Amit Sarker

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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
Research Group: HCI-VIS Lab

University of Dhaka, Dhaka, Bangladesh *Jan. 2016 - Dec. 2019*
B.Sc. in Computer Science and Engineering; Advised by Dr. Md. Mosaddek Khan
Research Group: CAIL Research Group

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

- **A. Sarker***, L. Panavas*, 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)* *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)* *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** *(NN,RNN,Adversarial Regularization,MemGuard)Oct. 2023 - Dec. 2023*
  - 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

- **Languages & Libraries:** Python, Java, C/C++, PyTorch, Pandas, NumPy, OpenDP, Diffprivlib
- **Web Development:** React, Node.js, Flask, MySQL, Oracle, MongoDB, Firebase
- **Visualization Tools:** D3, Matplotlib, Plotly
- **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.