self Initiated) | *Website Link*
  - Designed and developed a personal portfolio website using HTML, CSS, and JavaScript to showcase projects, skills, and achievements, featuring a responsive design for optimal viewing on various devices.
  - Conceptualised dynamic elements and user-friendly navigation, including interactive project galleries, animated elements, and contact forms to enhance user engagement and experience.

- **Developing Games and Puzzles with C and C++ Using DSA** [Jan '24 - April '24]
  (Self Initiated) | *Website Link*
  - Designed and implemented Connect4 and Up-it-Up games utilizing optimal move strategies and graph traversal algorithms for strategic gameplay and decision-making.
  - Developed Sudoku Solver and 2x2x2 Rubik's Cube Solver, employing advanced algorithms to enhance solving efficiency and optimal move calculations.

TECHNICAL SKILLS

- **Programming Languages:** Python, C, C++, Matlab, HTML, CSS, Javascript, Sql, Ansys Fluent.
- **Tools:** LaTeX, Quarto, GitHub, Adobe Illustrator, Arduino IDE, Autodesk Inventor.
- **Libraries:** PyTorch, NumPy, Pandas, Plotly, Seaborn, Scikit-Learn, SciPy, Flask, Sqllite.

ACHIEVEMENTS

- Received the **Academic Excellence** Award for achieving the highest CPI in AY 2023-24.
- Felicitated with **Dean's List Award** IITGN for **Semester II** for excellent academic performance.
- Secured a grade of **A+** (11/10) for outstanding performance in the course of Numerical Methods by successfully doing the project and simulation on **"Transient Thermal Analysis of a Car Brake System."**
- Earned the Specialist rank on Codeforces, highlighting strong competitive programming skills.

RELEVANT COURSES

- Thermodynamics, Chemical Process Calculations, Process Fluid Mechanics, Chemical Reaction Engineering, Heat Transfer, Data Structure and Algorithms, Discrete Mathematics, Numerical Methods, Theory of Computing, Process Dynamics and Control, Engineering Optimization, Separation Process, Chemical Engineering Lab (s), Process Synthesis, Design, and Simulation, Transport Phenomena, Design of Experiments, Operating Systems.

POSITIONS OF RESPONSIBILITY

- **Design Team Member, Amalthea '23** *(Annual Technical Summit of IIT Gandhinagar)* [Dec '22 - Feb '24]
  - Created engaging social media designs for diverse platforms, utilizing Adobe Illustrator, Canva, and other graphic design software.
  - Developed and executed visually compelling social media content for various platforms using Adobe Illustrator, Canva, and other graphic design tools.

- **Team Member, Vinteo** *(Film Making Club of IIT Gandhinagar)* [July '24 - Present]
  - Contributed to a short film's production, handling concept development, and filming. Ensured smooth execution.

- **Team Member, MAPRC** *(Media and Public Relations Committee of IIT Gandhinagar)* [July '24 - Present]
  - Designer for "ETHEREAL," IIT Gandhinagar's official monthly magazine, crafting visuals to showcase campus life, student achievements, events, and engaging stories.