Tanzim Hossain Romel

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Uttara, Dhaka, Bangladesh

RESEARCH INTERESTS

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

EDUCATION

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

WORK EXPERIENCE

- **IQVIA** *June 2023 - Present*
  Software Development Engineer Dhaka, Bangladesh
  - 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.
  - Analyzed 600+ developer discussions to create taxonomy of security misconceptions.

- **ReAgent++: Detecting Backdoor Triggers in LLM Agents** *August 2025 – Present*
  Tools: Python, Knockout Testing, cK-Arm Localization, SPRT, Black-box LLM Evaluation
  - Developing ReAgent++, a lightweight framework for identifying hidden prompt-level backdoors in LLM agents using only black-box access.
  - Implementing a two-stage pipeline: (1) simple behavioral tests to generate contrastive seeds, and (2) a cK-Arm knockout procedure with SPRT to recover minimal trigger tokens and logical conditions.
  - Building deterministic checks for structural and negation violations, mode stability, and output clustering.
  - Evaluating the approach on prompt-based backdoor scenarios involving semantic triggers, multi-condition triggers, and reasoning overrides to assess reliability and robustness under real LLM behavior.

- **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 | Submitted to ACM CSCW
◦ 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 | arXiv Preprint
◦ 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

- **Yet Another C Compiler** *Jun-Aug 2021, Oct 2024*
Tools: C++17, CMake
◦ Built complete C compiler with 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

- **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

- **Programming Languages:** C++, 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

HONORS AND AWARDS

- **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

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

ADDITIONAL INFORMATION

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