Md Kamran Chowdhury Shisher

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Summary

- 5+ years of research experience as a graduate research assistant at Auburn University.
- 3+ years of experience as a teaching assistant at Auburn University.
- My Ph.D. work started a new research area called "Remote Inference," a crucial part of Next-G wireless networks. I developed a novel information-theoretic tool to evaluate the importance of information freshness on remote inference and designed low-complexity optimal scheduling algorithms.
- I contributed to AI for Agriculture interdisciplinary and cross-university education and research between Auburn University and Tuskegee University, by mentoring a junior Ph.D. student from Tuskegee University, teaching machine learning labs to Auburn and Tuskegee graduate and undergraduate students in the Applied Statistics and Machine Learning course, and leading the research on a USDA project "AI-based Food Demand Forecasting for Alabama Food Pantry" in collaboration with Tuskegee University.
- I mentored and co-authored with a high school student from Auburn High School to publish a peer-reviewed journal paper and attend the Regeneron International Science and Engineering Fair in 2023.
- I am also maintaining a web page that contains a list of the research papers about the Age of Information.

Education

Ph.D. in Electrical Engineering **Aug 2018 – Present**
Auburn University, Auburn, AL; Advisor: Yin Sun *CGPA: 4.00/4.00*

M.S. in Electrical Engineering **Aug 2022**
Auburn University, Auburn, AL; Advisor: Yin Sun *CGPA: 4.00/4.00*

B.Sc. in Electrical and Electronics Engineering **Feb 2013- Sep 2017**
Bangladesh University of Engineering and Technology *CGPA: 3.80/4.00*

Courses at Auburn University

Stochastic Signal and System Analysis, Probability Theory I, Probability Theory II, Information Theory, Analysis I, Analysis II, Theory of Nonlinear Optimization, Applied Stochastic Process, Renewable Energy, Information Freshness

Research Experience

Research Assistant, Real-time Networking Lab, Auburn University Fall 2018-present

- **Project 1: Impact of Fresh Features on Machine Learning**

  We conducted five supervised learning-based experiments to understand the impact of fresh features. The experiments include: **robot state prediction, video prediction, channel state information prediction, temperature prediction**, and **solar power prediction**. The experimental results show that (i) for Markov data sequence, the fresh feature is always better, and (ii) for non-Markov data sequence, a fresh feature may not be better. For both Markov and non-Markov sequences, we developed an information-theoretic tool to interpret and analyze the importance of fresh features.

- **Project 2: Scheduler for Single Source-Predictor Pair Remote Inference System**

  Based on insights from Project 1, we designed new **feature selection strategies** and selection-from-buffer **scheduling algorithms** for improving the performance of a remote inference system. Our algorithms have the potential to reduce inference errors by 10,000 times.

- **Project 3: Scheduler for Multiple Source-Predictor Pairs Remote Inference System**

  Scheduling and feature selection problem for multiple source-predictor pairs is a **restless multi-armed bandit** problem with multiple actions. In this case, we designed new asymptotically optimal algorithms.

Teaching Experience

Teaching Assistant ELEC-5970/6970: Applied Statistical and Machine Learning — Spring 2023, 2024
Auburn University

- Delivered in-class coding lectures on K-nearest neighbors algorithm, SVM, decision tree, XGBoost, neural network, image classification with transfer learning, text classification with LSTM.
- Developed and graded assignments.

Teaching Assistant ELEC-7970: Reinforcement Learning — Spring 2020, 2021, 2022, Fall 2022
Auburn University

- Delivered in-class coding lectures on value iteration, policy iteration, temporal difference, SARSA, Q-learning, DQN, and REINFORCE algorithms.
- Developed and graded assignments.

Teaching Assistant ELEC-2120: Signals and Systems — Fall 2022
Auburn University

- Conducted labs. Graded homework and lab reports.

Lecturer Department of Electrical and Electronic Engineering — Nov 2017-June 2018
Bangladesh Army University of Science and Technology

Publications

In Preparation:

1. **Md Kamran Chowdhury Shisher** and Yin Sun, "On the Monotonicity of Information Aging for AR(p) Models," 2024.
2. Tasmeen Zaman Ornee, **Md Kamran Chowdhury Shisher**, Clement Kam, and Yin Sun, "Goal-oriented Status Updating: Wireless Scheduling for Situational Awareness Maximization," 2024.

Under Review:

3. **Md Kamran Chowdhury Shisher** and Yin Sun, "On the Monotonicity of Information Aging," under review in *IEEE INFOCOM ASoI Workshop*, 2024.
4. **Md Kamran Chowdhury Shisher**, Yin Sun, and I-Hong Hou, "Timely Communications for Remote Inference," under review in *IEEE/ACM Transactions on Networking*, 2023.
5. Cagri Ari, **Md Kamran Chowdhury Shisher**, Elif Uysal, and Yin Sun, "Goal-Oriented Communications for Remote Inference with Two-Way Delay," under review in *IEEE ISIT*, 2024.

Peer-reviewed Journal Papers:

6. **Md Kamran Chowdhury Shisher**, Bo Ji, I-Hong Hou, and Yin Sun, "Learning and Communications Co-Design for Remote Inference Systems: Feature Length Selection and Transmission Scheduling," *IEEE Journal on Selected Areas in Information Theory*, vol. 4, pp. 524-538, 2023.

7. Kevin Yan, **Md Kamran Chowdhury Shisher**, and Yin Sun, "A Transfer Learning-Based Deep Convolutional Neural Network for Detection of Fusarium Wilt in Banana Crops," *AgriEngineering*, vol. 5, no. 4, pp. 2381-2394, 2023.

Peer-reviewed Conference Papers:

8. Tasmeen Zaman Ornee, **Md Kamran Chowdhury Shisher**, Clement Kam, and Yin Sun, "Context-aware Status Updating: Wireless Scheduling for Maximizing Situational Awareness in Safety-critical Systems," *IEEE MILCOM QuAVoI Workshop*, 2023.

9. **Md Kamran Chowdhury Shisher** and Yin Sun, "How Does Data Freshness Affect Real-time Supervised Learning?" *ACM MobiHoc*, 2022. [**Acceptance Rate: 19.8%**]

10. **Md Kamran Chowdhury Shisher**, Heyang Qin, Lei Yang, Feng Yan, and Yin Sun, "The Age of Correlated Features in Supervised Learning based Forecasting," *IEEE INFOCOM AoI Workshop*, 2021.

11. **Md. Kamran Chowdhury Shisher**, Tasmeen Zaman Ornee, and Md. Farhad Hossain, "QoS aware user association in massive MIMO enabled hetnets for DTU and NDTU traffic," *IEEE ICAEE*, 2017.

Talks

Timely Inference over Networks

- Talk at Dept. of ECE, Auburn University — Feb 2023

Learning and Communications Co-design For Remote Inference: Feature Length Selection and Transmission Scheduling

- Invited Talk at University of Maryland, College Park, MD — Oct 2023
- Graduate Engineering Research Showcase, Auburn University (Both Oral and Poster Presentations) — Oct 2023

Communications of Timely Information for Real-time Machine Learning and Networked Intelligence

- North American School of Information Theory, Philadelphia, PA — June 2023

How Does Data Freshness Affect Real-time Supervised Learning?

- Information Theory Application Workshop, San Diego, CA — Feb 2023
- Auburn University Research Symposium (Poster Presentation) — March 2023
- ACM MobiHoc, Seoul, South Korea. — Oct 2022
- College of Engineering Research Showcase at the U.S. Space and Rocket Center, Huntsville, AL (Poster Presentation) — Aug 2022

The Age of Correlated Features in Supervised Learning based Forecasting

- IEEE INFOCOM AoI Workshop, Vancouver, BC, Canada (virtual) — May 2021

Student Mentoring

Zachary Gayford, Auburn University Undergraduate Student — Jan 2024-Present

Cason B. Vazquez, Auburn University Undergraduate Student — Aug 2023-Dec 2023

Justin Tran, Auburn University Undergraduate Student — May 2021-May 2022

Cagri Ari, Middle East Technical University Graduate Student — Aug 2023-Present

Mengxue Li, Tuskegee University Graduate Student — Aug 2023-Present

Kevin Yan, Auburn High School Student — Aug 2022-Dec 2023

Services

Maintainer of an **online paper repository on Age of Information** — Aug 2018-Present

Volunteer on E-Day, Auburn University, Auburn, AL — Feb 2020

Organizing Secretary, Bangladesh Student Organization, Auburn University — Aug 2022-Aug 2023

TPC member

- IEEE WCNC, 2021
- IEEE WCNC, 2022

Reviewer for Journal Manuscript Submissions

- IEEE Journal of Communications and Networks, 2023
- IEEE Journal on Selected Areas in Information Theory, 2023
- IEEE Open Journal of the Communications Society, 2023
- IEEE Transactions on Wireless Communications, 2022
- IEEE Journal on Selected Areas in Communication, 2020
- IEEE Journal of Communications and Networks, 2020

Reviewer for Conference Manuscript Submissions

- IEEE ISIT, 2022
- IEEE WCNC, 2022
- IEEE INFOCOM, 2022
- IEEE WCNC, 2021
- IEEE INFOCOM, 2020
- IEEE INFOCOM AoI Workshop, 2020
- IEEE INFOCOM AoI Workshop, 2019

Awards and Honors

Candidate Profile, ACM SIGMETRICS Performance Evaluation Review — Dec 2023

NSF Student Travel Grant, ACM MobiHoc — Oct 2023

NSF Travel Grant, North American School of Information Theory — June 2023

ACM SIGMOBILE Student Travel Grant, ACM MobiHoc — Oct 2022

IEEE INFOCOM Student Conference Grant — June 2022

NSF Student Conference Award, IEEE INFOCOM — June 2022

Professional Membership

IEEE Member

IEEE Information Theory Society Member

IEEE Communication Society Member

ACM SIGMOBILE Member

Skills

Programming Language: Python, C, MATLAB, Object Oriented Programming

Mathematics: Optimization and Decision Theory, Markov Decision Process, Dynamic Programming, Probability, Information Theory, Multi-armed Bandit

Machine Learning: Supervised Learning, Deep Learning, Reinforcement Learning, Transfer Learning, CNN, RNN, Federated Learning

Machine Learning Tools: TensorFlow, Keras, Scikit-learn, Pandas, Numpy

References

Prof. Yin Sun, yzs0078@auburn.edu, Auburn University

Prof. Shiwen Mao, smao@auburn.edu, Auburn University

Prof. I-Hong Hou, ihou@tamu.edu, Texas A&M University

Prof. Elif Uysal, uelif@metu.edu.tr, Middle East Technical University