Durjoy Majumdar

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Research Interests

My research asks how systems fail when their trust assumptions meet an adversary who does not share them. I am currently building LLM agents that detect and explain attacks on cross-chain bridges, evaluated against real exploits replayed on forked chains. I also study how reliable LLMs are as security analysts (when their judgments about code and smart contracts can be trusted) and how attackers use them.

Education

Indian Institute of Technology Patna 2025 – 2027 (expected)
M.Tech, Computer Science & Engineering *CPI 8.73/10 (current)*

- Supervisor: Dr. Somnath Tripathy. Thesis area: agentic AI for cross-chain security.

KL University (KLEF), Vaddeswaram 2021 – 2025
B.Tech (Honours), Computer Science & Engineering *CGPA 9.19/10*

- Specialisation in Cybersecurity and Blockchain Technology.

Publications

Preprints

- **D. Majumdar**. "Beyond F1: A Study of LLM Reliability in Smart Contract Vulnerability Detection." *Preprint, Research Square*, Aug 2026. doi:10.21203/rs.3.rs-10783572/v1

Peer-reviewed conference papers

- T. R. Smriti, **D. Majumdar**. "Hybrid Machine-Deep Learning Ensembles for English, Bangla and Banglish Spam Text Detection." *IEEE Pune Section International Conference (PuneCon), pp. 1–6*, 2025. doi:10.1109/PuneCon67554.2025.11377913
- **D. Majumdar**, S. Arjun, P. Boyina, S. S. P. Rayidi, Y. R. Sai, S. V. Gangashetty. "Beyond Text: Nefarious Actors Harnessing LLMs for Strategic Advantage." *International Conference on Intelligent Systems for Cybersecurity (ISCS), IEEE*, 2024. doi:10.1109/ISCS61804.2024.10581181
- S. Arjun, **D. Majumdar**, A. Z. Nabin, A. K. Sharma, S. M. Raheman. "Beyond Copy–Pasting—Contextualizing LLMs for Secure Code Generation." *International Conference on Innovations in Cybersecurity and Data Science (ICICDS), Springer*, 2024. doi:10.1007/978-981-97-5791-6_15
- **D. Majumdar**, R. R. Chintala. "Shadow ARP-ing for ARP Poisoning Detection." *9th International Conference on Advanced Computing and Communication Systems (ICACCS), IEEE*, 2023. doi:10.1109/ICACCS57279.2023.10112712

Research Experience

Junior Researcher, Cybersecurity Lab, IIT Patna Nov 2025 – Present

- Research on blockchain and cross-chain bridge security, supervised by Dr. Somnath Tripathy.
- Built Crucible, a testbed that reproduces historical cross-chain bridge exploits on forked EVM chains, and a private multi-node Ethereum network for smart contract security experiments (see Research Software).
- Ongoing: agentic AI for cross-chain attack detection (M.Tech thesis); with a lab summer intern, making hashed time-lock contracts (HTLCs) resistant to miner bribery.

Cybersecurity Researcher (part-time), CRAC Learning Apr 2025 – Nov 2026

- Studied how adversaries misuse AI models beyond conventional uses, and how AI can support defensive security.

Research Associate (Intern), Speech Research Group, KL University Nov 2024 – May 2025

- Supported the lab's data management, systems and security, and a project on voice-authentication attacks (replay and deepfake).

Student Researcher, AI4ECN Horizon Europe consortium proposal

- Represented KL University in a Horizon Europe consortium proposal on AI for the edge-cloud-network continuum, with 17 international partners including UCL and Telefónica.

Research Software

- **Crucible** – Modular, CLI-first testbed for EVM cross-chain bridge security research: forks chains at historical blocks, replays exploits deterministically, records run artifacts with integrity hashes, and offers a plugin SDK

for attack, bridge and LLM-agent plugins. Benchmarks for six incidents, including Wormhole, Nomad and Poly Network. Python, Foundry, Solidity, Docker. asokakrsna.github.io/crucible_docs
- **Private Ethereum Research Testbed** – Multi-node proof-of-work Ethereum network on lab machines at IIT Patna, with a faucet and role-based dashboard. Geth, Docker, Flask, Nginx.
- **CryptoSIM** – Desktop application for teaching cryptography and blockchain through simulation; 310 primitives and an instructor Professor Mode. Rust, Tauri. cryptosim-a2e.pages.dev

Projects

- **0xProblems** – Atlas of 229 open cybersecurity research problems across 11 areas, for students choosing a research direction. JavaScript. 0xproblems.vercel.app
- **Logalyzer** – SIEM for real-time log analysis and automated response, with log collection from isolated endpoints. Smart India Hackathon 2023 finalist. Python, PHP, PowerShell, JavaScript. github.com/AsokaKrsna/SIH2023
- **WeCrypt** – Forensic tool to locate and decrypt WeChat message databases via a downgrade weakness, tested on 50+ databases. KAVACH 2023 finalist. JavaScript, Shell. github.com/AsokaKrsna/KAVACH_2023

Honours and Awards

2026 Selected to attend the Google DeepMind APAC Research Symposium (Student Days).
2025–27 ICCR scholarship, Government of India, for M.Tech study at IIT Patna.
2025 Conference grant, Seasides Cybersecurity Conference.
2023 Finalist, Smart India Hackathon and KAVACH national cybersecurity hackathon (top 5 teams nationally per problem statement).
2021–25 Study in India (SII) scholarship, Government of India; 250 awardees worldwide, selected by the PRAGATII exam.
2019 National finalist, Extraordinary Talent Hunt (Science), Bangladesh.

Teaching and Mentoring

Teaching Assistant, IIT Patna Aug 2025 – Present
- Teaching assistant for Natural Language Processing and Advanced Topics in Blockchain.

Peer Mentor, KL University Apr 2022 – Jun 2024
- Mentored 100+ undergraduates across 7 security courses, including Computer Networks & Security and Digital Forensics; co-developed 4 lab workbooks used by 2,000+ students with 8 faculty members.

Volunteer Teaching and Mentoring
- Free cybersecurity awareness sessions for underprivileged students in Bengali (2024 – Present); volunteer mentor with Skillmate and Gold Heart Foundation (2025 – Present).

Service and Leadership

Research Advisor, White Hat Hackers Club, KL University May 2024 – Apr 2025
- Initiated 6 student research projects and guided 10 members, leading to 2 published papers; ran biweekly research discussions.

Technical Chairperson, White Hat Hackers Club, KL University May 2023 – May 2024
- Coordinated 15+ security events with 1,500+ participants; authored CTF challenges for 4 events, many built around covert channels.

CTF Player, Team Enigma Hunters 2022 – Present
- Competitive capture-the-flag player; top 1% globally on TryHackMe and LetsDefend.

Skills

- **Programming:** Python, Rust, Solidity, C, JavaScript, Bash, PowerShell, LaTeX; Linux, Docker, Git
- **Blockchain:** Ethereum, EVM, smart contracts, cross-chain bridges, Foundry (Forge, Anvil, Cast), Geth, chain forking and transaction replay
- **AI and LLMs:** LLM evaluation and benchmarking, prompt engineering, LLM agents, Jupyter, pandas
- **Security:** Vulnerability analysis, incident response, log and malware analysis, digital forensics, intrusion detection; Wireshark, Burp Suite, Nmap, Metasploit, Splunk, Volatility, Snort, Suricata
- **Certifications:** ISC2 Certified in Cybersecurity (CC); Juniper JNCIA-Junos; Fortinet Certified Associate in Cybersecurity; Google Cybersecurity Certificate; OCI Generative AI Professional; TryHackMe SAL1