Md Tariqul Islam 'Pavel', PhD

Assistant Professor of Trustworthy Cyberspace
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RESEARCH OVERVIEW

My research endeavors revolve around enhancing security, efficiency, and fault tolerance of distributed systems, with a particular emphasis on cloud computing and Blockchain technologies. Through the development of innovative algorithms and protocols, I strive to design practical solutions to address real-world challenges encountered in both industry and society.

RESEARCH INTERESTS

Distributed Systems (i.e., Cloud and Blockchain), Network and Computer Security, Applied Cryptography.

TEACHING INTERESTS

Cryptography and Data Security, Security of Distributed Systems, Network Security, Cloud Computing.

EDUCATION

University of Kentucky, Lexington, USA

Doctor of Philosophy in Computer Science, July 2020
Dissertation Title: Algorithms for Achieving Fault-tolerance and Ensuring Security in Cloud Computing Systems.
Advisor: Dr. D. Manivannan.

Master of Science in Computer Science, December 2016
Thesis Title: Predicting Application Failure in Cloud: A Machine Learning Approach.
Advisor: Dr. D. Manivannan.

University of Dhaka, Dhaka, Bangladesh

Bachelor of Science in Computer Science and Engineering, April 2008.
Thesis Title: IRH Filter: A Comprehensive Machine Learning Approach to Spam Reduction.
Advisor: Dr. Rezaul Karim.

WORK EXPERIENCES

Assistant Professor of Trustworthy Cyberspace, School of Information Studies (iSchool), Syracuse University (Aug. 2020 –).

Summer Instructor at Department of Computer Science, University of Kentucky (Summer 2016, 2017, 2018, and 2019).

Software Developer, Summer Intern at Department of Library and Information Sciences, University of Kentucky (May 2014 – Jul. 2014).

Graduate Teaching Assistant at the University of Kentucky (Jan. 2013 – May 2020).

Specialist– Revenue Management Systems at Robi Axiata Bangladesh Ltd. (Jul. 2012 – Dec. 2012).

Senior System Engineer at Grameenphone Bangladesh Ltd. (Dec. 2008 – Aug. 2011).

Services Engineer at LM Ericsson Bangladesh Ltd. (Jan. 2008 – Dec. 2008).

RESEARCH GRANT

External Grants [Pending and In-preparation]

- "SaTC: Core: Small: FirmChain: A Framework for High-Performance and Attack Resilient Blockchain," Sponsored by NSF. Islam, M. T. (Principal); $599,784. (Under Review).

- "Secure and Scalable Smart Contract Upgrade Framework with Cross-Chain Interoperability Leveraging Zero-Knowledge Proofs and Atomic Rollback", Sponsored by NSF. Islam, M. T. (Principal); $594,000 (Under Review).

- "AI-Enhanced Blockchain Security: Leveraging Reinforcement Learning and Game Theory for Attack Detection and Mitigation," Sponsored by NSF. Islam, M. T. (Principal). (In-preparation).

- "A Zero Trust Architecture for Cyber-Physical Systems: Blockchain and AI-Integrated Solutions," Sponsored by NSF. Islam, M. T. (Principal). (In-preparation).

External Grants [Declined and Being Revised]

- "Partnership Development and Planning for an Instrumented Decentralized Autonomous Informal STEM Learning Community," Sponsored by NSF (AISL). Islam, M. T. (Principal); $133,158. (Declined).

- "Decentralized Citizen Science Dynamic Ecosystems Project (DeSci-DEco): Instrumenting and Orchestrating Digital Learning Communities," Sponsored by NSF (RETTL). Islam, M. T. (Principal), Smith, Danielle (Co-PI) and McKnight, Lee (Co-PI); $778,643. (Declined).

- "MB-SCM: Multi-Blockchain Supply Chain Management for Accelerating LAM Manufacturing Process," Sponsored by LAM Research. Islam, M. T. (Principal), and McKnight, Lee (Co-PI); $50,000. (Declined).

Internal Grant

- "Building a Secure and Dynamic Auditing Framework for Cloud Storage Systems," Sponsored by 2021 Collaboration for Unprecedented Success and Excellence (CUSE), Syracuse University. Islam, M. T. (Principal), $21,000. (June 1, 2021 – May 31, 2023).

AWARDS AND HONORS

Best Paper Award (1)
Paper Title: A Secure and Decentralized Auditing Scheme for Cloud Ensuring Data Integrity and Fairness in Auditing [**C9**].
Venue: *Proceedings of the 2022 IEEE 9th International Conference on Cyber Security and Cloud Computing (CSCloud)*, June, 2022, Xi'an, China.

Best Paper Award (2)
Paper Title: MRL-PoS: A Multi-agent Reinforcement Learning based Proof of Stake Consensus Algorithm for Blockchain [**C20**].
Venue: *Proceedings of the 2024 IEEE 14th Annual Computing and Communication Workshop and Conference* (IEEE CCWC 2024), Jan. 2024, Las Vegas, United States.

Media Coverage
Following is a list of media coverage stemmed from one of our published research papers [**C12**] in the IEEE Conference on Cybersecurity and Cloud Computing (CSCloud2023).

- **Orange (formerly France Télécom)**: *"Quarks: decentralized and blockchain-secured instant messaging."* [March, 2024].

- **ELBLOG.PL** (Decoding AI: Unveiling the Future of Machine Intelligence): *"Quarks: Revolutionizing Digital Communication Security"* [March 2024].

- **BNN** (The People's Network): *"Discord Data Breach Exposes 760,000 Users: Blockchain Messaging as Future Security Hope"* [March 2024].

- **TechXplore**: *"A decentralized, blockchain-based messaging network for safer communications"* [August, 2023].

Awards/Honors at the University of Kentucky, Lexington, USA

– ***Provost's Award (Finalist)***, Outstanding Teaching Assistant, 2020.

– ***Midwestern Association of Graduate Schools (MAGS) Excellence in Teaching Award*** (Nominated from Computer Science), Outstanding Teaching Assistant, 2020.

– ***Provost's Award (Finalist)***, Outstanding Teaching Assistant, 2019.

– ***Dean's Award***, Outstanding Teaching Assistant, 2018.

– ***Computer Science Departmental Award***, Outstanding Teaching Assistant, 2018.

– ***Computer Science Departmental Award***, Outstanding Teaching Assistant, 2019.

Awards/Honors at the University of Dhaka, Dhaka, Bangladesh.

– ***Provost's Award*** for Academic Excellence in **BS in Computer Science**, 2008.

Awards/Honors from the Ministry of Education, Dhaka, Bangladesh

– ***In National Merit List*** for Academic Excellence in Higher-Secondary School Exam, 2000.

– ***Prime Minister Gold Medal*** for Academic Excellence in Secondary School Exam, 1998.

PUBLICATIONS   (*Author name followed by "(s)" indicates the author is/was one of my or my collaborators' student advisees.*)

Journals:

[**J4**] M. Munir, S. Dipro, K. Hasan, **T. Islam**, and S. Shetty, "Artificial Intelligence-Enabled Exploratory Cyber-Physical Safety Analyzer Framework for Civilian Urban Air Mobility," *Applied Sciences*, vol. 13, no. 2, Jan. 2023.

[**J3**] K. Hasan, S. Shetty, M.S. Ullah, A. Hassanzadeh, and **T. Islam**, "Criticality based Optimal Cyber Defense Remediation in Energy Delivery Systems," *EAI Endorsed Transactions on Security and Safety*, vol. 8, no. 28, Sep. 2021.

[**J2**] H. Mistareehi, **T. Islam**, and D. Manivannan, "A Secure and Distributed Architecture for Vehicular Cloud," *Internet of Things*, Jan. 2021.

[**J1**] **T. Islam**, D. Manivannan, and S. Zeadally, "A Classification and Characterization of Security Threats in Cloud Computing," *International Journal of Next-Generation Computing*, vol. 7, no. 1, Mar. 2016.

Conferences:

[**C31**] R. Haque$^{(s)}$, S. Aziz$^{(s)}$, T. Hossain$^{(s)}$, F. Bappy$^{(s)}$, M. Yanhaona, and **T. Islam**, "Collaborative Proof-of-Work: A Secure Dynamic Approach to Fair and Efficient Blockchain Mining," in *Proceedings of the 2025 IEEE Annual Computing and Communication Workshop and Conference (CCWC)*, Jan. 2025 (to appear).

[**C30**] T. Hossain$^{(s)}$, F. Bappy$^{(s)}$, T. Zaman, and **T. Islam**, "SEAM: A Secure Automated and Maintainable Smart Contract Upgrade Framework," in *Proceedings of the 2025 IEEE Consumer Communications & Networking Conference (IEEE CCNC 2025)*, Jan. 2025 (to appear).

[**C29**] F. Bappy$^{(s)}$, J. Park, K. Hasan, and **T. Islam**, "ChainGuard: A Blockchain-based Authentication and Access Control Scheme for Distributed Networks," in *Proceedings of the 2025 IEEE Consumer Communications & Networking Conference (IEEE CCNC 2025)*, Jan. 2025 (to appear).

[**C28**] M. Mia$^{(s)}$, M. Pritom, **T. Islam**, and K. Hasan, "Visually Analyze SHAP Plots to Diagnose Misclassifications in ML-based Intrusion Detection," in *Proceedings of the 2024 IEEE International Conference on Data Mining (ICDM)*, Dec. 2024 (to appear).

[C27] F. Bappy$^{(s)}$, K. Hasan, J. Park, C. Caicedo, and **T. Islam**, "Impact of Conflicting Transactions in Blockchain: Detecting and Mitigating Potential Attacks," in *Proceedings of the 2024 IEEE Global Conference on Communications (Globecom)*, Dec. 2024 (to appear).

[C26] F. Bappy$^{(s)}$, K. Hasan, M. Sajid, M. Pritom, and **T. Islam**, "Securing Proof of Stake Blockchains: Leveraging Multi-Agent Reinforcement Learning for Detecting and Mitigating Malicious Nodes," in *Proceedings of the 2024 IEEE Global Conference on Communications (Globecom)*, Dec. 2024 (to appear).

[C25] A. Amin$^{(s)}$, K. Hasan, S. Zein-Sabatto, L. Hong, S. Shetty, I. Ahmed, and **T. Islam**, "Advancing Healthcare: Innovative ML Approaches for Improved Medical Imaging in Data-Constrained Environments," in *Proceedings of the 2024 IEEE Global Conference on Communications (Globecom)*, Dec. 2024 (to appear).

[C24] F. Bappy$^{(s)}$, T. Zaman, M. Sajid, M. Pritom, and **T. Islam**, "Maximizing Blockchain Performance: Mitigating Conflicting Transactions through Parallelism and Dependency Management," in *Proceedings of the 2024 IEEE International Conference on Blockchain (Blockchain)*, pp. 140-147, Aug. 2024.

[C23] **T. Islam**, F. Bappy$^{(s)}$, M. Shifat$^{(s)}$, F. Ahmad$^{(s)}$, K. Hasan, and T. Zaman, "An Efficient and Scalable Auditing Scheme for Cloud Data Storage using an Enhanced B-tree," in *Proceedings of the 2024 IEEE International Conference on Communications (IEEE ICC 2024)*, pp. 4590-4595, Jun. 2024.

[C22] A. Amin$^{(s)}$, K. Hasan, S. Zein-Sabatto, D. Chimba, L. Hong, I. Ahmed, and **T. Islam**, "Empowering Healthcare through Privacy-preserving MRI Analysis," in *Proceedings of the 2024 IEEE SoutheastCon (SoutheastCon 2024)*, pp. 1534-1539, Mar. 2024.

[C21] E. Haque$^{(s)}$, K. Hasan, I. Ahmed, M. Alam, and **T. Islam**, "Enhancing UAV Security Through Zero Trust Architecture: An Advanced Deep Learning and Explainable AI Analysis," in *Proceedings of the 2024 IEEE International Conference on Computing, Networking and Communications (IEEE ICNC 2024)*, pp. 463-467, Feb. 2024.

[C20] **T. Islam**, F. Bappy$^{(s)}$, T. Zaman, M. Sajid, and M. Pritom, "MRL-PoS: A Multi-agent Reinforcement Learning based Proof of Stake Consensus Algorithm for Blockchain," in *Proceedings of the 2024 IEEE 14th Annual Computing and Communication Workshop and Conference (IEEE CCWC 2024)*, pp. 0409-0413, Jan. 2024. (**Best Paper Award**).

[C19] S. Ahmed$^{(s)}$, M. Nahiduzzaman$^{(s)}$, **T. Islam**, F. Bappy$^{(s)}$, T. Zaman, and R. Hasan, "FASTEN: Towards a FAult-tolerant and STorage EfficieNt Cloud: Balancing Between Replication and Deduplication," in *Proceedings of the 2024 IEEE Consumer Communications & Networking Conference (IEEE CCNC 2024)*, pp. 44-50, Jan. 2024.

[C18] F. Bappy$^{(s)}$, **T. Islam**, T. Zaman, M. Sajid, and M. Pritom, "ConChain: A Scheme for Contention-free and Attack Resilient BlockChain," in *Proceedings of the 2024 IEEE Consumer Communications & Networking Conference (IEEE CCNC 2024)*, pp. 1054-1055, Jan. 2024.

[C17] E. Haque$^{(s)}$, K. Hasan, I. Ahmed, M. Alam, and **T. Islam**, "Towards an Interpretable AI Framework for Advanced Classification of Unmanned Aerial Vehicles (UAVs)," in *Proceedings of the 2024 IEEE Consumer Communications & Networking Conference (IEEE CCNC 2024)*, pp. 644-645, Jan. 2024.

[C16] A. Amin$^{(s)}$, K. Hasan, S. Zein-Sabatto, D. Chimba, I. Ahmed, and **T. Islam**, "An Explainable AI Framework for Artificial Intelligence of Medical Things," in *Proceedings of the 2023 IEEE Global Communication Conference (IEEE Globecom 2023)*, pp. 2097-2102, Dec. 2023.

[**C15**] F. Bappy[(s)], S. Zaman[(s)], **T. Islam**, R. Rizvee, J. Park, and K. Hasan, "Towards Immutability: A Secure and Efficient Auditing Framework for Cloud Supporting Data Integrity and File Version Control," in *Proceedings of the 2023 IEEE Global Communication Conference (IEEE Globecom 2023)*, pp. 6801-6806, Dec. 2023.

[**C14**] F. Bappy[(s)], **T. Islam**, T. Zaman, R. Hasan, and C. Caicedo, "A Deep Dive into the Google Cluster Workload Traces: Analyzing the Application Failure Characteristics and User Behaviors," in *Proceedings of the 2023 International Conference on Future Internet of Things and Cloud (FiCloud 2023)*, pp. 103-108, Aug. 2023.

[**C13**] G. Sathi[(s)], L. Vedullapalli[(s)], M. Kishan[(s)], T. Zaman, **T. Islam**, and M. Badr, "NetMiner: Identifying Failure-Inducing Patterns in the Logs Generated by Network Monitoring Software," in *Proceedings of the IEEE 14th International Conference on Computing, Communication and Networking Technologies (IEEE ICCCNT)*, pp. 1-7, Jul. 2023.

[**C12**] M. Shuhan[(s)], **T. Islam**, E. Shuvo[(s)], F. Bappy[(s)], K. Hasan, and C. Caicedo, "Quarks: A Secure and Decentralized Blockchain-Based Messaging Network," in *Proceedings of the 2023 IEEE International Conference on Cyber Security and Cloud Computing (CSCloud)*, pp. 268-274, Jul. 2023.

[**C11**] T. Zaman, **T. Islam**, S. Vadla[(s)], and U. Rangu[(s)], "WasteMiner: An Efficient Waste Collection System for Smart Cities Leveraging IoT and Data Mining Technique," in *Proceedings of the 2023 IEEE Southeast Conference (IEEE SoutheastCon 2023)*, pp. 504-510, Apr. 2023.

[**C10**] K. Hasan, S. Shetty, **T. Islam**, and I. Ahmed, "Predictive Cyber Defense Remediation against Advanced Persistent Threat in Cyber-Physical Systems," in *Proceedings of the 2022 International Conference on Computer Communications and Networks (ICCCN)*, pp. 1-10, Jul. 2022.

[**C9**] **T. Islam**, K. Hasan, S. Singh[(s)], and J.S. Park, "A Secure and Decentralized Auditing Scheme for Cloud Ensuring Data Integrity and Fairness in Auditing," in *Proceedings of the 2022 IEEE 9th International Conference on Cyber Security and Cloud Computing (CSCloud)*, pp. 74-79, Jun. 2022. (**Best Paper Award**)

[**C8**] T. Zaman and **T. Islam**, "ReDPro: An Automated Technique to Detect and Regenerate Process-level Concurrency Failures," in *Proceedings of the 2022 ACM Southeast Conference (ACMSE 2022)*, pp. 106-112, Apr. 2022.

[**C7**] M. Ashik[(s)], **T. Islam**, K. Hasan, and K. Lim, "A Blockchain-Based Secure Fog-Cloud Architecture for Internet of Things," in *8th IEEE International Conference on Cyber Security and Cloud Computing (CSCloud)*, pp. 1-3, Jul. 2021.

[**C6**] **T. Islam**, K. Lim and D. Manivannan, "Blending Convergent Encryption and Access Control Scheme for Achieving A Secure and Storage Efficient Cloud," in *Proceedings of the IEEE Consumer Communications & Networking Conference (CCNC-2020)*, pp. 1-6, Jul. 2020.

[**C5**] K. Lim, **T. Islam**, K. Hyunbum, and J. Jingon, "A Sybil Attack Detection Scheme based on ADAS Sensors for Vehicular Networks," in *Proceedings of the IEEE Consumer Communications & Networking Conference (CCNC-2020)*, pp. 1-5, Mar. 2020.

[**C4**] H. Mistareehi, **T. Islam**, K. Lim and D. Manivannan, "A Secure and Distributed Architecture for Vehicular Cloud," in *Proceedings of the International Conference on P2P, Parallel, Grid, Cloud and Internet Computing (3PGCIC-2019)*, vol. 3, p.100355, Aug. 2019.

[**C3**] **T. Islam** and D. Manivannan, "FaCS: Toward a Fault-Tolerant Cloud Scheduler Leveraging Long Short-Term Memory Network," in *Proceedings of the IEEE International Conference on Cybersecurity and Cloud Computing (CSCloud/EdgeCom 2019)*, pp. 1-6, Jun. 2019.

[**C2**] **T. Islam**, H. Mistareehi, and D. Manivannan, "SecReS: A Secure and Reliable Storage Scheme for Cloud with Client-side Data Deduplication," in *Proceedings of the IEEE Global Communications Conference (GlobeCom-2019)*, Feb. 2019.

[C1] **T. Islam** and D. Manivannan, "Predicting Application Failure in Cloud: A Machine Learning Approach," in *Proceedings of the IEEE International Conference on Cognitive Computing (ICCC-2017)*, pp. 24-31, Jun. 2017.

TEACHING	**Syracuse University**, Syracuse, New York

IST 634— Security in Networked Environments (Fall '21 and '22)
IST 615— Cloud Management (Fall '23 and Spring '24)
IST 431— Security in Networked Environments (Spring '21 and Spring '22)
IST 233— Introduction to Networks and Cloud (Spring '24, '23, and '21; Fall '23, '22, and '21).

STUDENT MENTORING	**Syracuse University**, Syracuse, New York

Doctoral Students

- Tahrim Hossain [Fall 2024–]
- Faisal Haque Bappy [Fall 2022–]

Master's Students: Saheb Singh (Fall 2020 — Spring 2021, Graduated May 2021), Prathamesh Pradip Datar (Fall 2020 — Spring 2021, Graduated May 2021), Abhishek Sanjay Jain (Spring 2022), and Shabib Suhail Khan (Spring 2023).

PROFESSIONAL SERVICE	**Technical Program Committee Member**

- **ICC [2024]**: The IEEE International Conference on Communications
- **Globecom [2023, 2024]**: The IEEE Global Communications Conference
- **CCNC [2023, 2024, 2025]**: The IEEE Consumer Communications & Networking Conference
- **UbiSec 2022**: The 2nd International Conference on Ubiquitous Security
- **DASC 2022**: The 20th IEEE Conference on Dependable, Autonomic and Secure Computing
- **EAI WiCON 2022**: 15th European Alliance for Innovation (EAI) International Wireless Internet Conference
- **CSASE 2022**: The 2nd International Conference on Computer Science and Software Engineering

Journal Reviewer: IEEE Communications Magazine, Transactions on Cloud Computing, Journal of Security and Communication Network, International Journal of Information Security, IEEE Systems Journal, IEEE Transactions on Industrial Informatics, Vehicular Communications, Transactions on Emerging Telecommunications Technologies, and Journal of Pervasive and Mobile Computing (PMC).

Conference Reviewer: IEEE Global Communications Conference (Globecom), IEEE Consumer Communications & Networking Conference (CCNC), International Conference on Sustainable Technologies for Industry 4.0 (STI), International Conference on Ubiquitous Security (UbiSec), and IEEE International Conference on Dependable, Autonomic and Secure Computing (DASC).

SERVICE AT SYRACUSE UNIVERSITY	Undergraduate Program Committee (2020-21), IM/EDS Program Committee (2020-21), Doctoral Admission Committee (2021-), Personnel Committee (2021-22).

SOCIAL SERVICE AND LEADERSHIP	**President**, Bangladesh Student Association at the University of Kentucky [2018-2019]. **Secretary of Public Affairs**, Bangladesh Student Association at the University of Kentucky [2017-2018]. **Captain**, Soccer Team [2005-2007], Dept. of Computer Science, University of Dhaka, Bangladesh **President**, Tuff Boyz [1998–], A Local Sports Club in my Hometown, Gazipur, Bangladesh.

Syracuse University, Syracuse, New York

- **Flexicontracts**: A Novel and Efficient Scheme for Upgrading Smart Contracts in Ethereum Blockchain (Go, Solidity)
- **EB-Tree**: An Efficient and Scalable Auditing Scheme for Cloud Data Storage using an **E**nhanced **B-tree** (C++, Python)
- **MRL-PoS**: Securing **P**roof **o**f **S**take Blockchains: Leveraging **M**ulti-Agent **R**einforcement **L**earning for Detecting and Mitigating Malicious Nodes (Go)
- **ConChain**: Maximizing Blockchain Performance: Mitigating Conflicting Transactions through Parallelism and Dependency Management (Go, Hyperledger Fabric, Hyperledger Caliper)
- **FASTEN**: Towards a **FA**ult-tolerant and **ST**orage **E**fficie**N**t Cloud: Balancing Between Replication and Deduplication (C++, Python)
- **Quarks**: A Secure and Decentralized Blockchain-Based Messaging Network (Go, ReactJS, NodeJS, MongoDB)

University of Kentucky, Lexington, Kentucky

- **FaCS**: Toward a **F**ault-tolerant **C**loud **S**cheduler Leveraging Recurrent Neural Network (Python, Keras)
- **SecReS**: A **S**ecure and **R**eliable **S**torage Scheme for Cloud (C++, Crypto++, Jerasure)
- **FPS**: A **F**ailure **P**rediction **S**ystem for applications running in Cloud (Python, Keras)
- **DDBMS**: A Distributed Database Management System (Java, MySQL)
- **SecDB**: Database Security through Compartment (Java, MySQL)
- **SERS**: A **S**earch **E**ngine and **R**ecommendation **S**ystem (PHP, MySQL, Sphinx)

University of Dhaka, Dhaka, Bangladesh

- **Spam Filter**: An Efficient Approach to SPAM reduction (MS Visual C#, MS SQL Server)
- **SIMS**: **S**tudent **I**nformation **M**anagement **S**ystem (PHP, MySQL, JavaScript)
- **TDM**: Windows **T**ask and **D**evice **M**anager (MS Visual C#)

References available upon request.