Hasan Ali Emon

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SUMMARY

Artificial Intelligence Engineer with 5 years of practical experience in AI, machine learning, and deep learning, with a strong focus on large language models (LLMs), natural language processing, speech recognition, and computer vision. Demonstrated success in building high-accuracy models and deploying scalable AI solutions. Actively seeking a funded research opportunity to contribute to cutting-edge advancements in AI and drive innovation.

INTERESTS

Artificial Intelligence (AI), Machine Learning, Deep Learning, Large Language Models (LLMs), Natural Language Processing (NLP), Speech Recognition, Computer Vision, Image Processing, Signal Processing, Data Science & Analysis, Prompt Engineering, High Performance Computing (HPC), Advanced Human-Computer Interaction, Cybersecurity, Fraud Detection, Software Engineering, Cloud Computing, Robotics, Bioinformatics, and Medical Imaging.

EDUCATION

Bachelor of Science in Computer Science and Engineering

Begum Rokeya University, Rangpur, Bangladesh

Graduation: 2017

CGPA: 3.18

Relevant Coursework: Artificial Intelligence, Machine Learning, Deep Learning, Natural Language Processing, Data Structure & Algorithms, Software Development

TECHNICAL SKILLS

- **Languages** : Python(expert), C++(fluent), Java(prior experience), SQL(prior experience), Bash(familiar)
- **Agentic Systems** : **MCP, RAG, LangChain, LangGraph, LLM Orchestration**
- **ML/DL Framework** : **Tensorflow**, **Keras**, **PyTorch**, spaCy, Scikit Learn, NLTK
- **ML/DL Library** : Transformers, OpenCV, Numpy, Pandas, Seaborn, Matplotlib, SciPy, GloVe, Gensim
- **Workflow Automation** : **Kafka**
- **GPU-Aware Development** : CUDA Toolkit, NVIDIA Drivers, TensorRT, ONNX, Hardware Specific PyTorch/TensorFlow GPU builds
- **Development Tools** : Git, VS Code, Jupyter Notebook, Jupyter Lab
- **Web Development** : Django, Flask
- **DevOps** : **Docker**, **Kubernetes**, **GitHub Actions**
- **Scraping Tools** : Selenium, Beautifulsoup
- **Cloud Technology** : **AWS lambda, EC2**, **Local Server Deployment**
- **Miscellaneous** : **Prompt Engineering**, **Fine-tuning**, **LLM Domain Adaptation**, Hyperparameter Tuning

RESEARCH

Final Year Undergrad Thesis

Title: Action Recognition using RPCA and Attention

Description: Developing a deep learning model that can understand human action in the given video. I used RPCA to remove the background, YOLO to detect objects within the frame, CNN to extract features, and state-of-the-art Attention mechanism to focus on the movement area to increase the accuracy. I learned Convolution, activation functions, various image features like spatial, temporal, spectral feature, loss function, model accuracy, model metrics.

Technologies Used : Python, Tensorflow, OpenCV, Attention mechanism, GRU, PCA, YOLO, Numpy, Matplotlib

PROJECT EXPERIENCE

- **Contract Language Model (Contract LLM)**

  Description : Contract LLM is an advanced system designed to directly query and analyze contract documents, significantly reducing the need for manual effort. Utilizing cutting-edge techniques in natural language processing (NLP), including **Transformer models** like **Llama2**, **Domain Adaptation**, **Fine-tuning**, and **RAG**, Contract LLM excels at understanding and processing complex legal language with exceptional accuracy and reliability.

  Technologies Used : Transformers, PEFT, SFT, RAG, Flash Attention, LORA, Q-LORA

- **Automatic Speech Recognition (ASR) Bangla**
  Link : https://github.com/hassanaliemon/BanglaASR
  Description : Developed an advanced Bangla speech-to-text system capable of automatically converting audio recordings into Text without manual intervention. Leveraged cutting-edge deep learning techniques including **Transformer Encoder, Decoder** with the combination of **CNN**. Achieved a **Word Error Rate** of **14.73** on Whisper Small model on decent amount of data.
  Technologies Used : Transformer, Pytorch, Numpy.
- **Optical Character Recognition [Japanese & English Language]**
  Description : Convert an image to an editable document removing human manual effort. The system can analyze different layouts of documents and extract data from those documents. I used **CNN, GRU, LSTM, CTC-Loss, Mask-RCNN, and Relevent Deep Learning** algorithms to solve **OCR** problems. I have also used several **morphological image processing** which helped to boost the model performance further. Final OCR model was **99.87** % accurate on font data.
  Technologies Used : Django, Tensorflow, Keras, OpenCV, Numpy.
- **Named Entity Recognition**
  Description : Extract Entities along with their respective values to retrieve meaningful information from the document leveraging **NLP** techniques. I used **spaCy, Transformer** to solve **NER** problem alongside rule-based program to further furnish model's output. Final NER model has **97.29** % accuracy on our selected test dataset.
  Technologies Used : spaCy, Transformers, BERT, Numpy.
- **AI based Monitoring and surveillance**
  Description : Surveillance system that can automatically monitor individuals working on production systems and provide meaningful, pinpoint insights that can aid businesses to take decisions which consequently improves overall production system and also ensuring employee satisfaction.
  Technologies Used : Transformers, YOLO, OpenCV, Numpy.
- **Safe Driving**
  Description : Safe driving is a system that ensure driving safety. It is an AI-based system that can capture video of a driver and can predict whether the driver is sleeping or snooze or in a normal position. According to this prediction, it generates some alert for driver safety. I learnt **OpenPose** and **transfer learning** techniques. I was a newcomer then and my role is to help the team leader with anything they asks. Our team role is to find a facial landmark using OpenPose and classify this feature using **InceptionV3 pre-train** model.
  Technologies Used :Python, Tensorflow, OpenCV, PyQt.
- **Document Sequence Classification**
  Description : Classifying every chapter or sub-chapter of the document for better understanding or support to the end user and extracting important information from the selected chapter or sub-chapter so that extraction can be efficient, faster and lower computational resource required.
  Technologies Used :Transformers, BERT, NLTK, Numpy.
- **Attendance System Using Face Recognition**
  Description : Implement a face recognition system in an IP camera. It can identify multiple faces from the image and assign a name to the corresponding face. This system also can handle an unknown face. In the backend, we also have a database where all the information is saved. I learn **dlib, MTCNN** for cropping the face from image and **facenet**, for identifying face.
  Technologies Used : Python, Tensorflow, OpenCV, Facenet
- **Bangla LLAMA LLAMA-3 8B Model**
  Description:[Personal Project] Llama3, 8 Billions parameter model released by Meta is fine-tuned, specially adapted to the Bengali language. It has been trained and optimized to better understand, generate, and process text in Bengali, making it highly suitable for tasks such as translation, summarization, text generation, and sentiment analysis in the Bengali language. The fine-tuning process involved large-scale datasets in Bengali, focusing on providing enhanced linguistic and contextual understanding specific to the language, enabling improved performance across various Bengali NLP applications.
  Technologies Used : Python, Attention mechanism, KV Cache, GQA, Flash Attention, LORA, Q-LORA

WORK EXPERIENCE

ALTERSENSE. Tejgaon Industrial Area, Dhaka, Bangladesh
ML Engineer & Team Lead August 2024 to present

- Developed a surveillance application to **monitor individuals**, **track assigned tasks**, and **analyze engagement time** for performance insights.
- Optimized model size to **minimize latency** while **maintaining accuracy**.
- Collaborated with **DevOps** teams to **deploy surveillance models** using **Docker & Kubernetes**.
- Developed an **AI Agent powered** chatbot that allows officials to query financial data using natural language.
- Worked closely with the **product team to analyze, gather requirements**, and **define system specifications**.
- Designed a secure **DB schema abstraction** that allows the **AI agent** to utilize the schema without exposing the actual data.
- Designed & implemented a data pipeline for real-time streaming and fed streaming data into machine learning models for inference using **Apache Kafka**.

Next Solution Lab Mirpur DOHS, Dhaka, Bangladesh
AI Engineer April 2022 to August 2024

- Led a team in **Contract LLM** project that successfully trained **domain adaptation, fine-tuning** on Contract Document.
- Implemented **RAG** (Retrieval Augmented Generation) **on top of fine-tuned LLMs**.
- Developed **ASR** (Automatic Speech Recognition) with **3.91%** Word Error Rate.
- Led a team in an **OCR** project, achieving **3.5% accuracy** boost, and optimizing execution run **time by 33%** approximately.
- **Analyzed requirements and problems, developed, and optimized** deep learning models.
- Collaborated with **cross-functional** teams to create end-to-end pipelines.
- Ensured the **reliability & performance efficiency** of AI solutions.
- AI product containerization using **Docker** for deployment.
- Developed **Named Entity Recognition** system for **Japanese and English** language.
- Developed **document sequence classification**.
- Analyzing data and model output to **refine models** further.
- Designed and developed proof-of-concept using **NLP** techniques.
- **Explored new technologies** to enhance performance or replace existing ones.
- Improved post-processing pipeline to enhance OCR accuracy by 2.81% approximately.

AI Engineer(Associate) April 2021 to March 2022

- Developed data augmentation and text recognition pipeline.
- Developed data processing and test automation.
- Developed detection post-processing pipeline to enhance OCR accuracy 4.65% approximately.

Semantics Lab Mordern, Rangpur, Bangladesh

AI Researcher & Developer February 2019 to January 2021

- Built a face recognition-based attendance system for automated identification of registered individuals.
- Implemented a mechanism to detect and handle unknown persons.
- Developed a safe driving system that detects driver distraction and triggers alert alarms.
- Developed a facial expression detection system for recognizing and analyzing emotions.
- Developed a computer vision-based system for monitoring and analyzing toddler activities.
- Conducted research & developed deep learning and image processing algorithms for object detection and recognition.
- Analyzed data to identify key factors that affect the accuracy and performance of the model.

REFERENCES

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