Zahidur Talukder

Rigorous Design Lab
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RESEARCH INTERESTS

My current research interests span the areas of the theoretical, empirical, and security aspects of machine learning, algorithms, and distributed learning. I have been working on secured and efficient data and client handling of federated learning. I have developed self-regulating clients who can handle data-level errors and new aggregation techniques for servers in federated learning. I am highly passionate about applications involved with privacy-preserving machine learning, algorithms, and distributed learning. My overarching goal is to design and develop applied AI for social good to provide a safe and trustworthy online ecosystem.

EDUCATION

The University of Texas at Arlington, Texas

Ph.D. Candidate in Computer Science and Engineering — Aug 2019 – Present

- Lab: *Rigorous Design Lab, UTA*
- Advisor: Mohammad Atiqul Islam

Bangladesh University of Engineering and Technology (BUET), Dhaka, Bangladesh

B.S. in Electrical and Electronic Engineering — Sept 2018

PROFESSIONAL EMPLOYMENT

Graduate Research Assistant

Computer Science and Engineering, The University of Texas at Arlington
Lab: Rigorous Design Lab (RiDL) — Aug 2019 – Current

Graduate Teaching Assistant

Computer Science and Engineering, The University of Texas at Arlington
Notable Courses: Algorithm & Data Structure, Computer Architecture, Professional Practices etc — Aug 2019 – Current

RESEARCH EXPERIENCE

Graduate Research Assistant

Rigorous Design Lab (RiDL), UTA — Aug 2019 – Current

- **Fair Federated Learning with Heterogeneous Devices**
  - Proposed algorithms ensure fairness for heterogeneous devices with respect to model architecture for federated learning
  - Remove local computational power bottlenecks among participating clients in federated learning
  - Incorporate Q-fairness among clients to minimize the variance of accuracy among clients
  - Proposed the theoretical analysis of convergence guarantee of fair FL with heterogeneous devices
- **Self Regulating Clients for Federated Learning**
  - The designed algorithm enables self-regulating clients who can actively take decisions regarding participation in federated learning
  - Self-regulating clients can save local computation costs by stopping them from doing local computation
  - Self-regulating clients can save uplink communication costs by not sending the model update to the global server
  - Proposed algorithm can be incorporated in the backend with any existing federated learning techniques
  - Proposed the theoretical analysis of convergence guarantee of fair FL with heterogeneous devices

- **Auto-Weighted Aggregation for Heterogeneous Federated Learning**
  - The proposed lightweight auto-weighted aggregation techniques can handle the heterogeneity of federated learning by minimizing the weight of unfavorable model updates
  - The proposed algorithm is lightweight and adds no additional computation to the global server
  - The proposed algorithm is scalable and robust without adding additional computation
  - The worst-case performance of the proposed algorithm is like the popular federated averaging techniques
- **Server-Level Power Monitoring in Data Centers Using Single-Point Voltage Measurement**
  - The proposed power monitoring approach extracts power consumption information of all servers by utilizing the conducted electromagnetic interference of server power supplies
  - This is a low-cost approach and needs only one sensor
  - Designed the prototype to get the voltage information
  - Real-time power monitoring is possible using the side channel information

PUBLICATIONS

Refereed Journal Papers

- **Zahidur Talukder**, Mohammad A. Islam, "Remote Access Attack for Active Sensors in Autonomous Vehicles", [In Submission]
- Sajedul Talukder, Md. Iftekharul Islam Sakib, **Zahidur Talukder**, "Giving Up Privacy For Security: A Survey On Privacy Trade-off During Pandemic Emergency", International Journal on Cryptography and Information Security (**IJCIS)**, Jul 2020.
- Sajedul Talukder and **Zahidur Talukder**, "A Survey on Malware Detection and Analysis Tools", International Journal of Network Security & Its Applications (**IJNSA**), Vol. 12, No. 2, Mar 2020.
- **Zahidur Talukder**, "A comparative study of various methods of Phasor Measurement Unit (PMUs)", Bangladesh University of Engineering and Technology (BUET), 2018.

Refereed Conference Papers

- **Zahidur Talukder**, Bingqian Lu, Mohammad A. Islam, Shaolei Ren, "Fair Federated Learning with Heterogeneous Devices", [In Submission]
- Paul Agbaje, Afia Anjum, **Zahidur Talukder**, Mohammad Islam, Ebelechukwu Nwafor and Habeeb Olufowobi, "FedCime: An Efficient Federated Learning Approach For Clients in Mobile Edge Computing", IEEE International Conference on Edge Computing Communications (**IEEE EDGE**), 2023. [Submitted]
- **Zahidur Talukder**, Mohammad A. Islam, "FedSRC: Efficient Federated Learning with Self-Regulating Clients", ACM International Conference on Measurement and Modeling of Computer Systems (**SIGMETRICS**), 2022 (Poster).
- **Zahidur Talukder**, Mohammad A. Islam, "Computationally Efficient Auto-Weighted Aggregation for Heterogeneous Federated Learning", IEEE International Conference on Edge Computing Communications (**IEEE EDGE**), 2022.
- **Zahidur Talukder**, Kazi Nishat, Md Shamim Reza, "A Comparative Study of Various Methods of Phasor Measurement Unit Algorithms", 1st International Conference on Advances in Science, Engineering and Robotics Technology (**ICASERT**), 2019.
- Sajedul Talukder, Md. Iftekharul Islam Sakib, Md. Faruk Hossen, **Zahidur Talukder** and Md. Shohrab Hossain, "Attacks and Defenses in Mobile IP: Modeling with Stochastic Game Petri Net", In Proceedings of the IEEE International Conference on Current Trends in Computer, Electrical, Electronics and Communication (**IEEE ICCTCEEC**), Sep 2017.
- Sajedul Talukder, Md. Iftekharul Islam Sakib, **Zahidur Talukder**, Upoma Das, Arnob Saha and Nur Sultan Nazar Bayev, "USenSewer: Ultrasonic Sensor and GSM-Arduino Based Automated Sewerage Management", In Proceedings of the IEEE International Conference on Current Trends in Computer, Electrical, Electronics and Communication (**IEEE ICCTCEEC**), Sep 2017.

Workshops and Posters

- Pranjol Gupta, **Zahidur Talukder**, Mohammad A. Islam, Phuc Nguyen, "Towards Server-Level Power Monitoring in Data Centers Using Single-Point Voltage Measurement", 20th ACM Conference on Embedded Networked Sensor Systems (**SenSys**), 2022.
- **Zahidur Talukder**, Mohammad A. Islam, "FedSRC: Efficient Federated Learning with Self-Regulating Clients", ACM International Conference on Measurement and Modeling of Computer Systems (**SIGMETRICS**), 2022 (Poster).
- **Zahidur Talukder**, Mohammad A. Islam, "FedASL: Auto Weighted Aggregation Techniques for Federated Learning", SCRF@UTA 2022, **Best Poster Award Honorable Mention**.

WORK IN PROGRESS

- **Zahidur Talukder**, Bingqian Lu, Mohammad A. Islam, Shaolei Ren, "Fair Federated Learning with Heterogeneous Devices", In preparation.
- **Zahidur Talukder**, Mohammad A. Islam, "Self Regulating clients for Federated Learning", In preparation.

TEACHING EXPERIENCE

Graduate Teaching Assistant

Department of Computer Science and Engineering, UTA — Aug 2019 – Present

- *CSE-4323-001-QUANTITATIVE COMPUTER ARCH*
  - Designed weekly quizzes, graded quizzes, and lab reports, and tracked the students' progress using Gradescope and Canvas
  - Provided students with one-on-one tutoring and regular out-of-class assistance
  - Tutored students with special needs, including those with learning disabilities or who had language disadvantages
- *CSE-3318-001-ALGORITHMS DATA STRUCTURES*
  - Assisted professor with classroom instruction materials, exams, assignments, and record keeping
  - Collaborated with the professor at the weekly meetings and actively contributed new ideas on teaching
  - Improved student participation in the classroom through integration of creative role-playing exercises and peer review sessions
- *CSE-4314-001-PROFESSIONAL PRACTICES*
  - Prepared and presented lectures using multimedia technologies such as Zoom, PowerPoint, video clips, and Canvas course website
  - Developed and graded exams and quizzes that assess student mastery of subject matter
- *CSE-5392-001-TOPICS IN COMPUTER SCIENCE*
  - Prepared lesson plans, and assignments and conducted the labs
  - Evaluated homeworks, tests, and quizzes and held office hours to ensure students understood course concepts
  - Consistently received positive teacher evaluations from students
- *CSE-1105-001-INTRO COMPUTER SCI ENGR*
  - Conducted labs and graded student lab reports and quizzes using Canvas
  - Held office hours to ensure students understood the labs and successfully balanced student work-load with teaching work-load

MENTORING EXPERIENCE

OurCS@DFW Team Presentation Mentor

- *[Security-H] Stealing Secret Data from Computers Without a Network* **(Best OurCS@DFW Team Presentation Awards)**
  - Conduct the workshop in Computer science in the Dallas, Fort Worth area with more than 6 undergraduate students
  - Provided students hardware and software facilities to build their own project

UTA LSAMP - Summer Research Academy Mentor

- *Social Impact of Machine learning and AI*
  - Mentor an undergraduate student to learn about the social impact of Machine learning and AI
  - Help her to explore the potential privacy and security aspects of AI in our society

Summer High School Student Mentor

- *Introduction to Machine learning and AI*
  - Mentor a High school student to learn about Machine learning and AI
  - Provided all the materials to a high-level understanding of the concept of machine learning and AI
  - Teach a few machine learning algorithms, like clustering, PCA, ICA, and tree

HONORS AND AWARDS

- Best Poster Award Honorable Mention, SCRF@UTA, 2022, 2023
- Dean's Merit List Award from Bangladesh University of Engineering and Technology (BUET), 2017 & 2018
- Honorable Mention in Undergraduate Thesis Poster Competition, Department of EEE, BUET, 2018
- Bangladesh Government Merit Scholarship, Secondary and Higher Secondary public exams (Top 1% among 2 million students), 2011 & 2013

REFERENCES

Available upon request.