Rounak Mandal

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EDUCATION

Indian Institute of Technology Kharagpur **2021 – Present**
5th Year Dual Degree Undergraduate, Department of E&ECE *CGPA: 9.45*

Bhavan's Gangabux Kanoria Vidyamandir **2019 – 2021**
AISSCE - CBSE *Percentage: 97.4%*

Gitaram Academy **2010 – 2019**
ISCE - ICSE *Percentage: 98%*

EXPERIENCES

Research Internship | Systems and Languages group, Adobe Research, Bangalore (May '25 - Jul '25)
(Objective: Context Aware Acceleration of image and video generation pipelines)

- Introduced a **novel token pruning method** for Rectified Flow-based models like **Wan-2.1** and **FLUX.1**
- Reduced attention computation by reducing the number of tokens by **50%**, leveraging **spatial** and **temporal similarities** and also integrated **KV caching** into the architecture of the flow models for efficient execution.
- Benchmarked using **VBench**, achieving **20–35%** faster generation with only **0.5%** visual quality degradation

Research Internship | Max Planck Institute-CBG, under Prof. Ivo F. Sbalzarini (May '23 - Jul '23)
(Objective: Using Stable Diffusion to create animation of life stages of Trypanosoma Brucei)

- Imported a subset of **Tryptag** dataset and **subsampled** it and chose the optimal point from **SSIM v/s subsampling wavelength** graph and then used an **U-net** as the backbone of the **Diffusion model**
- Implemented **Conditional DDPM** on a **5000 image subset** of **Tryptag** database to generate samples and interpolated between its stages using Linear and Sinusoidal interpolation on stochastically encoded latents
- Approximated cell's skeleton using **Linear Splines** with a **10**% area error and used **K-means** to cluster them
- Implemented **Latent diffusion model** in **PyTorch** using a **autoencoder** to encode and decode the images

DAAD WISE Research Internship | DFKI, Germany, under Prof. Carsten Binnig (May '24 - Jul '24)
(Objective: Using Large Multimodal Models to solve streaming queries in traffic scenarios)

- Tested with **Flamingo** and **LLaVA** on traffic videos to identify number plates and predict traffic congestion
- Conducted research on techniques like **background subtraction** & **Haar cascades** to optimize **LMM** calls
- Enhanced **query plans** using the **LLaVA model** for traffic data queries, improving throughput and latency

Course Project | BTP, under Prof. Pabitra Mitra (Aug '24 - Nov' 24)
(Objective: Medical Visual Question Answering using Multimodal Transformer)

- Developed a multi-modal vision-language model for **VQA** using the **ROCO** dataset, integrating **Clinical BERT text embeddings**, **ViT image embeddings**, and graph-based **knowledge graph embeddings**
- Implemented **MLM** with **15% token masking** and used the **cross-entropy loss** for token prediction
- Developed a **DiRA-based** image embeddings by pretraining **ResNet-50** with **InfoNCE loss** on the ROCO dataset, transforming embeddings to **768** dimensions for integration with **Clinical BERT embeddings**

PROJECTS

Self Driving Car using Deep Q Learning | *Python, PyTorch* (Apr '23 - May '23)
(Objective: Use Deep Q Learning to create a self driving car)

- Implemented a **Neural Network** with a hidden layer of **30 neurons** with **ReLU** activation and **Adam** optimizer for approximating the **Q-function**, which maps state-action pairs to rewards.
- Executed **Experience Replay** to maintain a memory buffer of the last **10000** tuples of states and rewards
- Implemented **epsilon-greedy** action selection strategy within the system, computing **action probabilities** from **Q-values** and utilizing a **temperature factor** of **10** to balance exploration and exploitation.

Mini Shell | *C, Linux* (Nov '24 - Dec '24)
(Objective: Develop a C based Linux shell supporting I/O redirection, process control, and file-lock detection.)

- Created a **C** program to imitate a Linux shell, implementing **script execution** and **I/O redirection**.
- Provided support for multiple piped commands, background execution, program interruption by signals using **C syscall API** & **signal handling** and to record/navigate command history using **readline**
- Implemented **file-lock detection**, engineered a command to suggest potential malware process using **procfs**

Message Oriented TCP (M-TCP) | *C, Socket Programming, Linux* (Nov '24 - Dec '24)
(Objective: Developing a reliable connection protocol M-TCP using an unreliable UDP connection)

- Designed **M-TCP**, a **message-oriented**, **in-order**, end-to-end **reliable**, full-duplex protocol on top of **UDP**
- Achieved **reliability** and **flow control** via **Selective-Repeat ARQ**, simulating drops to validate design
- Implemented **multithreading** with **mutex** to manage **buffers** and m**essage windows** for **UDP data**

Heart Attack Risk Prediction | *Python, Scikit Learn, EvalML* (Nov '22 - Dec '22)
(Objective: Use Classical and automatic machine learning approaches to predict heart attack risk)

- Analyzed the data by visualizing it with **Seaborn** functions of **Countplot, Pairplot, Distplot, Heatmap**
- Implemented **Logistic Regression, SVM, Decision Tree, Random Forest, KNN** and **AdaBoost** and then selected the model with the highest **accuracy** of **87.5**% of predicting a patient's heart attack risk.
- Deployed **GridSearch** on **Logistic Regression, KNN, SVM** to find the best hypertuning parameters
- Deployed an **AutoML Libary EvalML** to train the model and predicting results with **AUC** score of **0.87**

ACADEMIC ACHIEVEMENTS

- Honored with the **DAAD WISE 2024** Scholarship among **200** scholars in India for an internship in Germany
- Received the **GKF Scholarship** awarded by **IITKGP Foundation** to students going for foreign internships
- Achieved a peak rating of **1768** (**Expert**) in **Codeforces** and **2018 (5-star)** in **CodeChef**
- Among the top **1**% students in **IIT Kharagpur** to be awarded a **Department Change** to **E**&**ECE**
- Secured an All India Rank **1840** in **JEE Advanced 2021** for being among the top **1.29**% of **142k** applicants
- Secured an All India Rank **1269** in **JEE Mains 2021** for being among the top **0.1**% of **1.3M** applicants
- Secured an All India Rank **431** in **KVPY SX 2020** conducted by **IISc** among **150k+** applicants
- Secured an All India Rank **50** in **Bachelor of Statistics Examination 2021** conducted by **ISI, Kolkata**
- Secured an All India Rank **17** in **West Bengal Joint Entrance Examination 2021** among **65k** candidates

TECHNICAL SKILLS

Programming Languages and Softwares: Python | C++ | C | LaTeX | Verilog | MATLAB
Libraries: Numpy | Pandas | Matplotlib | Scikit-learn | Keras | Tensorflow | PyTorch | OpenCV | NLTK | Seaborn
Technologies/Frameworks: Linux | GitHub | Jupyter Notebooks | Google Colab | ChatGPT

RELEVANT COURSES

IIT Kharagpur: Programming & Data Structures || Probability and Statistics || Algorithms || Advanced Computer System Architecture || NLP || Pattern Recognition and Machine Intelligence || Deep Learning || Computer Vision || Graphical and Generative Models for Machine Learning **MOOC's**: Andrew Ng's Machine Learning Specialization, Coursera || Machine Learning A-Z || Deep Learning A-Z || How Diffusion Models Work, DeepLearning.AI

POSITIONS OF RESPONSIBILITY

General Secretary, E&**ECE Department Society** (Oct '23 - May '24)
(Interdepertmental society of E&ECE department maintaining its affairs)

- Assisted with initiating a blog series, **Corepedia**, aiming to guide students through internship preparation.
- Acted as first point of contact to department students about **administrative queries** and resolved them
- Coordinated with other general secretaries under **Department Representative** to organize **events**

EXTRACURRICULAR

- Guided **Radhakrishnan Hall's** team to a **Bronze** medal in the Groups event in General Championship 2025
- Received **Gold** and **Silver** medal in **General Championship 2023** & **2024** in Eastern Instrumentals event