

# Tanzim Hossain Romel

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Uttara, Dhaka, Bangladesh

## EDUCATION

- **Bangladesh University of Engineering and Technology (BUET)** Mar 2018 - May 2023  
Dhaka, Bangladesh  
*B.Sc. in Computer Science and Engineering*
  - CGPA: 3.53/4.00 [3.61 in final term]
  - Thesis: Patient-Centric Blockchain Framework for Electronic Health Record Management

## RESEARCH INTERESTS

AI for Software Engineering (AI4SE), Empirical Software Engineering, Software and LLM Security, Human-Centered Computing, Blockchain Systems

## WORK EXPERIENCE

- **IQVIA** June 2023 - Present  
Dhaka, Bangladesh  
*Software Development Engineer*
  - Backend Engineer developing microservices-based healthcare applications handling millions of patient records using .NET Core, C#, and AWS
  - Deployed Multi-Agent systems using LangGraph for dashboard generation/modification, integrated with data exploration agent achieving 85% reduction in setup time
  - Achieved 60% reduction in query execution times through database optimization; implemented 40% API response improvement via Redis caching
  - Contributed to browser automation testing methodology in .NET, simplifying regression testing and improving test coverage from 72% to 95%
  - Received IQVIA Impact Program – Silver award (May 2025) for outstanding performance

## RESEARCH EXPERIENCE

- **An Empirical Study on Remote Code Execution in ML Model Hosting Ecosystems** June 2025 - Oct 2025  
*Tools: Python, Bandit, CodeQL, Semgrep, YARA, CWE Analysis | In Review at MSR 2026*
  - First large-scale cross-platform study analyzing ~45,000 repositories across 5 major platforms (Hugging Face, ModelScope, OpenCSG, OpenMMLab, PyTorch Hub) with co-authors Mohammad Latif Siddiq and Joanna C. Santos
  - Detected security vulnerabilities using static analyzers and YARA malware signatures: found CWE-502 (unsafe deserialization) in 74.54% and CWE-95 (eval injection) in 15.02% of affected repositories; 10.41% of Hugging Face repos contain security smells
  - Analyzed 600+ developer discussions to create taxonomy of security misconceptions; revealed only 6.6% SafeTensors adoption and widespread trust\_remote\_code usage
- **ReAgent++: Detecting Aligned Backdoors in LLM Agents** August 2025 - Present  
*Tools: Python, STRIP, K-Arm, UCB Scheduler, WebShop, OSWorld, AgentBench*
  - Extending ReAgent to detect aligned backdoors that maintain semantic consistency while subverting user intent through preference manipulation; collaboration with Dr. Chowdhury Md. Rakin Haider (BUET)
  - Implementing Text/Env-STRIP for perturbation-based runtime detection, and K-Arm trigger inversion for forensic analysis with multi-armed bandit optimization
  - Evaluating on 3 benchmarks (WebShop-1.18M products, OSWorld-369 tasks, AgentBench) against comprehensive attack suite including Sleeper-style, instruction backdoors, and multi-turn hidden triggers
- **Multi-Agent Framework for Generating Relational DB Schema & ERD** July 2025 - Present  
*Tools: Python, LangGraph, StateGraph, Z3 Solver, SQLAlchemy, Text2Schema*
  - Extended SchemaAgent with Dr. Sukarna Barua (BUET) using LangGraph StateGraph architecture with conditional routing and 3-tier auto-repair system
  - Designed 6-stage decomposed pipeline with specialized agents for entity extraction, relationship mining, and normalization with Z3 formal verification
  - Implemented granular component-level retry mechanism with intelligent violation analysis, reducing redundant LLM calls by 80%
- **Design by Contract for LLM APIs** Nov 2024 - Present  
*Tools: Python, OpenAI SDK, LangChain, Runtime Monitoring, Contract Enforcement | Manuscript in preparation*

- Developing taxonomy for API contracts through empirical study of 412 real-world issues with Dr. Akond Rahman (Auburn University)
- Created OpenAI SDK and LangChain extensions for automatic contract enforcement and runtime remediation
- Implemented precondition/postcondition validators with automatic retry mechanisms and fallback strategies

• **Sentiment Analysis of Anonymous Crisis Reports in Bangladesh**

*Sep 2024 - Nov 2024*

*Tools: Python, BERT, XLM-RoBERTa, Transformers, Bengali NLP, Flask*

- Developed uReporter – Bangladesh’s first anonymous reporting system during 2024 national crisis
- Analyzed 124 crowd-sourced reports using six transformer models with multilingual NLP pipeline for Bengali/Romanized Bengali
- Demonstrated anonymous crowd-sourcing’s potential for understanding Global South socio-political dynamics

• **Patient-Centric Blockchain Framework for Secure EHR Management**

*June 2022 – May 2023*

*Tools: Solidity, Ethereum, IPFS, React, Web3.js, AES-GCM, ECIES, EIP-712*

- Proposed a patient-centric blockchain architecture that decouples encrypted off-chain FHIR record storage from on-chain access control, eliminating trusted intermediaries and enabling verifiable patient.
- Implemented an ERC-721-based smart contract for record ownership with EIP-712 signed, time-bounded permissions and ECIES-wrapped AES-GCM keys ensuring confidentiality and non-repudiable authorization.
- Integrated off-chain IPFS storage with on-chain audit trails, achieving tamper-evident data integrity and complete access traceability through event logs.
- Evaluated scalability on 10,000 synthetic FHIR records; achieved 1.3–2.0 s end-to-end latency for 1 MB records and 10× gas reduction via Layer-2 (zkSync/Arbitrum) deployment.

## PROJECTS

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• **Yet Another C Compiler**

*Jun-Aug 2021, Oct 2024*

*Tools: C++17, CMake*

- Built complete C compiler with hand-written lexer and parser, semantic analysis, and x86-64 code generation
- Implemented SSA-based optimization pipeline including SCCP, GVN, LICM, and dead code elimination
- Designed a linear scan register allocator with spilling support
- Modernized legacy Flex/Bison-based prototype into a compiler architecture with modular IR passes and extensible optimization pipeline

• **Database Engine in Go**

*Oct 2024 - Present*

*Tools: Go, B+ Tree, WAL, ARIES Protocol*

- Built complete database engine from scratch with B+ tree indexing and page management system with 8KB pages
- Implemented LRU buffer pool achieving ~2M ops/sec for reads
- Implemented ACID transactions with WAL, crash recovery using ARIES protocol, and concurrent access support

• **Modern Image Captioning System**

*Jan 2023 – Feb 2023*

*Tools: PyTorch, CLIP, ViT, GPT-2, AoA, SCST, MS-COCO*

- Built modular image captioning system combining vision (ResNet, ViT, CLIP) and language (LSTM, Transformer, GPT-2) models
- Reached **127.6 CIDEr, 0.392 BLEU-4, 0.298 METEOR** on MS-COCO (Karpathy split) using CLIP + GPT-2 + AoA + SCST
- Improved CIDEr by +26.4 over ResNet-LSTM baseline through architectural and training refinements
- Applied Self-Critical Sequence Training and attention visualization for interpretability

• **Eventfly: End-to-end Event Management System**

*May 2022 - July 2022*

*Tools: TypeScript, Express.js, Next.js, Docker, Kubernetes, NATS, MongoDB*

- Designed microservices-based event management system
- Led back-end architecture implementing newsfeed, payment, authentication, and event management services

• **Network Simulation & TCP Protocol Analysis**

*Jan 2022 - May 2022*

*Tools: NS3, C++, TCP Reno, TCP Vegas*

- Implemented and analyzed TCP congestion control variants (Reno vs Vegas) using NS3 network simulator
- Designed TCP Vegas+ modification addressing fairness issues through dual-mode operation
- Conducted comprehensive performance analysis measuring throughput, fairness index, and packet drop ratios

## SKILLS

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- **Programming Languages:** C#, Python, JavaScript, TypeScript, Go, SQL, Java, Solidity
- **ML/AI Frameworks:** PyTorch, LangChain, LangGraph, Transformers, ResNet, LSTM, BERT
- **Backend Frameworks:** .NET Core, ASP.NET, Express.js, FastAPI, Next.js
- **Databases:** PostgreSQL, MongoDB, Redis, SQL Server, DynamoDB
- **Cloud & DevOps:** AWS, Azure, Docker, Kubernetes, GitHub Actions, Terraform, OpenTelemetry, Jaeger, NATS
- **Blockchain & Web3:** Ethereum, Solidity, IPFS, ERC-721, ERC-1155, Web3.js
- **Tools & Technologies:** NS3, Flex, Bison, Git, Linux, WAL, ARIES Protocol

## HONORS AND AWARDS

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- **IQVIA Impact Program – Silver Award** *May 2025*  
*IQVIA*
  - Awarded for outstanding performance and essential feature development
- **Finalist, Blockchain Olympiad Bangladesh** *2021*  
*BCOLBD*
  - Top 40 teams nationally with "Blockchain Based Ticketing Platform"
- **2nd Place - Bangla Handwritten Digits Recognition** *2022*  
*BUET ML Lab*
  - Achieved 95.9% accuracy using custom CNN
- **Dean's List Award** *Level-2*  
*BUET*
  - Awarded for outstanding academic results
- **National Science Olympiads** *2017*  
*Bangladesh*
  - National prize winner in Bangladesh Physics Olympiad (2017)
  - National prize winner in Chemistry Olympiad (2017)
- **Talentpool HSC Scholarship** *2017*  
*Rajshahi Board*
  - 15th in Rajshahi Board with 95.6% marks

## TEST SCORES

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- **TOEFL iBT:** 103/120 (Listening: 29, Reading: 29, Writing: 22, Speaking: 23)

## ADDITIONAL INFORMATION

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**Languages:** Bengali (Native), English (Professional proficiency)