

NAHEED ANJUM ARAFAT

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RESEARCH INTERESTS & EXPERTISE

My expertise encompasses various branches of Machine Learning and Data Mining, such as **graph and hypergraph representation learning**, **adversarially robust learning**, and **hypergraph data mining**, with applications in cybersecurity, computational physics simulation, and human-centered AI.

My research contributions have been recognized through publications in premier venues such as **ICML**, **ICLR**, **AAAI**, and **VLDB**, among others, as well as two patents granted (filed) at the **UK (US) Intellectual Property Offices**.

EMPLOYMENT HISTORY

Post-doctoral Research Fellow

College of Engineering and Architecture, Howard University

DC, USA

July 2025 - Now

Post-doctoral Research Fellow

Rolls-Royce@NTU Corporate Lab, NTU

Singapore

July 2021 - 2024

Post-doctoral Research Fellow

Department of Information Systems & Analytics, NUS

Singapore

July 2020 - July 2021

Research Assistant

Department of Computer Science, NUS

Singapore

Nov 2019 - June 2020

Full-time Lecturer

Department of Computer Science, United International University

Dhaka, Bangladesh

Jun 2014 - Jul 2015

Part-time Developer

Software Global Consultancy

Dhaka, Bangladesh

Jan 2014 - Mar 2014

RESEARCH EXPERIENCE

Post-doctoral Research Fellow

PI: Professor Danda B. Rawat

College of Engineering and Architecture, Howard University

March 2025 - Now

- **Projects:** Develop, design, and evaluate secure, trustworthy, robust, fair, explainable AI systems and ML algorithms.

Post-doctoral Research Fellow

PI: Associate Professor Adams Wai Kin Kong

Rolls-Royce@NTU Corporate Lab, NTU

July 2021 - 2024

- **Projects:** (1) Super-resolution/-fidelity of CFD simulations. (2) Accelerating unsteady flow simulation with physics-based AI.

Research Fellow

PI: Assistant Professor UM Sungyong

Department of Information Systems & Analytics, NUS

July 2020 - July 2021

- **Project:** Co-evolution of software ecosystem networks.

Research Assistant

PI: Professor Tan Kian Lee

Department of Computer Science, NUS

Nov 2019 - June 2020

- **Project:** Random generation of hypergraphs with prescribed constraints.

EDUCATION

National University of Singapore (NUS)

PhD in Computer Science

Singapore

Aug 2015 - Nov 2020

- **Thesis:** Analysis and generation of data with topology from combinatorial representations

Bangladesh University of Engineering and Technology (BUET)

Bachelors in Computer Science & Engineering

Dhaka, Bangladesh

Mar 2009 - Jul 2014

- **Thesis:** A Fuzzy Dominance Based Evolutionary Algorithm for solving many-objective optimisation problems.

RESEARCH PUBLICATIONS

• Conference Proceedings

1. Bishwamitra Ghosh, Sarah Hasan, **Naheed Anjum Arafat**, and Arijit Khan. Consistency of language models for logic facts checking on knowledge graphs. In *International Conference on Learning Representations (ICLR)*, 2025
2. **Naheed Anjum Arafat**, Debabrota Basu, Yulia Gel, and Yuzhou Chen. When witnesses defend: A witness graph topological layer for adversarial graph learning. In *Proceedings of the AAAI Conference on Artificial Intelligence*, 2025
3. **Naheed Anjum Arafat**, Ehsan Bonabi Mobaraki, Arijit Khan, Yllka Velaj, and Francesco Bonchi. Estimate and reduce uncertainty in uncertain graphs. In *2024 IEEE 11th International Conference on Data Science and Advanced Analytics (DSAA)*, 2024
4. *Loh Sher En Jessica, ***Naheed Anjum Arafat**, Wei Xian Lim, Wai Lee Chan, and Adams Wai Kin Kong. Finite volume features, global geometry representations, and residual training for deep learning-based cfd simulation. ICML (spotlight), 2024. * = equal contribution
5. Wei Xian Lim, **Naheed Anjum Arafat**, Wai Lee Chan, and Adams Wai Kin Kong. Multi-order loss functions for accelerating unsteady flow simulations with physics-based ai. In *2024 IEEE Conference on Artificial Intelligence (CAI)*, 2024
6. **Naheed Anjum Arafat**, Arijit Khan, Arpit Kumar Rai, and Bishwamitra Ghosh. Neighborhood-based hypergraph core decomposition. volume 16. VLDB Endowment, May 2023
7. **Naheed Anjum Arafat**, Debabrota Basu, Laurent Decreusefond, and Stéphane Bressan. Construction and random generation of hypergraphs with prescribed degree and dimension sequences. In *Database and Expert Systems Applications*, pages 130–145, Cham, 2020. Springer International Publishing
8. **Naheed Anjum Arafat**, Debabrota Basu, and Stéphane Bressan. Topological data analysis with ϵ -net induced lazy witness complex. In *Database and Expert Systems Applications*, pages 376–392, Cham, 2019. Springer International Publishing
9. **Naheed Anjum Arafat** and Stéphane Bressan. Hypergraph drawing by force-directed placement. In *International Conference on Database and Expert Systems Applications*, pages 387–394, Cham, 2017. Springer International Publishing

• Journals

10. Siddhartha Shankar Das, Md Monirul Islam, and **Naheed Anjum Arafat**. Evolutionary algorithm using adaptive fuzzy dominance and reference point for many-objective optimization. *Swarm and evolutionary computation*, 44:1092–1107, 2019

• Patents

11. Jessica Sher En Loh, **Naheed Anjum Arafat**, Wai Kin Adams Kong, Wai Lee Chan, and Bryce D. Conduit. Fluid flow simulation, Oct 2024. Granted; Filed: 14 August, 2023; Granted: 8 October, 2024
12. Jessica Sher En Loh, **Naheed Anjum Arafat**, Wai Kin Adams Kong, Wai Lee Chan, Bryce D. Conduit, Wei Xian Lim, and Thant Zin Oo. Fluid Flow Simulation, Feb 2025. Pending; Priority: Aug. 14, 2023; Filed: July 30, 2024

• Workshops/Posters

13. **Naheed Anjum Arafat**, Debabrota Basu, and Stéphane Bressan. ϵ -net induced lazy witness complexes on graphs. *Workshop on Applications of Topological Data Analysis (ATDA)*, held in conjunction with ECML-PKDD, 2019

• Preprints/Under-review

14. **Naheed Anjum Arafat**, Debabrota Basu, Yulia Gel, and Danda B. Rawat. MeLA-D: Adversarial attacks and robust training for hypergraph neural networks via meta learning. 2026. AAAI (under review)
15. Siddhartha Shankar Das, **Naheed Anjum Arafat**, Muftiqur Rahman, S M Ferdous, Alex Pothan, and Mahantesh M Halappanavar. SGS-GNN: A supervised graph sparsifier for graph neural networks. 2025. ICDM (under review)
16. Mikel K. Nguajio, **Naheed Anjum Arafat**, and Danda B. Rawat. Evaluating hatefulness in fake news through llm and human alignment. 2026. AAAI (under review)
17. **Naheed Anjum Arafat** and Danda B. Rawat. EdgeMask-HGNN: Learning to sparsify hypergraphs for scalable node classification. 2026. AAAI (under review)

TEACHING EXPERIENCE

As Graduate Assistant

NUS

Jan 2016 - 2019

I conducted weekly tutorials and held one-on-one consultation sessions for the following courses:

- **Big Data Techniques and Technologies (BT4221)**: Department Of Information Systems and Analytics, School of Computing - Semester 1, 2019.
- **Data Management and Warehousing (BT5110)**: Master Of Science Business Analytics Programme - Semester 1 of 2019, 2018 and 2017.
- **Information Visualisation (CS5346)**: Department of Computer Science, School of Computing - Semester 2, 2018.
- **Discrete Structures (CS1231)**: Department of Computer Science, School of Computing - Semester 1, 2016.
- **Programming Methodology (CS1010E)**: Department of Computer Science, School of Computing - Semester 2 of 2017 and 2016.

I designed course curriculum, prepared lecture notes, assignments, and exam questions, delivered lectures, conducted labs, and evaluated assignments and exam scripts. I was also involved in various administrative duties. The courses include:

- **Advanced Programming Languages:** Summer 2014, Fall 2014, Spring 2015, Summer 2015 trimesters.
- **Data Structures:** Fall 2014, Summer 2015 trimesters.
- **Discrete Mathematics:** Summer 2014 trimester.
- **Structured Programming Language:** Spring 2015 trimester.
- **Electric Circuits:** Fall 2014, Spring 2015, Summer 2015 trimesters.

MENTORING EXPERIENCE

- I held discussion, brainstorming, and coding sessions to train the students in academic research. I also gave suggestions to help improve their presentations and write-ups. The students include:
 - **Siddhartha Shankar Das:** PhD student at Purdue University, USA. (2024-2025)
 - **Sarah Hasan:** PhD student at Aalborg University, Denmark. (2023-2024)
 - **Ehsan Bonabi Mobaraki:** PhD student at Aalborg University, Denmark. (2022-2023)
 - **Loh Sher En Jessica:** PhD student at Nanyang Technological University. (2021-2023)
 - **Bishwamittra Ghosh:** PhD student at National University of Singapore. (2021-2022)
 - **Arpit Kumar Rai:** Undergraduate student at IIT Kanpur (2021-2022)
 - **Debabrata Mahapatra:** PhD student at National University of Singapore (2019)

RESEARCH MANAGEMENT EXPERIENCE

- **Research Equipment Purchasing**
 - I led the acquisition of a high-performance GPU server for experimenting with deep neural networks.
 - * I managed the entire procurement process, from preparing requirement specifications for Invitation-To-Quote (ITQ) and setting clear evaluation criteria to evaluating potential vendors and overseeing the installation, testing & commissioning of the server.
 - * I collaborated with the IT department to ensure seamless integration of the new equipment into ongoing research projects, significantly enhancing the computational capabilities of RR@NTU Corp Lab.
- **Grant Writing**
 - AI Singapore Research Grant. Status: under review
 - * I collaborated with my PI (at NTU) on developing the grant proposal by proposing ideas for potential work packages and drafted sections of the grant application, such as discussing state-of-the-art and their limitations.

TALKS

- **Guest Lectures:**
 - * **Big Data Techniques and Technologies module (NUS):** I delivered two guest lectures on 'Practical data analysis using Amazon EMR and Sagemaker services' during Semester 1, 2020 offering of the undergraduate module BT4221.
 - * **Data Management and Warehousing module (NUS):** I delivered a hands-on lecture on 'developing retail-sales data mart using Pentaho' during Semester 1, 2018 offering of the masters module BT5111.
 - * **Information visualisation module (NUS):** I delivered a guest lecture on 'Graph and hypergraph data visualisation tools' during Semester 2, 2018 offering of the master's module CS5346.
- **Seminar Talks:**
 - * **Talk at Grand Valley State University, MI (2025):** Graph Data Mining and Learning: Modern Applications, Challenges and Paradigms
 - * **Moscow-Beijing Topology seminar (2022):** I presented my work on Topological data analysis.
 - * **DEXA (2020):** I presented my paper: *Construction and random generation of hypergraphs with prescribed degree and dimension sequences*
 - * **DEXA (2019):** I presented my paper: *Topological data analysis with ϵ -net induced lazy witness complex*.
 - * **E2S2-CREATE seminar (2019):** I gave a talk on *Topological Data Analysis* at E2S2-CREATE Seminar, Feb 2018 attended by 20+ researchers from E2S2 project funded by NRF.

ACADEMIC SERVICES

- **PC Member:** AAAI (2026), CODS-COMAD ([2024](#), [2025](#)), TKDE (2023, 2021), SKIMA (2014).
- **Reviewer:** NeurIPS (2025), MLG workshop @ECML-PKDD (2025), LLM+G Workshop@VLDB (2025), IEEE Transactions on Artificial Intelligence (2025), ICML (2025), ICLR (2025), ICDE (2025, 2018), LoG (2024), NeurIPS (2024), CIKM (2024), Journal of Applied and Computational Topology (2024), DASFAA (2020), DAWAK (2020), VLDB (2017), DEXA (2017).
- **Session Chair:** [VLDB 2023 \(Learning, Recommendations, Social Networks\)](#)
- **Co-organiser:** Co-organised *8th International Conference on Software, Knowledge, Information Management and Applications (SKIMA)*, 2014
- **Session Chair:** Chaired two sessions at *NUS SoC-Telecom ParisTech joint workshop on Data Sciences and Artificial Intelligence*, April 2018 attended by 20+ scholars from Telecom ParisTech and NUS.
- **Session Chair:** Chaired sessions at *NUS School of Computing Research Workshop*, March 2018 attended by 50+ scholars across Asia.

AWARDS & ACHIEVEMENTS

- **Distinguished PC member award:** [CODS-COMAD 2024](#)
- **NUS Research Scholarship** for PhD students (2015-2019).
- **Teaching Assistant Training Certificate** issued by the Centre for Development of Teaching & Learning (CDTL), NUS on applying 'Collaborative Learning' approaches.
- **Distinguished Poster Award** at Undergraduate Research Poster Presentation Workshop 2014, Department of Computer Science and Engineering, BUET for presenting my undergraduate Capstone project
- **Inter-University Hardware Project Show Champion** award for showcasing the project titled 'Cell phone operated mini-car with surveillance' at CSE festival 2013, BUET.
- **Imdad-Sitara Khan Scholarship** for high-school studies (2006-2008) and undergraduate studies (2009-2013).

REFERENCES

Available upon request