

NAHEED ANJUM ARAFAT

Research Fellow, Department of Information Systems and Analytics, National University of Singapore

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RESEARCH INTERESTS

I am interested in the algorithmic and applied aspects of graph and hypergraph structured data and topological approaches for data analysis. I am also interested in the synergy between machine learning and network analysis. I have worked on the following topics over the years-

- **Graphs:** Co-evolution of software ecosystem networks. Topological analysis of graph structured data.
- **Hypergraphs:** Algorithms for generating and estimating properties of random hypergraphs with a prescribed constraint. Algorithms for visualising hypergraphs.
- **Topological data analysis:** Exact and approximate computation of topological features of Euclidean and graph data.
- **Optimisation:** Evolutionary algorithms for solving many-objective optimisation problems.

EDUCATION

National University of Singapore (NUS)

PhD in Computer Science

Singapore

Aug 2015 - Present (Thesis defended)

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

Bangladesh University of Engineering and Technology (BUET)

Bachelors in Computer Science & Engineering; GPA: 3.79/4

Dhaka, Bangladesh

May 2014

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

EMPLOYMENT HISTORY

Research Fellow

Department of Information Systems & Analytics, NUS

Singapore

July 2020 - Present

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

Research Fellow

Mentor: Assistant Professor UM Sungyong

Department of Information Systems & Analytics, NUS

July 2020 - Present

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

Research Assistant

Mentor: Professor Tan Kian Lee

Department of Computer Science, NUS

Nov 2019 - June 2020

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

PhD Student

PhD Supervisor: Associate Professor Stéphane Bressan

Department of Computer Science, NUS

Jan 2016 - Present

Undergraduate research

Supervisor: Professor Md Monirul Islam

Department of CSE, BUET

Jan 2013 - May 2014

TEACHING EXPERIENCE

Graduate Assistant

NUS

Jan 2016 - 2019

As a graduate teaching assistant, I conducted weekly tutorials and held student consultation sessions.

• 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.

Lecturer

United International University

Jun 2014 - Jul 2015

As a full-time lecturer, I designed module curriculum, prepared lecture notes, assignments and exam questions, delivered lectures, conducted lab-sessions, and evaluated assignment submissions and exam-scripts. I was also involved in various administrative duties.

• Courses-

- **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.

Mentor

NUS

Jan 2019 - Mar 2019

I held consultation and discussion sessions to assist students in their research.

- **Debabrata Mahapatra**: PhD lab-rotation under Stéphane Bressan.

RESEARCH PUBLICATIONS

• Conference Proceedings

1. **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
2. **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
3. **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

1. 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

• Preprints

1. **Naheed Anjum Arafat**, Debabrota Basu, Laurent Decreusefond, and Stéphane Bressan. Construction and random generation of hypergraphs with prescribed degree and dimension sequences (extended version). *arXiv preprint arXiv:2004.05429*, 2020

• Workshops/Posters

1. **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

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 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 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 masters module CS5346.
- **Seminar Talks:**
 - **DEXA 2020:** I presented my paper on *Construction and random generation of hypergraphs with prescribed degree and dimension sequences*
 - **DEXA 2019:** I presented my paper on *Topological data analysis with ϵ -net induced lazy witness complex*.
 - **E2S2-CREATE Seminar:** 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

- **Reviewer:** SKIMA 2014
- **External Reviewer:** DASFAA 2020, DAWAK 2020, ICDE 2018, VLDB 2017, DEXA 2017.
- **Co-organiser:** Co-organised *8th International Conference on Software, Knowledge, Information Management and Applications (SKIMA), 2014* held at United International University, Bangladesh.
- **Session Chair:** Chaired two sessions at *NUS SoC-Telecom ParisTech joint workshop on Data Sciences and Artificial Intelligence, April 2018* attended by 20+ researchers from Telecom ParisTech and NUS.
- **Session Chair:** Chaired two sessions at *NUS School of Computing Research Workshop, March 2018* attended by professors and researchers from various countries in Asia.

AWARDS & ACHIEVEMENTS

- **NUS Research Scholarship** for PhD students (2015-2019).
- **Teaching Assistant Training Certificate** issued by the Centre for Development of Teaching & Learning (CDTL), NUS for completing training on applying ‘Collaborative Learning’ approaches.
- **Distinguished Poster Award** at Undergraduate Research Poster Presentation Workshop 2014, Department of Computer Science and Engineering, BUET for presenting a poster titled ‘Many-Objective Evolutionary Approach using Fuzzy Dominance with Bidirectional Bias’.
- **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 higher-secondary studies (2006-2008) and undergraduate studies (2009-2013).
- **Talent pool Board scholarship** for excellence in Secondary and Higher Secondary exams, Jessore Board, Bangladesh.

REFERENCES

Available upon request