Curriculum Vitae
S M Ferdous

Personal Data

Place and Date of Birth:	Dhaka, Bangladesh | 25 December 1988
Address:	144 Halsey Dr, Apt 03, West Lafayette, In-47906
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Education

Sep 2021 (expected) — PhD in Computer Science, **Purdue University**, West Lafayette, Indiana
Thesis: "Algorithms for degree constrained subgraphs and applications"
Advisor: Prof. Dr. Alex Pothen | Gpa: 3.91/4.00

Mar 2014 — MSc Engg., Computer Science and Engineering
Bangladesh University of Engineering and Technology (BUET)
Thesis: "Practically Efficient Algorithms for Minimum String Cover and Minimum Common String Partition"
Advisor: Prof. Dr. M. Sohel Rahman | Gpa: 3.33/4.00

Feb 2011 — BSc Engg., Computer Science and Engineering
Bangladesh University of Engineering and Technology (BUET)
Thesis: "Cut Detection in Wireless Sensor Network"
9/138, *Degree with Honours* | Advisor: Prof. Dr. Mahmuda Naznin | Gpa: 3.89/4.00

Research Interests

My broad research interest is in continuous and combinatorial optimization. Some of my current projects are as follows.

- Exploring different **approximation algorithm** paradigm to design and develop efficient **parallel algorithms** on graphs
- Graph construction for Graph based **Semi Supervised Learning**
- Optimization based privacy ensuring aggregation in distributed optimization for **Federated Learning**

Graduate Coursework

• Statistical Machine Learning • Algorithm Design, Analysis and Implementation • Computational Methods in Optimization • Mathematical Toolkit for Computer Science • Data Communication and Computer Networks • Parallel Computing • Quantum Computation and Information • Reinforcement Learning

Certifications

Jun 2012	Algorithms: Design and Analysis, Part 1, Stanford University, Coursera (earned 87.8%)
Aug 2012	Machine Learning, Stanford University, Coursera (earned 97.3%)
Dec 2012	Algorithms: Design and Analysis, Part 2, Stanford University, Coursera (earned 82.5%)
Mar 2016	Approximation Algorithms Part I, Ecole normale superieure, Coursera (earned 96%)

Awards & Achievements

Apr 2020	Awarded John R. Rice Fellowship for Scientific Computing from the department of CS, Purdue University.
Jun 2018	Awarded Travel grant for attending SIAM CSC 2018 in Bergen, Norway.
Mar 2017	Awarded 3rd best prize on SIAM CSE student poster competition at Purdue.
Aug 2015	Awarded Ross Fellowship from Purdue University for academic year 2015-2016. The fellowship is awarded to incoming students for excellent academic record.
Aug 2016	Awarded travel and accommodation grant for attending Week long SAMSI summer school on Optimization on Aug 2016 at Research Triangle Park, NC.
2006-2011	Considered for *Dean's list* and *merit scholarship* in each of the four academic years in undergrad for excellent academic results.
Dec 2008	Participated in ACM Inter Collegiate Programming Contest Regional Dhaka Site in 2008 and placed 10th amongst 50 teams.

Professional Experience

Current
Aug 2016
Graduate Research Assistant,
Computer Science, Purdue University, USA
I am working as research assistant with Prof. Alex Pothen. My current research is on designing algorithms and applications for *degree constrained subgraph* problem.

Jun-Aug 2019
Summer Intern (PhD)
ENSA Group, Nokia Bell Labs, Murray Hill, NJ
My mentor was Dr. Anwar Walid and Dr. Muntasir Raihan Rahman. We worked on distributed *Federated Learning*. We developed a privacy preserving distributed federated learning algorithm using optimization technique.

May-Aug 2017
Summer Intern (PhD)
Data Science Group, Pacific Northwest National Lab, Richland, WA
My mentor was Dr. Mahantesh Halappanavar. I implemented different community detection algorithms.

May–Aug 2015
Assistant Professor
Computer Science and Engg., AUST, Dhaka, Bangladesh

Oct 2011–
Apr 2015
Lecturer
Computer Science and Engg., AUST, Dhaka, Bangladesh
The main responsibility was to instruct and evaluate undergraduate classes. I taught many core courses of computer science. Some of the courses I taught are Structured Programming language, Mathematical Analysis for CS, Pattern Recognition, Operating System and Data Structures. Other responsibilities included guiding the senior year project, advising and counseling students, administrative duties etc.

Mar 2011–
Sep 2011
Quantitative Software Developer
Stochastic Logic Ltd., Dhaka, Bangladesh
I built computational software from recent financial mathematical models. During my stay there I implemented the *time dependent Heston model for option pricing*. A live implementation with details can be found at http://financialmodule.stochasticlogic.com/financialmodule/module/tdhm/tdhm.aspx

Journal Publications

1. Alex Pothen, **SM Ferdous**, and Fredrik Manne. "Approximation algorithms in combinatorial scientific computing". In: *Acta Numerica* 28 (2019), pp. 541–633
2. **SM Ferdous** and M. Sohel Rahman. "An Integer Programming Formulation of the Minimum Common String Partition Problem". In: *PLoS ONE* 10.7 (2015), e0130266
3. **SM Ferdous** and M Sohel Rahman. "Solving the minimum common string partition problem with the help of ants". In: *International Conference in Swarm Intelligence*. Springer Berlin Heidelberg. 2013, pp. 306–313

4. Mustafizur Rahman, **SM Ferdous**, Syed Ishtiaque Ahmed, and Anika Anwar. "Speech development of autistic children by interactive computer games". In: *Interactive Technology and Smart Education* 8.4 (2011), pp. 208–223

Conference Publications

1. **SM Ferdous**, Alex Pothen, Arif Khan, Ajay Panyala, and Mahantesh Halappanavar. "A parallel approximation algorithm for submodular b-matching". In: *Proceedings of the First SIAM Conference on Applied and Computational Discrete Algorithms (ACDA)*. SIAM, 2021
2. Beomyeol Jeon, **SM Ferdous**, Muntasir Raihan Rahman, and Anwar Walid. *Privacy-preserving Decentralized Aggregation for Federated Learning*. Accepted for Workshop on Distributed Machine Learning and Fog Networks, IEEE INFOCOM 2021. arXiv: 2012.07183 [cs.LG]
3. Arif Khan, Krzysztof Choromanski, Alex Pothen, **SM Ferdous**, Mahantesh Halappanavar, and Antonino Tumeo. "Adaptive anonymization of data using b-edge cover". In: *SC18: International Conference for High Performance Computing, Networking, Storage and Analysis*. IEEE. 2018, pp. 743–753
4. Arif Khan, Alex Pothen, and **SM Ferdous**. "Parallel algorithms through approximation: b-edge cover". In: *Proceedings of IPDPS*. 2018
5. **SM Ferdous**, Alex Pothen, and Arif Khan. "New Approximation Algorithms for Minimum Weighted Edge Cover". In: *2018 Proceedings of the Seventh SIAM Workshop on Combinatorial Scientific Computing*. SIAM. 2018, pp. 97–108
6. **SM Ferdous** and M Sohel Rahman. "A metaheuristic approach for application partitioning in Mobile System". In: *Networking Systems and Security (NSysS), 2015 International Conference on*. IEEE. 2015
7. **SM Ferdous**, Md Mustafizur Rahman, and Mahmuda Naznin. "Finding network connectivity failure in a Wireless Sensor Network". In: *2016 Wireless Days (WD)*. IEEE. 2016, pp. 1–6
8. **SM Ferdous**, Anindya Das, M Sohel Rahman, and Md Mustafizur Rahman. "An Ant Colony Optimization approach to solve the minimum string cover problem". In: *2012 International Conference on Informatics, Electronics & Vision (ICIEV)*. IEEE. 2012, pp. 741–746
9. Mirfat Akter Sharmin, Md Mizanur Rahman, Syed Ishtiaque Ahmed, Md Mustafizur Rahman, and **SM Ferdous**. "Teaching intelligible speech to the autistic children by interactive computer games". In: *Proceedings of the 2011 ACM Symposium on Applied Computing*. ACM. 2011, pp. 1208–1209
10. Anika Anwar, Md Mustafizur Rahman, **SM Ferdous**, Samiul Alam Anik, and Syed Ishtiaque Ahmed. "A computer game based approach for increasing fluency in the speech of the autistic children". In: *2011 IEEE 11th International Conference on Advanced Learning Technologies*. IEEE. 2011, pp. 17–18
11. Md Mustafizur Rahman, **SM Ferdous**, and Syed Ishtiaque Ahmed. "Increasing intelligibility in the speech of the autistic children by an interactive computer game". In: *2010 IEEE International Symposium on Multimedia*. IEEE. 2010, pp. 383–387

Technical Posters

1. **SM Ferdous** and Alex Pothen. "Assignment using Lagrangian relaxation and application in ordering sparse matrices". Presented in SIAM CSC 2020, Seattle, WA. 2020
2. **SM Ferdous** and Alex Pothen. "On bounding the weight of b-matching on graphs". Presented in SIAM CSC 2016, Albuquerque, NM. 2016

Technical Talks

1. **SM Ferdous** and Alex Pothen. "Locality Matters! Efficient algorithms for submodular b-matching". Presented in SIAM CSE 2021, Happened virtually. 2021
2. **SM Ferdous** and Alex Pothen. "Efficent Algoirthms for Degree Constrained Subgraphs with Applications". Presented in SIAM CSE 2019, Spokane, WA. 2019

3. **SM Ferdous** and Alex Pothen. "New Approximation Algorithms for Minimum Weight Edge Cover". Presented in SIAM AN 2018, Portland, OR. 2018

Selected Grad Projects

Spring 2018 | **Implementing Grover's Search**

Grover's search is one of the most influential quantum algorithms. During Spring 2018, I took a Quantum Computation course with Prof. Sabre Kais, Purdue University. As a class project, I implemented Grover's search in IBM QISKIT. I tested my implementation using 6 Qubit by IBM simulator.

Spring 2017 | **On bounding the weight b-matching problem**

In this project, we investigate Lagrangian-relaxation based upper bounds for the maximum weight b-matching problem. The problem is formulated as an integer program, and then the relaxed dual problem is solved using subgradient methods to compute the upper bound. Since the method may not find a feasible b-matching, a simple heuristic is presented to find feasible solutions from the dual optimal variables. Preliminary experiments show that our method generates bounds that are close to bounds obtained from a linear programming based relaxation, but could be faster than the latter by an order of magnitude.

Fall 2015 | **Modeling Air Travel Demand between Two Cities**

The goal of this project was to model the air travel demand between any two cities, based on the socio-technical factors, using machine learning techniques. The demand was treated as a categorical value. We picked 30 major US airports and collected demand data between two airports for the last 10 years. The features that we considered was all publicly available such as population of the cities, average income of the cities, distance between two airports, airport category and so on. We use SVM as learning algorithm. The test accuracy we got around 71%.

Technical Skills

Programming:	C, C++, OpenMP, Open MPI, UNIX shell scripting, Matlab, R
Optimization tool:	Gurobi, Cplex
Web Programming:	HTML, PHP.
DBMS:	MySQL.

Activities

2018-2019:	Served as *general secretary*, Bangladesh Students association, Purdue University.
2017-2018:	Served as *web master*, Bangladesh Students association, Purdue University.

Others Experiences

Served as a reviewer in journal *PLoS ONE* and *ACM Transactions on Parallel Computing*.