

Amit Sarker

✉ asarker@umass.edu 🏠 amit-sarker.github.io in amit-sarker99 🎓 Google Scholar 🌐 amit-sarker ☎ (314) 679-0698

EDUCATION

- **University of Massachusetts Amherst**, Amherst, MA *Sep. 2022 - Aug. 2027*
Ms/PhD in Computer Science; Advised by Dr. Narges Mahyar and Dr. Ali Sarvghad
Courses: NLP, Neural Networks, Information Retrieval, Advanced Algorithms, Information Assurance
- **University of Dhaka**, Dhaka, Bangladesh *Jan. 2016 - Dec. 2019*
B.Sc. in Computer Science and Engineering; Advised by Dr. Md. Mosaddek Khan
Courses: Data Mining, AI, Data Structures, Algorithms, OOP, C/C++, Linear Algebra, Statistics

EXPERIENCE

- **University of Massachusetts Amherst**, *Graduate Research Assistant* *Sep. 2022 - Present*
 - Exploring fairness implications within Differential Privacy (DP) algorithms to ensure fair and equitable treatment across all demographic groups.
 - Working on designing and building a fair visual data exploration platform for DP data.
 - Conducted interviews with DP practitioners to identify real-world challenges in deploying privacy-preserving systems and how data visualization can be utilized to make DP widely adopted.
- **University of Massachusetts Amherst**, *Graduate Teaching Assistant*
 - Introduction to HCI (Fall 2023); Foundations of Programming (Fall 2024)
- **University of Dhaka**, *Research Assistant* *Jan. 2020 - Dec. 2020*
 - Applied local search and particle swarm optimization algorithms to solve Continuous Distributed Constraint Optimization Problems (C-DCOPs) in large-scale multi-agent systems.
 - Mentored two undergraduate students and contributed to their senior year thesis projects on multi-agent planning and scheduling.
- **TigerIT Bangladesh Limited**, *Software Engineer (QA)* *Apr. 2020 - Jul. 2021*
 - Enhanced system reliability and performance by identifying system requirements.
 - Analyzed and tested methodologies for a COVID-19 contact tracing module to mitigate the spread.
 - Created and executed well-structured test plans, and implemented automation scripts.

PUBLICATIONS (* - EQUAL CONTRIBUTION)

- L. Panavas*, **A. Sarker***, A. Sarvghad, C. Dunne, N. Mahyar. “Illuminating the Landscape of Differential Privacy: An Interview Study on the Use of Visualization in Real-World Deployments.” *IEEE Transactions on Visualization and Computer Graphics (TVCG)*, July 2024. ([Paper Link](#) [↗](#))
- M. Choudhury, **A. Sarker**, S. Yaser, MAA. Khan, W. Yeoh, M. M. Khan. “A Particle Swarm Inspired Approach for Continuous Distributed Constraint Optimization Problems.” *Engineering Applications of Artificial Intelligence (EAAI)* Volume 123, Part B, August 2023, 106280. ([Paper Link](#) [↗](#))
- **A. Sarker**, M. Choudhury, and M. M. Khan. “A Local Search Based Approach to Solve Continuous DCOPs.” In *Proceedings of the 20th International Conference on Autonomous Agents and Multiagent Systems (AAMAS)*, pages 1127–1135, 2021. ([Paper Link](#) [↗](#))
- **A. Sarker**, A. B. Arif, M. Choudhury, and M. M. Khan. “C-CoCoA: A Continuous Cooperative Approximation Algorithm to Solve Functional DCOPs.” In *Proceedings of the 19th International Conference on Autonomous Agents and Multiagent Systems (AAMAS)*, pages 1990–1992, 2020, IFAAMAS. (Extended Abstract) ([Paper Link](#) [↗](#))
- **A. Sarker**, A. B. Arif, M. Choudhury, and M. M. Khan. “C-CoCoA: A Continuous Cooperative Approximation Algorithm to Solve Functional DCOPs.” *11th International Workshop on Optimization and Learning in Multiagent Systems (OptLearnMAS) @ AAMAS*, 2020.

PROJECTS

- **ICL Capabilities of LLMs** (*NLP, In-Context Learning, Chain-of-Thought*) [!\[\]\(467d80e979964f7f8c752fb22248b5b7_img.jpg\)](#) Mar. 2024 - May. 2024
 - Conducted evaluations of pre-trained language models on arithmetic tasks and sentiment analysis using synthetic datasets, employing zero-shot, few-shot, and chain-of-thought prompting strategies.
 - Designed and implemented “Jumbled Arithmetic” tasks to test if models learn from prompts or rely on pre-trained knowledge, enhancing the understanding of model adaptability to altered symbols.
- **LLM Personalization** (*Scikit Learn, Probabilistic and Neural Retrievers*) [!\[\]\(b71552d33dbf62adf5e5199a70ee02bf_img.jpg\)](#) Oct. 2023 - Dec. 2023
 - Developed advanced retrieval strategies, including clustering and reranking, to enhance the personalization of LLMs by optimizing user-specific outputs from large data.
 - Employed multiple retrieval models like BM25 baseline, topic-model based retrieval, and Contriever reranking to refine personalization, culminating in integration with the Flan-T5-base model to assess output effectiveness.
- **Privacy Risk of ML Models** (*RNN, Adversarial Regularization, MemGuard*) [!\[\]\(03134b765d1473836ff001925b1b0550_img.jpg\)](#) Oct. 2022 - Dec. 2022
 - Evaluated neural network-based models’ vulnerability to membership inference attacks, developed and tested various defense mechanisms, including adversarial regularization and MemGuard.
 - Assessed their effectiveness in protecting sensitive training data against attacks, introduced a novel privacy risk score that quantifies the privacy risks of individual data samples based on their likelihood of being part of the model’s training set.

TECHNICAL SKILLS

- **Libraries & Tools:** PyTorch, scikit-learn, LLM, Huggingface, In-Context Learning, Prompt Engineering, Pandas, NumPy, OpenDP, Diffprivlib, D3, Matplotlib, Plotly
- **Languages:** Python, Java, C/C++, Javascript
- **Web Development:** React, Node.js, Flask, MySQL, Oracle, MongoDB, Firebase, Django
- **Research:** Differential Privacy, HCI, Data Visualization, Quantitative & Qualitative Data Analysis, Multi-Agent Systems, DCOPs

HONORS AND AWARDS

- James Kurose Scholarship in Computer Science, UMass Amherst, 2023.
- Conference Scholarship (AAMAS 2021, AAMAS 2020)
- 1st Runner-Up in Code Samurai 2019 Nov. 2019
 - The objective of the hackathon was to find efficient transportation routes in Dhaka city by considering several constraints, including transportation method, traffic situation, time, distance, etc.

VOLUNTARY ACTIVITIES & SERVICES

Conference Student Volunteer

- IEEE VIS 2023, AAMAS 2021, AAMAS 2020.

Shabab-Murshid Development Foundation (SMDF)

Feb. 2016 - Jan. 2020

Volunteer Teacher & Coach

- Took mathematics classes for underprivileged high school children.
- Motivated and prepared them to participate in the National Mathematical Olympiad, Bangladesh.

Leadership

Jan. 2017 - Feb. 2020

- Organized Freshers’ Week, Treasure Hunt competition for the freshman year students of CSE, DU.
- Organized annual picnics, study tours with CS department students. Organized an international tour (India) during my senior year.