Mohammad Atiqul Islam

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HIGHLIGHTS

Tier-1 Conference Publications: SenSys'23, HPCA'23, HPDC'22, HPCA'21, SIGMETRICS'20, SIGMETRICS'18, CCS'18, HPCA'18, CCS'17, HPCA'16, HPCA'15, and ICCAD'15.

Research Grants: Total $1010K as PI. $700K from US National Science Foundation ECCS and CCF (2022-2026), $300K from the University of Texas System Rising STARs (2019 - 2022), $10K from UTA Research Enhancement Program (2021-2022).

Services: Program committee member S&P'25, NDSS'25, Micro'24, HiPC'24, CCS'23, CCS'22, HPCA'222, SC'22, USENIX Security'21

RESEARCH AREAS

Cloud and distributed systems: performance, scheduling and resource allocation, energy efficiency, load balancing
Security and resilience: side-channels, power attacks, thermal attacks, handling overloads
Economics and computing: market design, auction and bidding, coordination through markets
Cyber-physical systems: data center power and cooling, thermal aware management, carbon-water efficiency
Privacy-preserving machine learning: efficient federated learning, fair federated learning, self-regulating clients

EMPLOYMENT

2019 - current	**Assistant Professor**, Computer Science and Engineering, University of Texas at Arlington
2008 - 2012	**Specialist**, Core Network Planning, Robi Axiata Ltd., Bangladesh

EDUCATION

2018	**Ph.D. in Electrical and Computer Engineering** University of California, Riverside
2008	**B.Sc. in Electrical and Electronics Engineering** Bangladesh University of Engineering and Technology

RESEARCH GRANTS

2023 - 2026	**NSF CCF#2324915**, Amount: $300K (PI) Collaborative Research: DESC: Type I: A User-Interactive Approach to Water Management for Sustainable Data Centers: From Water Efficiency to Self-Sufficiency
2022 - 2025	**NSF ECCS#2152357**, Amount: $400K (PI) Utilizing Conducted Electromagnetic Interference (EMI) for Low-Cost Server-Level Power Monitoring in Data Centers
2021 - 2022	**UTA Research Enhancement Program (REP)**, Amount: $10K (PI) Ultra-Low-Cost Server-Level Power Monitoring in Data Centers
2019 - 2022	**UT Systems Rising STARs**, Amount: $300K (PI)

PROFESSIONAL SERVICE

2021 - present	**Program Committee Member**, S&P'25, NDSS'25, Micro'24, HiPC'24, CCS'23, CCS'22, HPCA'222, SC'22, USENIX Security'21IEE
2028 - present	**Journal Reviewer**, TPDS, TCC, TDSC, TGCN, TSUSC, TON, TSC, ACM Computing Surveys, TOMPECS, TOSN

OUTREACH

2022 - present	**Faculty mentor** UTA LSAMP - Summer Research Academy and UTA I-Engage Mentoring Program
2020 - present	**Member of Outreach and Student Recruitment Committee** Computer Science and Engineering at the University of Texas at Arlington
2020 - present	**Member of External and BPC Student Award Committee** Computer Science and Engineering at the University of Texas at Arlington

ADVISING AND MENTORING

2019 - present	**Student advising:** Md Rajib Hossen (PhD), Pranjol Sen Gupta (PhD), Zahidur Rahim Talukder (PhD), Tasnim Azad Abir (PhD), Mohammad Shahedur Rahman (PhD), Sahar Zargarzadeh (PhD), Iftakhar Ahmad (MS)
2015 - 2018	**Student mentoring:** Zhihui Shao (PhD), Fangfang Yang (PhD), Ji Guo (MS), Christian Adrito (BS), Aaron Sanders (BS), Jerry Huang (High school)
2016 and 2017	**Judge and mentor for K-12 students** Science Fair Expo at the Riverside County Office of Education

ONGOING RESEARCH PROJECTS

1) Practical Efficient Microservice Management (Research Areas: Cloud, Distributed Systems): We are developing a lightweight and efficient microservice resource manager that, unlike existing ML-based approaches, neither needs extensive training nor causes any intentional SLO violations. Moreover, Our feedback-based approach does not require training, allowing it to adapt quickly to microservices' dynamic operating environments. [Related papers: *HPDC'22*, *SIGMETRICS'22 poster*, *Cloud Computing'22*]

2) User-in-the-Loop Management (Research Areas: Economics of Computing, Cloud, HPC): We are developing a novel market-based resource control where the users actively participate in HPC management. Our highly scalable approach alleviates the HPC manager's burden of power-aware job scheduling for oversubscribed HPC systems. [Related papers: *HPCA'23*, *HPCA'18*, *HPCA'16*, *HPCA'15*]

3) Efficient Federated Learning (Research Areas: Security and Privacy, Edge Computing): We are developing novel algorithms to efficiently address the data heterogeneity problem in Federated Learning (FL). We propose computation efficient methods to auto-generate aggregation weights for the central model server. On the client side, we are developing lightweight checkpoints to decide early exit from participating in FL model updates and saving clients' computation and communication costs. [Related papers: *IEEE Edge'22*, *SIGMETRICS'22 poster*]

4) Novel Monitoring for Data Center Reliability (Research Areas: Security, Cyber-Physical Systems, Sensors): We are developing an acoustic sensing-based system using microphone arrays to measure a server's "true" power consumption from its cooling fan noise. Our system will be able to mitigate the threat of behind-the-meter heat injection attacks from servers with integrated batteries. [Related papers: *HPCA'21*, *SIGMETRICS'18*, *CCS'17*]

5) Server-Level Power Monitoring in Data Centers (Research Areas: Cyber-Physical Systems, Sensors): We are developing the first-of-its-kind ultra-low-cost server-level power monitoring in data centers that extracts server power usage information from the conducted electromagnetic interference (EMI) generated by server power supplies. Our approach will significantly lower the data center's instrumentation cost by eliminating the need for dedicated power meters for each server. Instead, we use a single sensor's voltage measurement from a single point to provide server-level power consumption. This project is funded by NSF under the three-year $400K grant ECCS#2152357. [Related papers: *SenSys'23*, *SIGMETRICS'20*, *CCS'18*]

6) Monitoring Behind-the-Meter Distributed Energy Resources (Research Areas: Sensors, IoT): We are developing a novel voltage probing and analysis prototype that captures high frequency (10kHz~100kHz) conducted electromagnetic interference (EMI) signatures from grid-tied inverters enabling utilities to identify the presence and operational status of behind-the-meter distributed energy resources (DERs) such as solar. Our approach breaks significant barriers in situational awareness of customer-side BTM DERs. We do not rely on any historical patterns/characteristics; instead, we directly monitor the DER inverter's real-time generation. We can identify battery-coupled DER systems. We enable a non-intrusive utility-side and fully utility-managed BTM DER monitoring system. [Related papers: *SenSys'23*, *SIGMETRICS'20*, *CCS'18*]

PUBLICATIONS

Journals

Perf. Review	Z. Talukder and **M. A. Islam**, "Efficient Federated Learning with Self-Regulating Clients", in *ACM SIGMETRICS Performance Evaluation Review* Volume 50, Issue 4, March 2023, pp 23–25. https://doi.org/10.1145/3595244.3595253. (Impact factor: 2.5)
Perf. Review	M. Hossen and **M. A. Islam**, "Practical Efficient Microservice Autoscaling", in *ACM SIGMETRICS Performance Evaluation Review* Volume 50, Issue 4, March 2023pp 50–52. https://doi.org/10.1145/3595244.3595262. (Impact factor: 2.5)
Perf. Review	M. Hossen and **M. A. Islam**, "Mobile Task Offloading Under Unreliable Edge Performance", in *ACM SIGMETRICS Performance Evaluation Review* Volume 48, Issue 4, March 2021, pp 29–32. https://doi.org/10.1145/3466826.3466838. (Impact factor: 2.5)
POMACS	Z. Shao, **M. A. Islam**, and Shaolei Ren, "Your Noise, My Signal: Exploiting Switching Noise for Stealthy Data Exfiltration from Desktop Computers", in *Proc. ACM Meas. Anal. Comput. Syst.* 4, 1, Article 7 (March 2020), 39 pages. https://doi.org/10.1145/3379473
TCC	**M. A. Islam**, H. Mahmud, S. Ren, and X. Wang, "A Carbon-Aware Incentive Mechanism for Greening Colocation Data Centers", in *EEE Transactions on Cloud Computing*, vol. 8, no. 1, pp. 4-16, 1 Jan.-March 2020, doi: 10.1109/TCC.2017.2767043. (Impact factor: 4.7)
POMACS	**M. A. Islam**, L. Yang, K. Ranganath, and S. Ren, "Why Some Like It Loud: Timing Power Attacks in Multi-tenant Data Centers Using an Acoustic Side Channel", in *Proc. ACM Meas. Anal. Comput. Syst.* 2, 1, Article 6 (March 2018), 33 pages. https://doi.org/10.1145/3179409
TCC	**M. A. Islam**, K. Ahmed, H. Xu, N. Tran, G. Quan, and S. Ren, "Exploiting Spatio-Temporal Diversity for Water Saving in Geo-Distributed Data Centers", in *IEEE Transactions on Cloud Computing*, vol. 6, no. 3, pp. 734-746, 1 July-Sept. 2018. (Impact factor: 5.97)
TWC	M. N. H. Nguyen, N. H. Tran, **M. A. Islam**, C. Pham, S. Ren, and C. S. Hong, "Fair Sharing of Backup Power Supply in Multi-Operator Wireless Cellular Towers", in *IEEE Transactions on Wireless Communications*, 2017. (Impact factor: 6.39)
TCC	**M. A. Islam**, S. Ren, G. Quan, M. Shakir, and A. Vasilakos, "Water-Constrained Geographic Load Balancing in Data Centers", in *IEEE Transactions on Cloud Computing*, vol. 5, no. 2, pp. 208-220, April-June 1 2017. (Impact factor: 5.97)
TSC	**M. A. Islam**, S. Ren, A. H. Mahmud and G. Quan, "Online Energy Budgeting for Cost Minimization in Virtualized Data Center", in *IEEE Transactions on Services Computing*, vol. 9, no. 3, pp. 421-432, May-June 1 2016. (Impact factor: 5.7)
SUSCOM	**M. A. Islam**, S. Ren, N. Pissinou, A. H. Mahmud, and A. V. Vasilakos, "Distributed Temperature-aware Resource Management in Virtualized Data Center", *Sustainable Computing: Informatics and Systems*, vol. 6, pp. 3-16, June 2015. (Impact factor: 1.2)
TSP	S. Ren, N. Deligiannis, Y. Andreopoulos, **M. A. Islam**, and M. van der Schaar, "Dynamic Scheduling for Energy Minimization in Delay-Sensitive Stream Mining", in *IEEE Transactions on Signal Processing*, vol. 62, no. 20, pp. 5439-5448, Oct. 15, 2014. (Impact factor: 5.23)

Conferences

SenSys'23	P. Gupta, Z. Talukder, T. Abir, P. Nguyen, and **M. A. Islam** "Enabling Low-Cost Server Level Power Monitoring in Data Centers Using Conducted EMI", *ACM Conference on Embedded Networked Sensor Systems*, 2023.
IEEE EDGE'23	P. Agbaje, A. Anjum, Z. Talukder, **M. A. Islam**, E. Nwafor, and H. Olufowobi "FedCime: An Efficient Federated Learning Approach For Clients in Mobile Edge Computing", *IEEE International Conference on Edge Computing & Communications*, 2023.
HPCA'23	M. Hossen, K. Ahmed, and **M. A. Islam** "Market Mechanism-Based User-in-the-Loop Scalable Power Oversubscription for HPC Systems", *IEEE Intl. Symp. on High Performance Computer Architecture*, 2023.
IEEE EDGE'22	Z. Talukder and **M. A. Islam** "Computationally Efficient Auto-Weighted Aggregation for Heterogeneous Federated Learning", *IEEE International Conference on Edge Computing & Communications*, 2022.

HPDC'22	M. Hossen, <u>**M. A. Islam**</u>, and K. Ahmed, "Practical Efficient Microservice Autoscaling with QoS Assurance", *ACM International Symposium on High-Performance Parallel and Distributed Computing*, 2022.
CNS'21	F. Yang, <u>**M. A. Islam**</u>, and S. Ren, "CompKey: Exploiting Computer's Electromagnetic Radiation for Secret Key Generation", *IEEE Conference on Communications and Network Security (CNS)*, 2021.
HPCA'21	Z. Shao, <u>**M. A. Islam**</u>, and S. Ren, "Heat Behind the Meter: A Hidden Threat of Thermal Attacks in Edge Colocation Data Centers", *IEEE Intl. Symp. on High Performance Computer Architecture*, 2021.
SIGMETRICS'20	Z. Shao, <u>**M. A. Islam**</u>, and S. Ren, "Your Noise, My Signal: Exploiting Switching Noise for Stealthy Data Exfiltration from Desktop Computers", *ACM International Conference on Measurement and Modeling of Computer Systems*, 2020.
CLOUD'20	Z. Shao, <u>**M. A. Islam**</u>, and S. Ren, "DeepPM: Efficient Power Management in Edge Data Centers using Energy Storage", *IEEE CLOUD*, 2020.
NSS'20	F. Yang, <u>**M. A. Islam**</u>, and S. Ren, "PowerKey: Generating Secret Keys from Power Line Electromagnetic Interferences", *International Conference on Network and System Security*, 2020.
CCS'18	<u>**M. A. Islam**</u> and S. Ren, "Ohm's Law in Data Centers: A Voltage Side Channel for Timing Power Attacks", *ACM Conference on Computer and Communications Security*, 2018.
SIGMETRICS'18	<u>**M. A. Islam**</u>, L. Yang, K. Ranganath, and S. Ren, "Why Some Like It Loud: Timing Power Attacks in Multi-Tenant Data Centers Using an Acoustic Side Channel", *ACM International Conference on Measurement and Modeling of Computer Systems*, 2018.
HPCA'18	<u>**M. A. Islam**</u>, X. Ren, S. Ren, and A. Wierman, "A Spot Capacity Market to Increase Power Infrastructure Utilization in Multi-Tenant Data Centers", *IEEE Intl. Symp. on High Performance Computer Architecture*, 2018.
NOMS'18	M. N. H. Nguyen, N. H. Tran, <u>**M. A. Islam**</u>, C. Pham, S. Ren and C. S. Hong, "Multi-operator backup power sharing in wireless base stations", *IEEE/IFIP Network Operations and Management Symposium*, 2018.
CCS'17	<u>**M. A. Islam**</u>, S. Ren, and A. Wierman, "Exploiting a Thermal Side Channel for Power Attacks in Multi-Tenant Data Centers", *ACM Conference on Computer and Communications Security*, 2017.
SIGMETRICS'17	<u>**M. A. Islam**</u>, X. Ren, S. Ren, and A. Wierman, "A Spot Capacity Market to Increase Power Infrastructure Utilization in Multi-enant Data Centers", *ACM International Conference on Measurement and Modeling of Computer Systems*, 2017. (extended summary of HPCA'18)
HPCA'16	<u>**M. A. Islam**</u>, X. Ren, S. Ren, A. Wierman, and X. Wang, "A Market Approach for Handling Power Emergencies in Multi-Tenant Data Center", *IEEE Intl. Symp. on High Performance Computer Architecture*, 2016.
IGSC'16	<u>**M. A. Islam**</u>, A. Gandhi, and S. Ren, "Minimizing Electricity Cost for Geo-Distributed Interactive Services with Tail Latency Constraint", *Intl. Green and Sustainable Computing Conference*, 2016.
IGSC'16	T. Wei, <u>**M. A. Islam**</u>, S. Ren, and Q. Zhu, "Co-Scheduling of Datacenter and HVAC Loads in Mixed-Use Buildings", *Intl. Green and Sustainable Computing Conference*, 2016.
HPCA'15	<u>**M. A. Islam**</u>, H. Mahmud, S. Ren, and X. Wang, "Paying to Save: Reducing Cost of Colocation Data Center via Rewards", *IEEE Intl. Symp. on High Performance Computer Architecture*, 2015.
ICCAD'15	K. Ahmed, <u>**M. A. Islam**</u>, and S. Ren, "A Contract Design Approach for Colocation Data Center Demand Response", *Intl. Conference on Computer Aided Design*, 2015.
ICAC'14	S. Ren and <u>**M. A. Islam**</u>, "Colocation Demand Response: Why Do I Turn Off. My Servers?", *USENIX Intl. Conf. on Autonomic Computing*, 2014.
ICAC'14	<u>**M. A. Islam**</u>, K. Ahmed, S. Ren, and G. Quan, "Exploiting Temporal Diversity of Water Efficiency to Make Data Center Less Thirsty", *USENIX Intl. Conf. on Autonomic Computing*, 2014.

IGCC'14	**M. A. Islam**, S. Ren, and X. Wang, "GreenColo: A Novel Incentive Mechanism for Minimizing Carbon Footprint in Colocation Data Center", *Intl. Green Computing Conference*, 2014.
MASCOTS'13	**M. A. Islam**, S. Ren, and G. Quan, "Online Energy Budgeting for Virtualized Data Centers", *IEEE Intl. Symp. on Modeling, Analysis and Simulation of Computer and Telecommunication Systems*, 2013.
IGCC'13	**M. A. Islam**, S. Ren, N. Pissinou, H. Mahmud, and A. V. Vasilakos, "Distributed Resource Management in Data Center with Temperature Constraint", *Intl. Green Computing Conf.*, 2013.

Workshops, Posters, and Short Papers

SenSys'22	P. Gupta, Z. Talukder, **M. A. Islam**, and P. Nguyen "Towards Server-Level Power Monitoring in Data Centers Using Single-Point Voltage Measurement", *ACM Conference on Embedded Networked Sensor Systems*, 2022 (Poster).
SIGMETRICS'22	M. Hossen and **M. A. Islam** "Practical Efficient Microservice Autoscaling", *ACM International Conference on Measurement and Modeling of Computer Systems*, 2022 (Poster).
SIGMETRICS'22	Z. Talukder and **M. A. Islam** "Efficient Federated Learning with Self-Regulating Clients", *ACM International Conference on Measurement and Modeling of Computer Systems*, 2022 (Poster).
CLOUD COMPUTING'22	M. Hossen and **M. A. Islam**, "Towards Efficient Microservices Management Through Opportunistic Resource Reduction", *The Thirteenth International Conference on Cloud Computing, GRIDs, and Virtualization (CLOUD COMPUTING)*, 2022 (Short paper).
WAIN'20	Md Rajib Hossen and **M. A. Islam**, "Mobile Task Offloading Under Unreliable Edge Performance", *Workshop on AI in Networks and Distributed Systems (collocated with IFIP Performance'20)*, 2020.
SIGMETRICS'19	Z. Shao, **M. A. Islam**, and S. Ren, "A First Look at Thermal Attacks in Multi-Tenant Data Centers.", *ACM International Conference on Measurement and Modeling of Computer Systems*, 2020. (work in progress paper)
SIGMETRICS'17	**M. A. Islam**, X. Ren, S. Ren, and A. Wierman, "A Spot Capacity Market to Increase Power Infrastructure Utilization in Multi-enant Data Centers", *ACM International Conference on Measurement and Modeling of Computer Systems*, 2017. (extended summary of HPCA'18)
Greenmetrics'17	**M. A. Islam**, S. Ren, and A. Wierman, "A First Look at Power Attacks in Multi-Tenant Data Centers", *ACM Greenmetrics (collocated with SIGMETRICS'17)*, 2017. (extended abstract of CCS'17)
CoolDC'16	**M. A. Islam** and S. Ren, "A New Perspective on Energy Accounting in Multi-Tenant Data Centers", *USENIX Workshop on Cool Topics on Sustainable Data Centers (collocated with NSDI'16)*, 2016.
HotPower'14	K. Ahmed, **M. A. Islam**, S. Ren, and G. Quan, "Can data center become water self-sufficient?", *In Proceedings of the 6th USENIX conference on Power-Aware Computing and Systems*, 2014.
Greenmetrics'14	S. Ren and **M. A. Islam**, "A First Look at Colocation Demand Response", *ACM Greenmetrics (co-located with SIGMETRICS)*, 2014. (extended summary of ICAC'14)