Mohor Banerjee

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Education

- **Nanyang Technological University** — Singapore
  Bachelor of Engineering in Computer Science — *Jul 2022 - June 2026*
  Courses: Computer Architecture, DSA, Digital Logic, Discrete Math, Computational Thinking, DS & AI, Linear Algebra, Probability & Statistics, OOP, Network, Algorithm – Design & Analysis, Operating System. Computer Security, Artificial Intelligence, Introduction to Database, Software Engineering, Compiler Techniques, Neural Networks & Deep Learning, Natural Language Processing, Computer Vision, Machine Learning
- **Navi Mumbai City School, CBSE** — Navi Mumbai, India
  High School Diploma; Scores: 98.4 %- (First in class of 200) — *Aug 2020 - July 2022*
- **Delhi Public School** — Navi Mumbai, India
  Secondary School Qualification; Scores: 99.6 % All India 3rd Rank; (First in class of 240) — *July 2020*

Skills Summary

- Programming Languages: Java, C++, Python, C, SQL, Javascript, HTML5, CSS
- Software Tools: PostgreSQL, React.js, React Native, Node.js, Express.js, MongoDB, Git, FIGMA, Tensorflow, PyTorch, Scikit-learn, NumPy, Matplot.lib, Pandas, Linux

Conference and Publications

- Conference Presentation:Abstract selected for presentation at ICUR-URECA research conference (International Conference of Undergraduate Research) 2024
- Conference Presentation:Paper selected for DAI 2024 (International Conference on Distributed Artificial Intelligence) titled "SOPPU : Scalable One PEFT per User"
- Research Article: Enhancing Urban Mobility through Adaptive Traffic Analysis: A Case Study in Singapore. The preprint published in Research Square (https://www.researchsquare.com/article/rs-4591616/v1)

Industrial Experience

Panasonic R&D Center — Singapore
AI Engineer Intern — *Jan 2025- May 2025*
- We plan to work on "The Detection and Classification of Acoustic Scenes and Events (DCASE) challenges" and participate in annual competitions that focus on advancing the state-of-the-art in acoustic scene classification, sound event detection, and other related tasks in environmental sound processing

SEATRIUM — Singapore
Data Engineering Intern — *May 2024- July 2024*
- Working on turning various data driven AI centric proof of concepts into full-scale pilots
- Full-stack web development and embedding OCR into Web App

Bosch — Singapore
NTU VeNTUre Project — *March 2024-April 2024*
- Conducted data analysis, cleaning and pre-processing tasks for user and recipe data gathered from Bosch Cookit smart appliance
- Designed two-tower hybrid recommendation system for giving personalized recipe recommendations to users who use the appliance
- Achieved an accuracy of 80% in the recommendations which took into account user profile features as well as recipe keywords (via NLP)
- Clustered recipes based on keywords using PCA and K Means

Teleskop.Tech — Singapore
AI Intern — *December 2023*
- Delved into study various open-source large language models, with a focus on developing a chatbot to assist customers with financial queries
- Gathered and analyzed around 100 academic articles and industry perspectives to enhance the chatbot's functionality and relevance

Academic Experience

University of South Carolina United States
Research Intern : Artificial Intelligence Institute of South Carolina *May 2024 - present, REMOTE*

- Advisors: Dr Amitava Das, Aman Chadha (AWS), Vinija Jain (Amazon), Aishwarya Naresh Reganti (AWS)
- Conducting research on catastrophic forgetting in alignment of Large Language Model

Nanyang Technological University Singapore
Undergraduate Research Experience on CAmpus (URECA) - Prof Alvin Chan Guo Wei *August 2024, on going*

- Multi-modal Large Language Model for Drug Development. Working towards a creativity benchmark for LLMs and looking into how hallucination reduction strategies impact creativity & reasoning abilities of LLMs

Nanyang Technological University Singapore
Undergraduate Research Experience on CAmpus (URECA) - Prof Christopher Lee *August 2023 - June 2024*

- Conducted extensive literature review and successfully developed a model aimed at enhancing motor drive control using neural network algorithms
- Applied machine learning-based strategies to optimize motor performance, with a focus on simulating torque ripple signals in PMSM using MATLAB Simulink

Nanyang Technological University Singapore
Technical Director, HACKoss - Student Open Source Program *Sept 2023 - May 2024*

- Leading a team of seven, Managing project on 'Network Intrusion Detection System'.
- Liaising with external partners and mentoring members to build their technical skills.
- Worked on network intrusion datasets (4 million rows) and utilizing machine learning models for attack classification and anomaly detection.
- Achieved 90 plus % accuracy in binary classification of attack and non-attack cases and multi-class classifications of different type of attacks. Currently working on multi-modal input data and deployment.

Industry Challenge Projects

SOPPU - Scalable One PEFT per User Aug 2024 - Oct 2024
Global Top 50 (Semi Final) : Alibaba Global E-commerce Challenge 2024

- Decentralized LLM interface for scalable personalized AI using compressed PEFT (LoRA) adapters
- Built with Hugging Face Transformers and PEFT library, and integrated LoRAX for dynamic, scalable serving of personalized adapters at scale
- Achieved multi-adapter joint compression using diagonalization, with 1.99x ratio and 49.7% memory savings

ATLAS- Adaptive Traffic Learning and Analysis System March 2024 - March 2024
National University of Singapore : Singapore Traffic decongestion problem

- Converted Open Street Map data to SUMO (Simulation of Urban Mobility)-compatible network XML files for traffic simulations
- Ran simulations in SUMO, and processed outputs to store traffic data
- Wrote Python scripts to calculate mean and standard deviation of traffic flow from SUMO output
- Utilized Llama2 and ChromaDB Vector Database to analyze congestion points from derived statistical measures and suggest improvements based on traffic data

RottenAI - food waste management advisor Feb 2024 - May 2024

- Developed a Gemini-powered chatbot that advises users on how to utilize food waste by analyzing images and additional details provided by the user.
- Integrated four sensors (temperature, humidity, water, and moisture) via Arduino to assess the condition of the food
- Enabled real-time, interactive communication within the chatbot, allowing users to ask follow-up questions about food safety, recipes, and composting methods

Fabric Anomaly Unsupervised Detection Jul 2023 - Aug 2023

- Leveraged advanced machine learning techniques, including convolutional neural networks (CNNs) and unsupervised segmentation algorithms, to reduce dependency on manually labeled datasets by 50%. Utilized Python and TensorFlow for implementation.
- Enhanced defect detection capabilities in textile images across a dataset of over 10,000 images. Developed algorithm for anomaly localisation and masking that significantly improved detection efficiency

Automatic Depth Thresholding of Agricultural Produce for yield prediction Aug 2023 - Sept 2023

- Developed a Computer Vision system using Python to predict agricultural yields with a focus on optimizing resource allocation and maximizing production efficiency.
- Implemented advanced depth thresholding techniques alongside machine learning algorithms to analyze and predict crop yield potential from depth-sensor data, significantly enhancing prediction accuracy by 30% compared to traditional methods.
- Processed and analyzed over 5,000 images of various crop types, utilizing depth data to accurately assess and categorize yield potential, leading to a prototype that can be scaled for real-world agricultural applications

Academic Projects

CROSS BORDER - Full Stack Web Application Jan 2024 - April 2024

- Collaborated in the development of a full-stack web application designed to assist migrant workers in Singapore by providing essential services and information.
- Participated in drafting the Software Requirements Specification (SRS), ensuring alignment with IEEE standards
- Contributed to various phases of the project lifecycle, from initial concept, design, through to final implementation
- Played a significant role in developing an AI chatbot to address user inquiries, enhancing user interaction and support within the application
- Technologies: Front-end: React.js Back-end: Node.js, Express.js Data Storage: MongoDB, AWS S3 Bucket Storage APIs: Google Places, Currency Converter, News API, Gemini API

CAMS (CAmp Management Systems) - OOP Project Sept 2023 - Nov 2023

- Utilized advanced Object-Oriented Programming (OOP) principles in Java to develop a comprehensive Camp Allocation System, demonstrating proficiency in encapsulation, inheritance, and polymorphism to create a modular and scalable application architecture.
- Implemented robust security features including secure login with password hashing and session management, alongside developing user-specific interfaces and functionalities for different roles within the camp management ecosystem, such as administrators and participants.
- Engineered a dynamic data management module capable of handling complex data operations, such as registration, allocation, and real-time updates, effectively managing data for over 500 participants and staff.
- Collaborated in a team of four, leading the design and implementation of the system's security framework and user interface. This project underscored the importance of secure and user-centered design in software development.

Image Classification using CNN and Hyper Parameter tuning to make predictions June 2023 - July 2023

- Implemented advanced CNN architectures using TensorFlow to classify images, achieving a 70% accuracy rate on a diverse dataset of over 10,000 images.
- Conducted comprehensive hyperparameter tuning, employing techniques such as data augmentation to optimize dataset size, learning rate, and choice of optimizer (Adam, SGD).
- Developed expertise in deep learning principles, TensorFlow for model development. Gained practical experience in image analysis, data augmentation, and model optimization techniques, leading to significant improvements in prediction accuracy and model reliability

Shakespearean Poem Generator - ML project May 2023 - May 2023

- Engineered a machine learning model using LSTM networks to authentically generate text in Shakespearean style, leveraging TensorFlow and Scikit-learn for model development
- Achieved a high degree of linguistic fidelity in generated texts, with the model producing original poems that closely mimic Shakespeare's vocabulary and thematic content, demonstrating the model's capacity for creative text generation and deep learning's potential in understanding complex language patterns

MerkleRex Cryptocurrency Trading Platform Simulation June 2023 - July 2023

- Engineered a comprehensive cryptocurrency trading platform simulation in C++, applying core Object-Oriented Programming principles to create a scalable and modular architecture
- Implemented a robust command-line interface offering functionalities such as live market simulation, portfolio management, and transaction processing (buy/sell orders, limit orders), utilizing C++ standard libraries for efficient execution
- Demonstrated proficiency in software development and financial simulation

Little Lemon App – Restaurant Food ordering App May 2023 - May 2023

- Developed a restaurant food ordering app and demonstrated proficiency in mobile APP development
- Utilized React Native for cross-platform compatibility Streamlined the user experience for easy food ordering

Honors and Awards

- Dean's List - Computer Science Nanyang Technological University, placed on dean's list for excellent academic performance during AY2022-23
- All India Joint Entrance Main Exam, Ranked 972 amongst approx 1 million students, AY2021-22
- KVPY Fellow, Indian Institute of Science, Bangalore, India, Ranked 535 amongst approx 50K students, AY2020-21
- Ranked joint 3rd in All India Secondary School leaving exam conducted by CBSE amongst 1.89 million student, AY2019-20

Certifications

- Generative AI with Large Language Models by DeepLearning.AI
- Machine Learning Specialisation by DeepLearning.AI
- SQL and PostgreSQL: the complete developer's guide
- Meta React Native Specialisation by Meta
- Google IT Support Professional Certificate
- Applied Social Network Analysis in Python by University of Michigan
- Object Oriented Programming by University of London

Co-curricular Activities

- High Performance Computing Club: Exploring Software and Hardware Optimizations; Server Architectures and various applications of high performance computing
- Hackathon by NTU MAE Robotics Club: Secured 3rd position. Proposed improvements in MRT system for better crowd-control, seat occupancy detection and door safety mechanism. Presented a working prototype
- Young Innovation Challenge: Qualified for Semi-finals. Ideated a start-up "The Green Chain" for making the healthcare supply-chain more sustainable and secure using block chain technology
- JDF Innovation Fest: Used C and Arduino to pitch a new product to raise financial literacy among kids
- 3D-Printing workshop: Learnt Fusion360, created own model, executed printing and later gave training to others