Syed Muhammad Aqdas Rizvi

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Profile

Computer Science researcher and LUMS alumnus specializing in the intersection of Systems, Networks, Human-Computer Interaction, and Artificial Intelligence. Sole author of an IEEE-published paper on transport-layer scheduling and a comprehensive preprint on MLSys and decentralized consensus. Proven ability to engineer low-level protocols (C++, ns-3) and architect scalable, rigorous AI evaluation pipelines (Python, DSPy). Currently utilizing a gap year in enterprise cybersecurity to study the practical constraints, threat models, and operational bottlenecks of large-scale distributed systems. Eager to bring this blend of theoretical rigor and real-world systems perspective to complex, cross-cutting problems in a top-tier graduate research group.

Research Interests

Computer Networks, Distributed Systems Architecture, Systems Programming, Human-Computer Interaction (HCI), and Artificial Intelligence.

Education

Lahore University of Management Sciences (LUMS) **Lahore, Pakistan**
BS Computer Science (Graduation with Merit / Cum Laude) *Aug 2021 – Jul 2025*
Relevant Coursework: Networks and Systems, Data Structures/Algorithms, Software Engineering, Operating Systems, Databases, AI & ML, Natural Language Processing.

Publications & Preprints

2026: **S. M. A. Rizvi**. "The Cognitive Penalty: Ablating System 1 and System 2 Reasoning in Edge-Native SLMs for Decentralized Consensus." *Working Paper*. Available on **arXiv**: arXiv:2604.16913.

2025: **S. M. A. Rizvi**. "A Case for CATS: A Conductor-driven Asymmetric Transport Scheme for Semantic Prioritization." *Proceedings of the 6th International Conference on Innovative Computing (ICIC 2025)*. Published in **IEEE Xplore**. DOI: 10.1109/ICIC68258.2025.11413235.

2024: **S. M. A. Rizvi**. "A Literature Review of Keyword Spotting Technologies for Urdu." *Technical Report*. Available on **arXiv**: arXiv:2409.16317.

Proposals

2026: **S. M. A. Rizvi**. "Interactive Semantic Video Seeking—ISVS: A Proposed Architecture and Research Roadmap for Non-Linear Media Navigation." *Working Paper*. Available on **GitHub**: smarizvi110/isvs-spec.

Research Experience

Independent Researcher **Karachi, Pakistan**
Cross-Layer Computer Science Research *May 2024 – Present*
Conducting independent research involving Distributed Systems, Computer Networks, HCI, and AI. Focused on empirical benchmarking, low-level protocol optimization, and publishing findings.

◇ **MLSys & Cryptoeconomics (Sentinel-Bench Project)**

- Authored a working paper bridging Mechanistic Interpretability with distributed systems physics, evaluating 9B-parameter LLMs as edge-native governance firewalls. [View Repository]
- Engineered **Sentinel-Bench**, a robust 840-inference MLOps pipeline utilizing Python, DSPy, and Ollama to conduct a strict intra-model ablation on the Qwen-3.5-9B architecture.
- Corroborated a severe "Compute-Accuracy Inversion," showing that System 2 (Chain-of-Thought) reasoning suffers a **26.7% cognitive collapse rate** on complex legal texts, degrading trial-to-trial consensus stability to 72.6%.
- Translated LLM behavioral metrics into hard cryptoeconomic vulnerabilities, proving that the 17× latency overhead of reasoning models critically threatens Byzantine Fault Tolerance (BFT) and exposes networks to Governance Extractable Value (GEV).

◇ **Transport-Layer Protocol Modification (CATS Project)**

- Conceived, designed, and evaluated **CATS**, a novel framework endowing TCP with semantic priority awareness, culminating in a **sole-author publication on IEEE Xplore**. [View Repository]
- Engineered a custom C++ TCP socket implementation within the **ns-3 network simulator**, utilizing an "Interceptor and Feeder" architecture seamlessly operating alongside the TCP BBR congestion control algorithm.
- Designed a sophisticated two-threshold hysteresis intra-flow fairness mechanism to prevent starvation of low-priority data.
- Proved a **78.7% improvement in First Contentful Paint (FCP)** by intelligently reordering packet transmission, radically improving user-perceived QoE with negligible overhead to total load time.

Center for Speech and Language Technologies (CSaLT) — **Lahore, Pakistan**
Student Researcher under Dr. Agha Ali Raza — *Jan 2024 – May 2024*

- Conducted a comprehensive literature review of Keyword Spotting (KWS) technologies, focusing specifically on Urdu. [View Report]
- Analyzed current acoustic modeling challenges and proposed architectural solutions to advance accessibility in low-resource AI environments, publishing the findings as an independent arXiv preprint.

PhysLab — **Lahore, Pakistan**
Student Researcher under Dr. Muhammad Sabieh Anwar — *Jul 2019 – Jul 2021*

- Investigated Faraday's Law of Electromagnetic Induction; co-authored the official experiment manual and developed MATLAB scripts for automated data processing, both published on the laboratory's platform. [View Project]
- Refined experimental setups for Surface Plasmon Resonance to significantly improve measurement accuracy.

Work Experience

Risk Associates — **Karachi, Pakistan**
Cybersecurity Consultant (Information & AI Security) — *Nov 2025 – Present*

- Translating abstract security and compliance requirements (ISO/IEC 27001 & 42001) into concrete, system-level controls spanning software architecture, data governance, and access control networks.
- Conducting threat modeling and risk assessments for enterprise infrastructures, gaining deep practical insight into real-world distributed systems vulnerabilities and mitigation strategies.
- Assisting in the design of AI Management Systems, providing hands-on exposure to emerging challenges in AI governance, model lifecycle oversight, and secure pipeline architecture.

AI in Healthcare Initiative (AIHI), LUMS — **Lahore, Pakistan**
Software/ML Engineer (Final Year Project) — *Sep 2024 – May 2025*

- Developed **MigraineAid**, an applied machine learning platform to help sufferers predict attack occurrences.
- Implemented a high-performance backend in **Rust** to ensure memory safety and fast data processing for real-time analytics, integrating Firebase and Firestore for scalable data management.
- Contributed to ML model development pipelines and built a secure frontend dashboard in JavaScript for researchers.

TeReSol (for Bank AL Habib Limited) — **Karachi, Pakistan**
Software Engineering Intern — *Dec 2024 – Jan 2025*

- Engineered reusable micro-frontend components for core banking software utilizing a finite state machine (FSM) to manage strict user workflows and API integrations under high-security banking constraints.

Selected Projects

LLM-4-LLU: Large Language Models for Low Literacy Users
Python, Whisper-1, GPT-3.5/4, WhatsApp API — *Feb 2024 – May 2024*

- Architected a system providing robust LLM access via WhatsApp, enabling voice-driven AI interfaces for low-literacy users.
- Engineered the backend for scalability, successfully handling over 500 concurrent users within 48 hours of launch. [View Repository]

Bump Off!
JavaScript, Chrome Extensions, Manifest V3 — *Oct 2024*

- Developed an algorithmic Chrome extension to automatically detect and hide spam comments on social media platforms, actively improving end-user interaction and digital QoE for a 50+ user base. [View Repository]

Technical Skills

Languages: C/C++, Rust, Python, TypeScript/JavaScript, C#, SQL

Systems & Architecture: Network Architecture, Protocol Design, Distributed Systems, Systems Programming, Network Simulation (ns-3), Performance Evaluation, Operating Systems Fundamentals

Frameworks & Tools: React, Node.js, PyTorch, TensorFlow, DSPy, Ollama, Pydantic, Docker, Kubernetes, Git, CMake, LaTeX, MATLAB

Academic Honors

2025: **Graduation with Merit (Cum Laude)** – Lahore University of Management Sciences (LUMS)

2021 – 2024: **Dean's Honour List** – Placed on DHL for exceptional academic performance in 2021–2022 and Fall 2023–2024.

2022 – 2023: **Chandrasekhar Honorific Fellowship in Physics** – Awarded highly competitive, merit-based fellowship for demonstrating exceptional aptitude in undergraduate physics.