Faisal Haque Bappy

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Research Interests

My research interests lie in enhancing the **security**, **scalability**, and **performance** of distributed systems, with a focus on **blockchain** and **cloud computing**. I work on developing solutions to address system vulnerabilities, optimize performance, and ensure robust, efficient operation in decentralized environments.

Education

Syracuse University *Aug 2022 – Present*
PhD in Information Science and Technology *CGPA: 3.91*

- **Advisor:** Dr. Md Tariqul Islam

Shahjalal University of Science and Technology *Jan 2017 – Dec 2020*
BSc in Computer Science and Engineering *CGPA: 3.56*

- **Thesis:** Modelling and Simulating Attacks in a Private Blockchain System
- **Advisor:** Dr. Md Sadek Ferdous

Relevant Courses

- **Graduate Courses:** Research Methods in IST, Security in Networked Environments, Text as Data for Research, Cloud Management, Software and Systems Security, Computer Security, Foundations of HCI, and Scripting for Data Analysis.
- **Undergraduate Courses:** Algorithm Design and Analysis, Object-Oriented Programming, Database Systems, Operating System and System Programming, Data Science, Networking, Software Engineering and Design Patterns, Artificial Intelligence, Computer Security, Compiler Construction, and Bioinformatics.

Experience

Graduate Research Assistant *Syracuse, NY, USA*
School of Information Studies (iSchool), Syracuse University *Aug 2022 - Present*

- Developed and implemented a novel scheme to mitigate the impact of conflicting transactions in blockchain networks, improving system efficiency and reducing transaction delays.
- Designed a consensus mechanism leveraging multi-agent reinforcement learning to enhance the security of Proof of Stake blockchains, improving detection and mitigation of malicious nodes.
- Redesigned the workflow of an existing radio spectrum frequency-sharing scheme and implemented multiple APIs optimized for low-resource IoT devices.
- **Tools Used:** Hyperledger Fabric, Ethereum, GoLang, PostgreSQL, Azure Functions

Software Engineer *Sydney, NSW, Australia*
FConnect (formerly Footylight Pty Ltd.) *Mar 2021 – Jul 2022*

- Developed a content monetization solution from scratch that is now used by 1000+ partner websites and the system is handling 500 million video plays per month on average.
- Developed a search infrastructure for maintaining ever-growing data using ELK Stack & AWS.
- **Tools Used:** NextJS, React, AWS Lambda, .NET, DynamoDB, MSSQL, ElasticSearch

Research and Development Intern *Sylhet, Bangladesh*
Pipilika - Bangla Search Engine *Sep 2019- Aug 2020*

- Collaborated on a project titled “Pipilika Media Monitor” which was used to generate different analytics and analyze public reaction to trending news of Bangladesh.
- **Tools Used:** React, ExpressJS, Django, Tensorflow, MongoDB, ElasticSearch

Publications

Conference Papers

[C15] **FH Bappy**, E Cheon, T Islam, **"Centralized Trust in Decentralized Systems: Unveiling Hidden Contradictions in Blockchain and Cryptocurrency"** in *Proceedings of the 2025 ACM Conference on Fairness, Accountability, and Transparency (FAccT)*

[C14] T Hossain, **FH Bappy**, TS Zaman, T Islam, **"SmartShift: A Secure and Efficient Approach to Smart Contract Migration"** in *Proceedings of the 2025 ACM International Conference on the Foundations of Software Engineering (FSE)*

[C13] T Hossain, S Hassan, **FH Bappy**, MN Yanhaona, TS Zaman, T Islam, **"Bridging Immutability with Flexibility: A Scheme for Secure and Efficient Smart Contract Upgrades"** in *Proceedings of the 2025 IEEE International Conference on Blockchain and Cryptocurrency (ICBC 2025)*

[C12] R Haque, SM Aziz, T Hossain, **FH Bappy**, MN Yanhaona, T Islam, **"Collaborative Proof-of-Work: A Secure Dynamic Approach to Fair and Efficient Blockchain Mining"** in *Proceedings of the 2025 IEEE 15th Annual Computing and Communication Workshop and Conference (CCWC)* arXiv PrePrint

[C11] T Hossain, S Hassan, **FH Bappy**, MN Yanhaona, STA Rumee, M Zaber, T Islam, **"FlexiContracts: A Novel and Efficient Scheme for Upgrading Smart Contracts in Ethereum Blockchain"** in *Proceedings of the 2024 23rd IEEE International Conference on Trust, Security and Privacy in Computing and Communications (TrustCom)*

[C10] **FH Bappy**, T Islam, K Hasan, MSI Sajid, MMA Pritom, **"Securing Proof of Stake Blockchains: Leveraging Multi-Agent Reinforcement Learning for Detecting and Mitigating Malicious Nodes"** in *Proceedings of the 2024 IEEE Global Communications Conference (GLOBECOM)* arXiv PrePrint

[C9] **FH Bappy**, T Islam, K Hasan, JS Park, C Caicedo, **"Impact of Conflicting Transactions in Blockchain: Detecting and Mitigating Potential Attacks"** in *Proceedings of the 2024 IEEE Global Communications Conference (GLOBECOM)* arXiv PrePrint

[C8] **FH Bappy**, TS Zaman, MSI Sajid, MMA Pritom, T Islam, **"Maximizing Blockchain Performance: Mitigating Conflicting Transactions through Parallelism and Dependency Management"** in *Proceedings of the 2024 IEEE International Conference on Blockchain (Blockchain)* 10.1109/Blockchain62396.2024.00027

[C7] T Islam, **FH Bappy**, MNUH Shifat, F Ahmad, K Hasan, TS 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 (ICC)* arXiv PrePrint

[C6] S Ahmed, M Nahiduzzaman, T Islam, **FH Bappy**, TS Zaman, 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 (CCNC)* 10.1109/CCNC51664.2024.10454894

[C5] **FH Bappy**, S Zaman, T Islam, RA Rizvee, JS Park, 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 Communications Conference (GLOBECOM)* 10.1109/GLOBECOM54140.2023.10436828

[C4] **FH Bappy**, T Islam, TS Zaman, R Hasan, C Caicedo, **"A Deep Dive into the Google Cluster Workload Traces: Analyzing the Application Failure Characteristics and User Behaviors"** in *Proceedings of the 2023 10th International Conference on Future Internet of Things and Cloud (FiCloud)* 10.1109/FiCloud58648.2023.00023

[C3] MKB Shuhan, T Islam, EA Shuvo, **FH Bappy**, K Hasan, C Caicedo, **"Quarks: A Secure and Decentralized Blockchain Based Messaging Network"** in *Proceedings of the 2023 IEEE 10th International Conference on Cyber Security and Cloud Computing (CSCloud)* 10.1109/CSCloud-EdgeCom58631.2023.00053

[C2] MA Shahriar, **FH Bappy**, AF Hossain, DD Saikat, MS Ferdous, MJM Chowdhury, MZA Bhuiyan, **"Modelling Attacks in Blockchain Systems using Petri Nets"** in *Proceedings of the 2020 IEEE 19th International Conference on Trust, Security and Privacy in Computing and Communications (TrustCom)* 10.1109/TrustCom50675.2020.00142

[C1] AHM Linkon, MM Labib, **FH Bappy**, S Sarker, M Jannat, MS Islam, **"Deep Learning Approach Combining-Lightweight CNN Architecture with Transfer Learning: An Automatic Approach for the Detection and Recognition of Bangladeshi Banknotes"** in *Proceedings of the 2020 11th International Conference on Electrical and Computer Engineering (ICECE)* 10.1109/ICECE51571.2020.9393113

Workshop Papers

[W2] T Hossain, **FH Bappy**, TS Zaman, T Islam, **"CrossLink: A Decentralized Framework for Secure Cross-Chain Smart Contract Execution"** in *Proceedings of the 2025 IEEE International Conference on Blockchain and Cryptocurrency Cross-Chain Workshop (ICBC-CCW)*

[W1] T Islam, **FH Bappy**, TS Zaman, MSI Sajid, MMA 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 (CCWC)* 10.1109/CCWC60891.2024.10427777 | 🏆**Awarded as best paper**

Posters

[P3] T Hossain, **FH Bappy**, TS Zaman, T Islam, **"SEAM: A Secure Automated and Maintainable Smart Contract Upgrade Framework"** in *Proceedings of the 2025 IEEE Consumer Communications & Networking Conference (CCNC)* arXiv PrePrint
[P2] **FH Bappy**, JS Park, K Hasan, T Islam, **"ChainGuard: A Blockchain-based Authentication and Access Control Scheme for Distributed Networks"** in *Proceedings of the 2025 IEEE Consumer Communications & Networking Conference (CCNC)* arXiv PrePrint
[P1] **FH Bappy**, T Islam, TS Zaman, MSI Sajid, MMA Pritom, **"ConChain: A Scheme for Contention-free and Attack Resilient BlockChain"** in *Proceedings of the 2024 IEEE Consumer Communications & Networking Conference (CCNC)* 10.1109/CCNC51664.2024.10454692

Projects

ConChain: Mitigating Conflicting Transactions in Blockchain *Full paper*

- Developed a blockchain scheme integrating transaction parallelism with an intelligent dependency manager to minimize conflicting transactions.
- Achieved superior performance compared to existing Hyperledger Fabric networks in terms of transaction success rates, throughput, and latency.
- Demonstrated that the scheme effectively addresses the challenges posed by conflicting transactions.
- Showcased potential for enhancing the performance and stability of blockchain networks in real-world applications.

MRL-PoS+: Multi-agent Reinforcement Learning based Proof of Stake Consensus *Full paper*

- Developed a consensus algorithm that enhances PoS blockchain security using Multi-agent Reinforcement Learning techniques.
- Introduced a penalty-reward system for detecting and eliminating malicious nodes, effectively mitigating potential attack behaviors.
- Achieved significant improvements in attack resilience against six major attack types without additional computational overhead.

Auditing Scheme for Cloud Data Storage using an Enhanced B-tree *Full paper*

- Developed a dynamic auditing solution that leverages an enhanced B-tree structure for efficient insert, update, and delete operations while maintaining balance.
- Outperformed traditional blockchain-based approaches in terms of time, storage efficiency, and overall performance.
- Demonstrated high suitability for scalable cloud auditing applications, particularly for dynamic data updates.

BRAC Dishari *Google play store*

- Developed Dishari, a learning platform for health workers at BRAC, aimed at enhancing training and resources.
- Created an Android application and a web dashboard to provide an integrated solution supporting users' learning needs.
- Currently utilized by 4,000 health workers across Bangladesh, offering essential tools and information to improve their field performance.

Ekushe Bangla Keyboard *Google play store*

- This was the first Bangla keyboard to incorporate a swipe-to-type feature, revolutionizing the typing experience for users. In this project, I developed various keyboard layouts tailored to different user preferences and integrated the swipe capabilities, enabling seamless and efficient text input in Bangla.

Technical Skills

Programming Languages: JavaScript, Go, Java, Bash, Python, Dart, PHP, C++, C#

Framework & Libraries: Hyperledger Fabric, Ethereum, React, NextJS, ElasticSearch, Apache Kafka, Android SDK, Flutter, .NET, Laravel, Django

Databases: MySQL, PostgreSQL, MSSQL, MongoDB, DynamoDB, Redis

Other Tools: Git, LaTeX, Docker, CI/CD, AWS, Azure

Services

- **Reviewer and PC Memeber** of the **Cyberspace Privacy** track in the 2nd International Conference on Ubiquitous Security (UbiSec 2022) *2022*

Achievements

- **Best Paper Award** in **IEEE CCWC 2024** at Las Vegas, NV, USA *January 2024*
- **Winner** of **BRACathon 3.0** in the health services category at Dhaka, Bangladesh *July 2019*
- **Champion** of **SUST Techfest Hackathon 2019** at Gazipur, Bangladesh *April 2019*
- **1st Runners-up** in 10th **IUT ICT Fest Hackathon 2019** at Sylhet, Bangladesh *April 2019*