Syed Eqbal Alam

Department of Electrical and Computer Engineering
University of Alberta
Edmonton, Alberta, Canada

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Education

Ph.D., Information and Systems Engineering November 2021
Concordia University, Montreal, Quebec, Canada
Advisors: Dr. Jia Yuan Yu (Concordia University, Montreal, Quebec, Canada) and Prof. Robert Shorten (Dyson School of Design Engineering, Imperial College London, London, UK)
Thesis title: Communication-efficient Distributed Multi-resource Allocation.

Master of Technology, Information Technology July 2010
International Institute of Information Technology (IIIT)-Bangalore, India
Advisor: Prof. Shrisha Rao
Thesis title: (m, n)-Semirings and a Generalized Fault Tolerance Algebra of Systems.

Employment

Post Doctoral Fellow April 2024 - present
Department of Electrical and Computer Engineering
University of Alberta, Edmonton, Alberta, Canada.

Post Doctoral Fellow March 2022 - March 2024
Dr. J. Herbert Smith Centre for Technology Management & Entrepreneurship
University of New Brunswick, Fredericton, New Brunswick, Canada.

Lecturer October 2010 - August 2016
College of Computers and Information Technology
Taif University, Kingdom of Saudi Arabia.

Research Interests

Distributed optimization
Differential privacy
Social choice theory
Multi-agent systems
Machine learning
Federated learning
Deep learning, Generative adversarial networks
Fault tolerance in distributed systems.

Publications

Journal articles:

(J3) **Syed Eqbal Alam**, Dhirendra Shukla, and Shrisha Rao, "A Communication-efficient Local Differentially Private Algorithm in Federated Optimization," in IEEE Access, 2023, doi: 10.1109/ACCESS.2023.3283503.

(J2) Pietro Ferraro, Jia Yuan Yu, Ramen Ghosh, **Syed Eqbal Alam**, Jakub Marecek, Fabian Wirth, and Robert Shorten, "On unique ergodicity of coupled AIMD flows", International Journal of Control, October 2023, preprint.

(J1) **Syed Eqbal Alam**, Shrisha Rao, and Bijan Davvaz, "(m, n)-Semirings and a generalized fault tolerance algebra of systems", Journal of Applied Mathematics, vol. 2013, Article ID 482391, 2013,

doi:10.1155/2013/482391.

Book chapters:

(BC1) **Syed Eqbal Alam**, Robert Shorten, Fabian Wirth, and Jia Yuan Yu, "Distributed algorithms for Internet-of-Things-enabled prosumer markets: A control theoretic perspective", Analytics for the Sharing Economy: Mathematics, Engineering and Business perspectives, editors E. Crisostomi et al., Springer, 2020, ISBN 978-3-030-35031-4.

Conference proceedings:

(CP8) **Syed Eqbal Alam** and Dhirendra Shukla, "Communication-efficient Allocation of Multiple Indivisible Resources in a Federated Multi-agent System", 62nd IEEE Conference on Decision and Control (CDC), Singapore, December 13–15, 2023, preprint.

(CP7) **Syed Eqbal Alam**, Dhirendra Shukla, and Shrisha Rao, "Near Optimal Differentially Private Client Selection in Federated Settings," 59th Allerton Conference on Communication, Control, and Computing, Monticello, IL, USA, September 2023, pp. 1–8, doi: 10.1109/Allerton58177.2023.10313432 preprint.

(CP6) **Syed Eqbal Alam** and Dhirendra Shukla, "Communication-efficient Preference-based Federated Multi-resource Allocation," 59th Annual Allerton Conference on Communication, Control, and Computing (Allerton), Monticello, IL, USA, September 2023, pp. 1–4, doi: 10.1109/Allerton58177.2023.10313434.

(CP5) **Syed Eqbal Alam** and Dhirendra Shukla, "Existence of unique invariant measure and ergodic property for AIMD-based multi-resource allocation", American Control Conference, San Diego, USA, pp. 2592–2598, May 2023, doi: 10.23919/ACC55779.2023.10155852.

(CP4) **Syed Eqbal Alam** and Dhirendra Shukla, "Optimal Regulation of Prosumers and Consumers in Smart Energy Communities", IEEE International Smart Cities Conference (ISC2), Paphos, Cyprus, September 2022, doi: 10.1109/ISC255366.2022.9921890.

(CP3) **Syed Eqbal Alam**, Robert Shorten, Fabian Wirth, and Jia Yuan Yu, "Derandomized distributed multi-resource allocation with little communication overhead", 56^{th} Annual Allerton Conference on Communication, Control, and Computing, Illinois, USA, October, pp. 84–91, 2018, doi: 10.1109/ALLERTON.2018.8635929.

(CP2) **Syed Eqbal Alam**, Robert Shorten, Fabian Wirth, and Jia Yuan Yu, "Communication-efficient distributed multi-resource allocation algorithms", 4^{th} IEEE International Smart Cities Conference (ISC2), Kansas City, USA, September, pp. 1–8, 2018, doi: 10.1109/ISC2.2018.8656964 (**finalist for the best paper award**).

(CP1) Amartya Dasgupta, **Syed Eqbal Alam**, Arijit Mitra, Salone Gupta, Sneha Joseph, and Shrisha Rao, "High Availability Using Virtualization", ISCA 24^{th} International Conference on Computer Applications in Industry and Engineering (CAINE 2011), Honolulu, Hawaii, USA, 2011.
`http://www.academia.edu/1416046/High_Availability_Using_Virtualization`

Skills

Programming Languages: Python, C, C^{++}, Java.
Matlab, R, Octave
LaTeX

Grants and Awards

NSERC Collaborative Research and Development Grants, with Beast Group, Montreal, Canada
2017
Wrote the grant proposal with my PhD advisor, titled "Reinforcement learning and optimization for mass customization of embroidery" of 114,000 CA$.

Conference and exposition award 2019
Concordia University, Montreal, Quebec, Canada

Graduate student mobility award 2018
Concordia University, Montreal, Quebec, Canada

Concordia University International Tuition Award of Excellence (35,949 CA$) 2016–2020
Concordia University, Montreal, Quebec, Canada

Research Experience

(1) Post Doctoral Fellow March 2022 - present
Dr. J. Herbert Smith Centre for Technology Management & Entrepreneurship
University of New Brunswick, Fredericton, New Brunswick, Canada.

- Developed and published communication-efficient differentially private algorithms for federated optimization.
- Developed and published stochastic and distributed algorithms for regulating energy prosumers in smart energy communities.
- Mentored an intern, an undergrad from University of Toronto, in the summer semester to develop a data exchange platform that uses blockchain technologies.

(2) Research Assistant August 2016 - November 2021
Concordia University, Montreal, Quebec, Canada
I developed several algorithms, a few are listed as follows:

- Stochastic algorithm for distributed multi-resource allocation for divisible resources.
- Deterministic algorithm for distributed multi-resource allocation for divisible.
- Stochastic algorithm for distributed multi-resource allocation for indivisible.
- Stochastic algorithm for regulating prosumers in a prosumer market.

(3) Research intern, Mitacs Accelerate program December 2016 - June 2017
Capbeast-Mitacs, Montreal, Canada
Project title: Embroidery Automation and Optimization for Mass Customization

- Developed algorithms to automatically generate embroidery-like images from customer images using Deep Learning techniques—the Generative Adversarial Networks (GANs).

(4) Research Assistant January 2010 - June 2010
IIIT Bangalore, Bangalore, India
Proposed a new class of algebraic structure called (m, n)-semiring and presented a formalism to compare the fault tolerance behaviour of two systems using our framework of a partially ordered (m, n)-semiring. The work is published as a journal article.

Mentoring and Teaching Experience

(1) **Course Instructor** May 2022 - April 2023
University of New Brunswick, Fredericton, New Brunswick, Canada

- Taught the Computer Science Department's Data Structures and Algorithms (CS #2383) undergraduate course in Spring 2023.
- Supervised Masters students at the J. Herbert Smith Centre for Technology Management & Entrepreneurship, UNB, in their Project Prototype design and development course.

(2) **Lecturer** October 2010 - August 2016
Taif University, Taif, Saudi Arabia

- Taught lab sessions of the following computer science courses at the undergraduate level:
  Data Structure and Algorithm (Fall 2011, Spring 2014, Fall 2014, Fall 2015, Spring 2016)
  Computer Programming (C^{++}) (Spring 2016)
  Object Oriented Programming (Java) (Fall 2013, Spring 2014, Fall 2014, Spring 2015)
  Artificial Intelligence (Spring 2011, Spring 2012, Spring 2013)
  Distributed Computer Systems (Fall 2010, Fall 2011)
  Artificial Neural Networks (Spring 2011)
  Structural Programming (Fall 2010)

- Taught theory and exercise classes of the following courses at undergraduate level:
  Discrete Structures (Fall 2013, Fall 2014, Fall 2015)
  Engineering Economics (Summer 2011)
- Conducted training sessions for C^{++} Programming and Website Design to the undergraduate students.

(3) **Tutorial leader** September 2016 - December 2017
Department of Computer Science and Software Engineering
Concordia University, Montreal, Quebec, Canada
Conducted tutorials for the Mathematics for Computer Science course for the undergraduate students.

(4) **Teaching assistant** January 2010 - June 2010
IIIT Bangalore, Bangalore, India
Operating Systems course for the masters students.

Invited Talks

(1) *A Communication-Efficient Local Differentially Private Algorithm in Federated Optimization* August 2023, 2nd workshop of AARMS CRG on Mathematical Foundations of Scientific Machine Learning, University of New Brunswick, Fredericton, New Brunswick, Canada.

(2) *Distributed Algorithms for Internet-of-Things enabled Prosumer Markets* November 2019
University of Passau, Passau, Germany.

Research Visits

(1) Imperial College London, UK, hosted by Prof. Robert Shorten November 2019 - December 2019

(2) University of Passau, Germany, hosted by Prof. Fabian Wirth November 2019 - December 2019

(3) University College Dublin, Ireland, hosted by Prof. Robert Shorten September 2018 - December 2018

Theses

Ph.D. thesis title: Communication-efficient Distributed Multi-resource Allocation September 2016 - November 2021
Advisors: Dr. Jia Yuan Yu (Concordia University, Montreal, Quebec, Canada) and Prof. Robert Shorten (Dyson School of Design Engineering, Imperial College London, London, UK)
Available at: `https://spectrum.library.concordia.ca/id/eprint/989944/`

Masters thesis title: *(m, n)-Semirings and a Generalized Fault Tolerance Algebra of Systems* January - June 2010
Advisor: Prof. Shrisha Rao (IIIT Bangalore, Bangalore, India)
Available at: `https://www.seqbal.com/wp-content/uploads/2016/09/syed_thesis.pdf`

Professional Membership

Member IEEE

Community Involvement

Session chair:
62nd IEEE Conference on Decision and Control, Singapore, 2023.

Coordinator of volunteers:
International Conference on Autonomous Agents and Multiagent Systems (AAMAS 2019), Montreal, Quebec, Canada.

Reviewer:
Future Generation Computer Systems
IEEE Transactions on Automatic Control
IEEE Conference on Decision and Control
IEEE Access
IEEE Transactions on Mobile Computing
IEEE SMC International Conference on Systems, Man, and Cybernetics