

Nisarg Bhavsar

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EDUCATION

Indian Institute of Technology Kharagpur

B.Tech. (Hons.) + M.Tech in Chemical Engineering, Minor in Artificial Intelligence

West Bengal, India

Dec 2021 – Jun 2026

PUBLICATIONS

Nisarg Bhavsar, Abhinav Thakur, Amrit Lal Singh, and Ashish Patwa. "RTaC: A Generalized Framework for Tooling." In: G. Rehm et al. (Eds.): *Natural Scientific Language Processing and Research Knowledge Graphs 2024*, LNAI 14770, pp. 61–79, 2024. DOI: 10.1007/978-3-031-65794-8_5.

Nisarg Bhavsar, Rwik Dey, Sachish Singla, Divyansh Sharma, and Subarno Maji. "SATYA: Smart AI-driven Talent Yield Analyzer for Resume Screening and Recommendation Evaluation." In: *2024 4th International Conference on Robotics, Automation and Artificial Intelligence (RAAI)*. 2024. DOI: 10.1109/RAAI64504.2024.10949555.

Nisarg Bhavsar and Zaid Ahmed Khan. "CipherBERT: A Systematic Framework for High-Accuracy Encrypted Transformer Inference." To appear in: *The 7th IEEE International Conference on Trust, Privacy and Security in Intelligent Systems, and Applications (IEEE TPS)*, 2025.

Nisarg Bhavsar, Aditya Nandy, Jyothiraditya SSVKSS, and Abhinav Thakur. "The Lunar Elemental Surface Map at 1.2 km Resolution: A Machine Learning Approach to Chandrayaan-2 CLASS XRF Data." (Submitted to *ICARUS*).

Nisarg Bhavsar, Rahul Sharma, and Somnath Ganguly. "Combining Physical Descriptors and Mat2Vec Embeddings to Enable Rapid and Reliable Ionic Conductivity Predictions for Solid-State Battery Electrolytes." (In preparation for submission to *ACS Applied Materials & Interfaces*).

RESEARCH EXPERIENCE

Master Thesis Project

Jul 2025 – Present

Indian Institute of Technology, Kharagpur

Advisor: Prof. Somnath Ganguly

Aim: Develop a ML framework to accelerate discovery of solid electrolytes by predicting conductivity from simple inputs.

- Developed a **Random Forest** framework to rapidly **predict ionic conductivity** from only material name/temp by engineering a feature set combining **14 physical** descriptors with **200-dimensional** Mat2Vec **embeddings**.
- The final framework achieved high accuracy ($R^2 = 0.88$) on **1240 unseen compounds** while demonstrating **reduced bias** (0.43 dex) in the useful high-conductivity range as compared to 0.72 dex for lower conductivities.
- First author paper detailing this work is in preparation for submission to *ACS Applied Materials & Interfaces*.

Research Lead & Team Captain (IIT KGP)

Sep 2024 – Dec 2024

Inter-IIT Tech Meet (in collaboration with Indian Space Research Organisation)

Advisor: Netra S Pillai

Aim: Process CH-2 XRF data to produce the first high-resolution (1.2 km) global elemental maps of the lunar surface.

- Conceptualized a hybrid ML pipeline involving **EMD-based spectral cataloguing** to filter noisy data, **GMMs** for estimating line intensities, **C-Q algorithm** to estimate elemental concentrations, **XGBoost** model to correlate XRF with optical imagery for super-resolution, and **Fast Fourier Transforms** for sharpening of final maps.
- The pipeline successfully generated **1.2 km elemental maps** for 7 elements including rare elements like Mn, Ti, Cr from native 12.5 km data, a **10x resolution increase**, and **won Silver Medal** at **Inter-IIT Tech Meet '24**.
- First author paper detailing this work has been submitted to *ICARUS* journal and is currently under review.

Bachelor Thesis Project

Jul 2024 – Apr 2025

Indian Institute of Technology, Kharagpur

Advisor: Prof. Ayantika Chatterjee

Aim: Design a framework for high-accuracy BERT inference on Encrypted (HE) data for privacy-preserving NLP.

- Designed **CipherBERT**, a framework involving novel **CKKS** optimized **polynomial approximations** (quadratic ReLU, inhibitor attention) with a **depth-aware** Strassen's algorithm for efficient encrypted matrix multiplication.
- Achieved state-of-the-art Homomorphic Encryption performance, retaining **99.4% of plaintext accuracy** on sentiment analysis task and demonstrating an **11.45% latency improvement** over the previous THOR baseline.
- First author paper detailing this work has been accepted at *IEEE Trust Privacy & Security (TPS)* 2025.

Data Science Research Intern

Jun 2023 – Oct 2023

Indian Institute of Management, Ahmedabad

Advisor: Prof. Adrija Majumdar

Aim: Apply NLP to quantify textual financial risk from S&P 500 10-K reports.

- Designed **RNN/Bi-LSTM** models for financial **risk analysis** of S&P 500 10-K reports, while integrating features from **McDonald Loughran** sentiment framework to improve predicted financial rating **accuracy by 10%**.

Artificial Intelligence Research Intern

May 2023 – Jun 2023

Indian Institute of Technology, Bombay

Advisor: Prof. Ganesh Ramakrishnan

Aim: Build a high-accuracy OCR pipeline for ancient Sanskrit texts.

- Developed an **OCR** pipeline for Sanskrit, achieving **3% CER** by implementing a **YOLO-based CNN** for character identification on bounding boxes created (0.98 IoU) using the **docTR** library on archaic manuscripts.

INDUSTRY EXPERIENCE

LLM Research Intern

Jan 2024 – Mar 2024

DevRev Inc.

Bengaluru, India

Aim: Develop a framework to train LLMs complex tool usage/sequencing including iterative and conditional cases.

- Designed **RTaC**, which reimagines tool usage as coding task, involving engineering a dual-agent **data generation** pipeline with **GPT-4** and **fine-tuning** coding LLMs (**CodeLlama-7B** & **DeepSeek-1.3B**) with **QLoRA**(peft).
- The framework, using **DeepSeek 1.3B** (1.3B params), outperformed **GPT-4** (170B params) on key metrics: **93.28 vs 86.82 F-1 Score**, **5.25s vs 7.32s latency**, and **5.6x lower cost** (\$ 0.0060 vs \$ 0.0341 per query).
- First author paper detailing this work was published in *Natural Scientific Language Processing (NSLP) 2024*.

Research Intern

Oct 2024 – Dec 2024

EightFold.AI

Bengaluru, India

Aim: Design an AI system to automate resume screening & recommendation credibility analysis using graph based NLP.

- Designed **SATYA**, a multi-level AI system involving a **graph-based** recommendation network (using **PageRank**) and a **RoBERTa** based semantic similarity module trained on 1,000 expert-scored resumes for resume screening
- Achieved **91.4% accuracy** in predicting candidate quality, outperforming traditional keyword screening methods.
- First author paper detailing this system was published in the *Robotics, Automation and AI (RAAI) 2024*.

Data Science Intern

Jun 2025 – Jul 2025

NoBroker (Convozen.ai)

Bengaluru, India

Aim: Engineer a real-time, polyglot Text-to-Speech (TTS) system for 9 Indian languages.

- Engineered a **polyglot TTS** system (**MOS 4.8**) for 9 Indian languages by fine-tuning DVAE, GPT, HiFi-GAN components of **XTTSv2** and **FishSpeech**, and **open sourced** the "Koel" benchmark to evaluate code-switching.

Data Science Intern

Jul 2024 – Dec 2024

Swiggy Limited

Bengaluru, India

Aim: Develop a spatio-temporal deep learning model for delivery demand forecasting.

- Developed a hybrid **ARIMA-HexCNN-LSTM** model for spatio-temporal demand forecasting, using **H3 library** to capture hexagonal lat/long location features, which achieved a **15% MAE reduction** over ARIMA baselines.

TEACHING EXPERIENCE

Teaching Assistant

Jun 2025 – Present

Indian Institute of Technology, Kharagpur

Course: Instrumentation and Process Control (Theory + Lab)

- Led **weekly laboratory sessions and tutorials** for **150 undergraduate students** in sensor data acquisition and control, created tutorial materials on **state-space representation & feedback control theory**.

RELEVANT COURSEWORK

Artificial Intelligence: Advanced Learning Paradigms for Artificial Intelligence, Artificial Intelligence: Foundations and Applications, Statistical Foundation for AI and Machine Learning, Machine Learning Foundations and Applications
Mathematics: Linear Algebra, Numerical & Complex Analysis, Programming and Data Structures, Advanced Calculus

HONORS & AWARDS

- Gold Medalist**, Open IIT Data Analytics, Inter-IIT Tech Meet 12.0 & **Silver Medalist** Inter-IIT Tech Meet 13.0.
- Secured a **Top 0.5% Rank** in the **JEE Advanced** (2021) & **INMO Qualifier** (2017-18).

TECHNICAL LEADERSHIP & OUTREACH

Advisor (Prev. Executive Head, Assoc. Member)

Mar 2022 – Present

Kharagpur Data Analytics Group (KDAG), IIT Kharagpur

- Spearheaded the Kharagpur Data Science Hackathon 2024 (**7,000+ international participants, 90% YoY growth**) and conducted **technical workshops** for **1,200+ students** on "LLMs in Finance" (RAG, fine-tuning).