Saadat Hasan Khan

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Experience

Captial One June 2025 – August 2025
PhD Data Science Intern *McLean, VA*

- Improved retrieval quality for RAG systems on multi-hop QA by reducing redundancy and enhancing context diversity
- Designed a novel query-aware retrieval framework by extending Maximal Marginal Relevance to dynamically balance relevance and diversity at inference time
- Developed DF-RAG, a training-free RAG that adaptively selects diverse, high-utility context chunks, improving performance over vanilla RAG by up to 10% F1 score and beating contemporary RAG pipelines
- Validated the approach through extensive experiments and published the work in the *Findings of EACL 2026*

Brillient Corporation June 2024 – August 2024
Machine Learning Engineer Intern *Reston, VA*

- Contributed to the planning, design and implementation of 4 modules of BRAG (Brillient RAG) project
- Designed and developed the pre-processor and source-finder services for enhanced data processing and retrieval capabilities using Flask, Docker and deployed in AWS EC2
- Developed custom chunking models tailored to the company's unstructured documents, improving the context retained by chunks by around 20% compared to off-the-shelf libraries and stored chunks in OpenSearch vector database
- Integrated all developed services to the main gateway of BRAG, connected the gateway with Llama-3 8b model, managed the services' pay-loads and ensured seamless operation and accessibility within the components of BRAG

George Mason University August 2022 – Present
Graduate Research Assistant *Fairfax, VA*

- Research on LLM consistency and robustness under perturbed question–answering settings through noisy retrieval settings
- Research on developing health focused Conversational AI leveraging LLMs using techniques like Fine-Tuning, Knowledge Distillation, RAG, RLHF, Agent Simulation

Education

George Mason University August 2022 – May 2027
Ph.D in Computer Science *Fairfax, VA*

Brac University September 2015 – August 2019
B.Sc. in Computer Science and Engineering *Dhaka, Bangladesh*

Selected Publications

- **Saadat Hasan Khan**, Spencer Hong, Jingyu Wu, Kevin Lybarger, Youbing Yin, Erin Babinsky, Daben Liu. DF-RAG: Query-Aware Diversity for Retrieval-Augmented Generation. 2026. Findings of the EACL, 2026.
- **Saadat Hasan Khan**, Kevin Lybarger. Efficient Information Extraction Using LLMs and Knowledge Distillation: A Study on HPV Health Communication. (Under Review)-PLOS Digital Health.
- Fardin Ahsan Sakib, AHM Karim, **Saadat Hasan Khan**, Md Mushfiqur Rahman. Intent Detection and Slot Filling for Home Assistants: Dataset and Analysis for Bangla and Sylheti. 2023. Proceedings of the First Workshop on Bangla Language Processing, 2023. doi : 10.18653/v1/2023.banglalp-1.6 [Equal Contribution]
- Fardin Ahsan Sakib, **Saadat Hasan Khan**, AHM Karim. Extending the frontier of ChatGPT: Code generation and debugging. 2024. 2024 International Conference on Electrical, Computer and Energy Technologies. doi : 10.1109/ICECET61485.2024.10698405 [Equal Contribution]
- **Saadat Hasan Khan**, M. G. R. Alam. A Federated Learning Approach to Pneumonia Detection. 2021. 2021 International Conference on Engineering and Emerging Technologies (ICEET) doi: 10.1109/ICEET53442.2021.9659591.

Selected Projects

ScienceRAG | *GPT 4o, openai, ChromaDB* October 2024

- Developed a Retrieval Augmented Generation (RAG) conversational system with a chat interface, integrating arXiv, PubMed Central, and Wikipedia sources, implementing query rewriting and proposing novel evaluation metrics for query reformulation, information accuracy, and response correctness. Project was designed for CS-678 (Advanced NLP) class

Pneumonia-as-a-service | *Tensorflow, Flask, AWS, Kunbernetes, Rancher, Jenkins* March 2024

- Developed and deployed a scalable deep learning web service for Pneumonia detection from chest X-ray images using a fine-tuned VGG-16 model. Implemented a Dockerized Flask API with a front-end interface, deployed on Kubernetes, and automated CI/CD with Jenkins

Academic Serivces

Reviewer: Applied Clinical Informatics, Journal of the American Medical Informatics Association