Biplob Biswas

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Experience

Research Engineer
Dec. 2023 – Present

Fujitsu Research of America, Inc. — *Santa Clara, CA*

- Designed a sequence generation model for predictive process monitoring.*[Python, PyTorch]*
- Developed an ML-driven web tool for process data analysis and visualization.*[Python, Streamlit]*
- Designed and developed a multi-agent system (RAG, Coding) for an AI chatbot to analyze tabular and textual data.*[Python, LangChain, LangGraph, Ollama, Streamlit, Chroma]*

Machine Learning Intern
Jun. 2021 – Dec. 2023

Emplifi — *Columbus, OH*

- Designed and developed a **knowledge-grounded response generation framework** to automatically answer user queries in a customer care setting (Real-world data) and deployed it as an API service. *[AWS, Docker, Python, PyTorch, HuggingFace, FastAPI]*
  - Employed neural information retrieval (IR) techniques to collect knowledge from historical unstructured data and blended that information into generated responses through a fine-tuned GPT-2 model.
  - The model generates **12% more informative and 15.3% more semantically similar responses** than that of vanilla GPT-2 (contemporary state-of-the-art).
- Developed **a paraphrasing model and corresponding web service** to introduce diversity in the business response template. *[AWS, Docker, Python, PyTorch]*

Graduate Research Associate
Aug. 2021 – Dec. 2023

The Ohio State University — *Columbus, OH*

- Designed a **hybrid information ranking system** by combining jointly learned sparse lexical and dense semantic representation. Demonstrated with retrieval augmented generation models for heterogeneous product-question answering tasks. (Code, Dataset: hetPQA). *[Python, PyTorch, BERT, T5]*
  - Outperforms independently trained retrievers by **10.95%** (sparse) and **2.7%** (dense) in MRR@5.
  - Offers better interpretability and performs comparably to state-of-the-art cross encoders while reducing response time by **30%** (latency) and cutting computational load by approximately **38%** (FLOPs).
- Designed and developed an **explainable deep-learning model - TransICD** to predict ICD codes from a patient discharge summary (Code, Dataset: MIMIC-III).*[Python, PyTorch]*
  - The model achieves stable **micro-AUC and micro-F1 scores of 0.92 and 0.64** respectively with 1.1% and 2.5% increases over the corresponding metrics of LEAM (contemporary state-of-the-art).
- Designed and developed TransDTBA, a transformer-based model to predict drug-protein binding affinity (Code, Dataset: KIBA). *[Python, PyTorch]*
- Implemented joint slot-filling and intent detection, developed end-to-end NLG system for E2E NLG Shared Task (Code, Dataset: ATIS, E2E). *[Python, PyTorch, RNN]*

Graduate Teaching Associate
Aug. 2018 – May 2021

The Ohio State University — *Columbus, OH*

- Instructor of "Introduction to Computer Programming in C++" (Spring'20, Summer'20, Autumn'20 and Spring'20)
- Instructor of "Modeling and Problem Solving with Spreadsheets and Databases" (Autumn'18 and Spring'19)

Engineer, Research and Development
Mar. 2016 – Jul. 2018

KONA Software Lab Limited (in collaboration with KONA I, Seoul, Korea) — *Dhaka, Bangladesh*

- Developed the front-end of a leading **Android payment application** in Bangladesh NexusPay (**5M+ Downloads**)
  - Utilized REST APIs for backend communication and implemented various transaction interfaces including NFC, QR-code, and online payment. *[Android, Java, SQLite]*
- Developed a Nexgo POS application to facilitate transactions from an Android payment application. *[C]*

Education

The Ohio State University Aug. 2018 – Dec. 2023
Ph.D. in Computer Science and Engineering *Columbus, OH*

- Advisor: Dr. Rajiv Ramnath
- Research Topics: Natural Language Processing, Text Generation, Information Retrieval
- Dissertation: Improving Response Automation for Customer Communication through Document Categorization and Information Retrieval
- Courses Taken: Machine Learning, Data Mining, Parallel Computing, Neural Networks, Speech and Language Processing, Social Media and Text Analysis
- GPA: 3.89 / 4.00

The Ohio State University Aug. 2018 – May. 2023
Master of Science in Computer Science and Engineering *Columbus, OH*

- GPA: 3.89 / 4.00

Bangladesh University of Engineering and Technology Feb. 2011 – Mar. 2016
Bachelor of Science in Computer Science and Engineering *Dhaka, Bangladesh*

- GPA: 3.73 / 4.00

Professional Services

- Reviewer: EMNLP 2023 - Workshop BLP, ASONAM 2023
- Led a team of graduate students to employ a **deep reinforcement learning model for a question-answering task** in customer care service.

Technical Skills

Languages: Python, Java, C, C++
Frameworks & Others: PyTorch, LangChain, LangGraph, Streamlit, FastAPI, Scikit, spaCy, MCP, A2A
Platforms: Android, AWS, Docker, CUDA, Databricks
Tools: Git, BitBucket, Jira, Trello, PyCharm, IntelliJ Idea, VS Code
LLMs: BERT, BART, GPT, T5, Gemini, Llama, Qwen
Database: Oracle, MySQL, Chroma, Pinecone

Publications

- **Efficient and Interpretable Information Retrieval for Product Question Answering with Heterogeneous Data**, Biplob Biswas, Rajiv Ramnath. In Proceedings of the Seventh Workshop on e-Commerce and NLP @ LREC-COLING, May 2024.
- **Retrieval Based Response Letter Generation For a Customer Care Setting**, Biplob Biswas, Renhao Cui, Rajiv Ramnath. In Proceedings of the 2022 Conference of the North American Chapter of the Association for Computational Linguistics (NAACL): Human Language Technologies: Industry Track, July 2022.
- **TransICD: Transformer Based Code-wise Attention Model for Explainable ICD Coding**, Biplob Biswas, Hoang Pham, Ping Zhang. In International Conference on Artificial Intelligence in Medicine (AIME) Jun 2021.
- **Towards Simulating Non-lane Based Heterogeneous Road Traffic of Less Developed Countries**, Q. M. Alam, B. Sarker, Biplob Biswas, K. H. Zubaer, T. Toha, N. Reza and ABM A. Al Islam. In ICT4S, May 2018.

Honors and Awards

- Dean's Merit List in 4th year of Bachelors 2016
- Dean's Merit List in 2nd year of Bachelors 2013
- Education Board Scholarship - for notable performance in SSC and HSC examination 2010

Additional Information

- H-1B visa approved in 2024