Nafis Neehal

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Machine Learning | Deep Learning | Large Language Models | Generative AI | AI in Healthcare

Education

Rensselaer Polytechnic Institute Aug 2019 – May 2025 (Expected)
Ph.D. (Candidate), Computer Science | ***GPA**: 3.74/4.00* *Troy, New York*

Rensselaer Polytechnic Institute Aug 2019 – May 2021
M.S., Computer Science | ***GPA**: 3.68/4.00* *Troy, New York*

Experience

Graduate Student Researcher (Team Lead) Feb 2022 – Present
IBM-RPI Research Collaboration Projects *Troy, NY*

- Building **TrialBrain** - a Multitask/MoE LLM for automating clinical trial design tasks.
- Developed hallucination-adjusted LLM pipeline using RAG-based few-shot learning and dynamic prompting in clinical trial baseline feature prediction task - achieved 48.5% accuracy improvement over baseline. [Arxiv'24], [Git]
- Released four specialized Llama models (PEFT, 4-bit quantized) fine-tined on 65k+ clinical trials for baseline feature prediction task in clinical trial design [Model + Data]
- Engineered modular framework leveraging novel ML-based patient recommendation in clinical trials - improved treatment effect accuracy by 75-80% and demographic equity by 96-99% while potentially reducing recruitment costs by 25%. [**RecSys'24**], [AMIA'23], [SCT'23 (Best Poster Award)], [Git]

Graduate Student Researcher May 2020 – Jan 2022
CDPHP-RPI Industrial Research Collaboration Projects *Troy, NY*

- Developed and deployed a novel T2D health management analysis system processing 9M+ patient records, incorporating Deep-Autoencoder models for patient matching (35% faster matching, 40% reduced memory for patient trajectory representation) and multi-stage survival analysis; optimized PySpark/AWS implementation achieving 60% faster processing and 10x computational efficiency. [HIMS'22]
- Engineered a hybrid ML framework for heterogeneous treatment effect analysis of 350K+ patients, combining nearest-neighbor matching and PCM clustering algorithms to automatically identify 3 distinct treatment-response subpopulations in pre-diabetes intervention program. [IEEE BIBM'22]
- Engineered ML-based patient risk prediction system processing 22.5M+ healthcare records with 87-dimensional features, implementing PCA-based preprocessing pipeline (200x efficiency gain) achieving 95% alignment with physician diagnoses and 30% early detection rate for high-risk cases despite 0.5% positive class ratio. [IEEE BIBM'21], [Git (Non-Proprietary)]

Open-Source Projects (Selected)

1. BanglaLLM: Contributing to developing fine-tuned open-source LLMs for reasoning and factual analysis in Bengali Language. [HuggingFace]
2. MAMA-gpt: Built GPT-4 powered Bengali voicebot integrating real-time Speech-to-Text, Text-to-Speech, and bidirectional English-Bengali translation capabilities. [Git]
3. Trade-Mind: Implemented end-to-end MLOps pipeline for hourly Bitcoin closing price prediction with Hopsworks feature store, automated data ingestion and model train/deploy through GitHub Actions (CI/CD). [Git] [Live Demo]
4. ChanBOT: Fine-tuned Llama3.1-8B using PEFT and 4-bit quantization to mimic a fictional TV character (Chandler from FRIENDS). [Git] [Demo]
5. Machine Translation: Built Seq-to-Seq neural machine translation models (RNN, GRU) for French-English translation with BLEU and TER score evaluation. [Git]
6. Fake Image Generation: Implemented DCGAN in PyTorch for generating synthetic celebrity images trained on CELEBA dataset. [Git]

Technical Skills

Programming Language and Database: Python, R, SQL, Cypher, C++, Google Firestore, Neo4j, MySQL
ML/DL: PyTorch, DDP, TensorFlow, Scikit-Learn, AutoML, OpenCV, Spacy, Langchain, LlamaIndex, HuggingFace
LLM Experiences: Fine-Tuning (SFT/PEFT), Quantization, Prompt Engineering, RAG/GraphRAG, Benchmarking
MLOps & Tools: MLflow, Docker, Axolotl, Unsloth, ChromaDB, Comet, Opik, PySpark, Hopsworks
Cloud & Deployment: AWS (SageMaker, Lambda, EC2, S3), Git Actions (CI/CD), HopsWorks, HF Space, Heroku
Data Visualization: Tableau, Streamlit, Gradio, R-Shiny