RABIMBA KARANJAI

3711 Southmore Blvd.
Houston, TX-77004
https://www.rabimba.me

Phone: (469) 438-2410
Email: rkaranjai@uh.edu
Alt: rabimba@gmail.com

PARTICULARS

EDUCATION

University Of Houston — Houston, TX
Ph. D. in Computer Science — *2020 - 2025 (Defended July,25)*
Industry Work Experience: 2019-2020

Rice University — Houston, TX
M. S. in Computer Science — *2015 - 2018*
Distinction in Research

CURRENT STATUS

F1 Visa (OPT), Citizen of India.

RESEARCH INTERESTS

My research interests lie at the intersection of blockchain technology, programming languages, and artificial intelligence, with a particular focus on code generation, repair and AI Reasoning. I am specifically interested in exploring novel applications of large language models (LLMs) to enhance the security and reliability of smart contracts and low resource domain specific codes, including vulnerability detection, code analysis, and automated program repair. My prior work has involved developing and evaluating LLM-based frameworks for code translation and vulnerability detection in smart contracts. I'm interested to also apply these learnings to other areas of science such as biomedical data and financial data. I am also interested in broader topics related to decentralized systems, formal verification, and software engineering.

DISSERTATION

Title: "Teaching AI's to reason and Code, Confidentially"
Advisor: Prof. Weidong (Larry) Shi

ACADEMIC HONORS

- Outstanding PhD Student - University Of Houston, 2022-2023, 2023-2024
- Graduate Tuition Fellowship, University Of Houston, 2021-2025.
- Google Cloud Research Innovator, 2023.
- Cullen Travel Fellowship, 2023.
- Google Research CS research mentorship program, 2023.
- HPE DSI Artificial Intelligence Summer Student Showcase - 3rd Place, 2023-2024
- Distinguished Paper Candidate, IEEE ICBC 2022.
- Mozilla Research Fellowship, 2018.
- Graduate Tuition Fellowship, Rice University, 2015-2018.

WORK EXPERIENCE

- **Staff Agentic AI Researcher, Paypal,** Sep 2025 - Present. Designed and deployed advanced machine learning models and AI-driven systems to power secure and intelligent financial products. Leading the development of foundational Large Language Models (LLMs) for production use, driving innovation in financial AI. Applying research from doctoral work on AI reasoning, secure code generation, and LLMs to create scalable, trustworthy systems. Contributing to ongoing academic research and publication efforts, bridging theory and real-world impact.
- **Senior Software Engineer, Clearedin,** Dec 2020 - Aug 2021. Designed and implemented advanced policy and threat detection engines within the email scanning pipeline, ensuring robust email security. Spearheaded the development of innovative solutions, including URL scanning, phishing detection algorithms, and machine learning pipelines for malicious email classification, significantly enhancing the accuracy and effectiveness of threat detection measures.
- **Machine Learning Lead - Automated Speech Recognition Engine, Fireflies.ai.**, Aug. 2020 - Dec 2020. Developed and deployed an on-premise Automatic Speech Recognition (ASR) engine for Fireflies, leveraging DeepSpeech and customized models to enhance performance used now by 10 million users worldwide. Built the first Machine Learning team.
- **Programmer Analyst, Cognizant Technology Solutions,**, Dec. 2010 - Aug. 2013. Contributed to the Innovation team by spearheading the development of automated mobile hardware and software testing solutions. Leveraged OpenCV and vision-based technologies to design advanced testing frameworks, enabling efficient and reliable validation of mobile devices.

RESEARCH EXPERIENCE

- **Research Assistant, University Of Houston**, Sep 2021 - Present.
  AI & Software Engineering: I explored the potential of artificial intelligence (AI) in Code Generation, Low Resource Code translation and Reasoning. I also explored it's use in healthcare by developing a system for AI-driven analysis of histopathology images to enhance vascular disease diagnosis. Additionally, I investigated the challenges of mitigating hallucinations in AI-driven medical diagnosis, contributing to the development of more reliable AI systems in healthcare. I also examined the irrationality in large language models (LLMs) and identified open research questions, leading to a better understanding of the limitations and potential improvements of LLMs. This research demonstrates my efforts in advancing AI and LLM technologies for practical applications.

  Decentralization: I examined the possibility of creating decentralized infrastructure as code (IaC) using blockchain technology, which led to the development of DlaC, a novel system that ensures secure and transparent management of infrastructure. I designed and implemented a decentralized function-as-a-service (FaaS) framework over multiple clouds, enhancing the efficiency and scalability of decentralized applications (dApps) and Web3 services. I also explored the use of trusted execution environments (TEEs) for critical infrastructure protection, enabling secure and private computation in blockchain applications. This work contributes to the advancement of decentralized technologies and their application in various domains.
- **Research Assistant, Rice University**, Jan 2015 - Aug 2018.
  High Performance Computing: Worked on java script parallelization on Mozilla Firefox and other web browser engines so that it can run on weareable VR headsets.
- **Research Associate, Mozilla Research,** Sep. 2017 - Jan. 2018. Conducted in-depth research to optimize parallelism and performance in Web Virtual Reality and WebGL, focusing on enhancing the efficiency of three.js, which became my masters thesis. Developed techniques to offload resource-intensive computations to the GPU using WebAssembly, significantly improving performance and reducing latency in VR applications. Parallelized object loading and texture rendering in three.js through non-blocking GPU processes, enabling faster and more efficient rendering.
- **Summer Research Intern, IBM Almaden Research Center,** May. 2017 - Aug. 2017. Developed and got awarded a patented multi-factor authentication system (US Patent US11025643B2) integrating biometric features and blockchain technology. Designed identity specifications for Hyperledger Fabric to enable secure and reliable digital identity management. Innovated Android-based multi-party fingerprint authentication and iris recognition using cancellable biometrics, enhancing both security and privacy. Established methods for extracting fingerprint templates and features on commodity mobile devices, improving accessibility and convenience in biometric authentication solutions.
- **Summer Research Intern, IBM Almaden Research Center,** May. 2015 - Aug. 2015. Developed a tamper-evident mobile application solution capable of provably verifying application integrity, even on rooted or jailbroken devices. Designed and implemented a tamper-evident data structure and logging system leveraging ARM TrustZone and blockchain technology to securely store and log data, ensuring resilience against tampering and unauthorized modifications.
- **Researcher, IBM T J Watson Research Lab,** May. 2014 - Nov. 2014. Embedded cognitive computing and NLP into real-world Watson solutions by developing advanced systems for data extraction, processing, and analysis. Designed a document parsing system utilizing OCR and DeepQA, training models on extensive datasets

and optimizing performance for accurate data extraction. Engineered a scalable solution for storing and processing massive datasets, including the development of user-friendly front-end and visualization libraries. Created and trained customized Natural Language Processing models and evidence-scoring systems, optimized for self-learning and tailored to specific use cases.

TEACHING EXPERIENCE

- **Instructional Assistant.** COSC 6309: Introduction to Automata and Computability, Fall 2025, University Of Houston.
- **Instructional Assistant.** COSC 4351: Fundamentals of Software Engineering, Spring 2022, Summer 2022 and Summer 2023, Summer 2024, University Of Houston.
- **Instructional Assistant.** COSC 2306: Data Programming, Fall 2023, University Of Houston.
- **Instructional Assistant.** COSC 6376: Cloud Computing, Fall 2022, Spring 2023, University Of Houston.
- **Teaching Assistant.** COMP 541: Intro to Computer Security, Spring 2016, Rice University.
- **Teaching Assistant.** COMP 321: Introduction to Computer Systems, Fall 2016, Rice University.
- **Teaching Assistant.** COMP 424: Mobile and Embedded Systems, Spring 2017, Rice University.

PUBLICATIONS

PAPERS

1. **Rabimba Karanjai**, Hemanth Madhavarao, Lei Xu, Weidong Shi, "***QuCoWE: Quantum Contrastive Word Embeddings with Variational Circuits for Near-Term Quantum Devices***", *to be presented at QC+AI, AAAI, 2026.*
2. **Rabimba Karanjai**, Lei Xu, Weidong Shi, " ***Securing the Multi-Chain Ecosystem: A Unified, Agent-Based Framework for Vulnerability Repair in Solidity and Move***", *to be presented at ACM AIWare 2025. **Winner of ACM SIGSOFT Distinguished Paper award.***
3. **Rabimba Karanjai**, Lei Xu, Weidong Shi, "***HPCAgentTester: A Multi-Agent LLM Approach for Enhanced HPC Unit Test Generation***", *to be presented at ACM AIWare 2025.*
4. **Rabimba Karanjai**, Yang Lu, Ranjith Chodavarapu, Lei Xu, Weidong Shi "***Evaluating the Quality of Randomness and Entropy in Tasks Supported by Large Language Models***,", *KDD - Agentic & GenAI Evaluation*, 2025.
5. **Rabimba Karanjai**, Sam Blackshear, Lei Xu, Weidong Shi "***Collaboration is all you need: LLM Assisted Safe Code Translation***,", *FSE*, 2025.
6. **Rabimba Karanjai**, Boris Shor, Amanda Austin, Ryan Kennedy, Yang Lu, Lei Xu, Weidong Shi, "***Synthesizing Public Opinions with LLMs: Role Creation, Impacts, and the Future to eDemorcacy***", *ICEDEG 2025.*
7. **Rabimba Karanjai**, Yang Lu, Dana Alsagheer, Keshav Kasichainula, Lei Xu, Weidong Shi, Stephen Huang, "***LogBabylon: A Unified Framework for Cross-Log File Integration and Analysis***,", *ACM SAC*, 2025.
8. Suravi Majumder, Koushik Sen, **Rabimba Karanjai**, "***AI-Based Target for Personalized Interventions of Atherosclerosis from Gut Microbiota Signature***,", *SynBio*, 2025.
9. **Rabimba Karanjai**, Lei Xu and Weidong Shi, "***Smart Contract Code Translation based on Concepts***,". *ACM Foundations of Software Engineering (FSE)*, 2024.
10. **Rabimba Karanjai**,Sangwon Shin, Wujie Xiong, Xinxin Fan, Lin Chen, Tianwei Zhang, Taeweon Suh,Weidong Shi, Veronika Kuchta, Francesco Sica and Lei Xu, "***TPU as Cryptographic Accelerator***", *MICRO*, 2024.
11. Ranjith Chodavarapu, **Rabimba Karanjai**, Xinxin Fan, Larry Shi and Lei Xu, "***Adding All Flavors: A Hybrid Random Number Generator for dApps and Web3***,", *International Symposium on Stabilization, Safety, and Security of Distributed Systems (SSS)*, 2024.
12. **Rabimba Karanjai** and Weidong Shi, "***Trusted LLM Inference on the Edge with Smart Contracts***", *IEEE ICBC*, 2024.
13. **Rabimba Karanjai**,Lei Xu,Lin Chen,Nour Diallo,Weidong Shi, "***Decentralized FaaS over Multi-Clouds***", *ACM SAC*, 2024.
14. Nour Diallo, Dana Alsagheer, Lei Xu, Yang Lu, **Rabimba Karanjai**, Weidong Shi and Mohammad Kamal, "***All We Need is Voter Feedback***",*IEEE ICEDEG*, 2024.
15. **Rabimba Karanjai**,Keshav Kasichainula,Lei Xu,Nour Diallo,Lin Chen,Weidong Shi, "***DIaC: Re-imagining Decentralized Infrastructure As Code using Blockchain***", *IEEE TNSM*, 2023.
16. **Rabimba Karanjai**, E Li, L Xu, W Shi, "***Who is Smarter? An Empirical Study of AI-based Smart Contract Creation***", *BRAINS*, 2023.
17. **Rabimba Karanjai**, Rowan Collier, Zhimin Gao, Lin Chen, Xinxin Fan, Taeweon Suh, Weidong Shi and Lei Xu, "***Supporting Heterogeneous TEE for Critical Infrastructure Protection***", *ACM AsiaCCS*, 2023.

18. **Rabimba Karanjai**, Keshav Kasichainula,Nour Diallo,Mudabbir Kaleem,Lei Xu,Lin Chen,Weidong Shi, "***Decentralized Application Infrastructures as Smart Contract Codes* — Distinguished Paper Award**",*IEEE ICBC*, 2022.
19. **Rabimba Karanjai**, Lei Xu,Zhimin Gao,Lin Chen,Mudabbir Kaleem,Weidong Shi, "***Privacy preserving event based transaction system in a decentralized environment***",*ACM Middleware*, 2021.
20. **Rabimba Karanjai**, Lei Xu, Zhimin Gao, Lin Chen, Mudabbir Kaleem, Weidong Shi, "***On Conditional Cryptocurrency With Privacy***",*IEEE ICBC*, 2021.
21. **Rabimba Karanjai**, L Xu, L Chen, F Zhang, Z Gao, W Shi, "***Lessons Learned from Blockchain Applications of Trusted Execution Environments and Implications***",*ACM HASP*, 2021.
22. Mudabbir Kaleem,Keshav Kasichainula,**Rabimba Karanjai**,Lei Xu,Zhimin Gao,Lin Chen,Weidong Shi, "***An event driven framework for smart contract execution***",*ACM DEBS*, 2021.
23. **Rabimba Karanjai**, "***Optimizing Web Virtual Reality***",*Masters Thesis*, Rice University, 2018.

SHORT PAPERS

24. **Rabimba Karanjai**, Yang Lu, Lei Xu and Weidong (Larry) Shi, "***Unlocking On-Chain Intelligence: A Practical Framework for GenAI-Powered Smart Contracts***", *BRAINS 2025.*
25. Xinyu Hou, Yang Lu, **Rabimba Karanjai**, Lei Xu, Weidong Shi, "***Ransomware 3.0: Enhancing Risk Management and Mitigation Options with Proof-of-Decryptability and Smart Contracts***", *IEEE ICBC 2025.*
26. **Rabimba Karanjai**, Lei Xu ,Nour Diallo, Lin Chen and Weidong Shi, "***DeFaaS: Decentralized Function-as-a-Service for Emerging dApps and Web***", *IEEE ICBC*, 2023.
27. **Rabimba Karanjai**, Zhimin Gao, Lin Chen, Xinxin Fan, Taeweon Suh, Weidong Shi and Lei Xu, "***DHTee: Decentralized Infrastructure for Heterogeneous TEE***", *IEEE ICBC*, 2023.
28. Dana R Alsagheer, Nour Diallo, Lei Xu, **Rabimba Karanjai** and Weidong Shi, "***Decentralized Machine Learning Governance: Overview, Opportunities, and Research Challenges***", *IEEE ICBC*, 2023.

WORKSHOP PAPERS

29. **Rabimba Karanjai**, Suravi Majumder, "***Mitigating Hallucinations in AI-Driven Medical Diagnosis***", *3rd Annual AI in Health Conference*, Rice University, Ken Kennedy, 2024.
30. **Rabimba Karanjai**, Suravi Majumder, "***Enhancing Vascular Disease Diagnosis through AI-Driven Analysis of Histopathology Images***", *3rd Annual AI in Health Conference*, Rice University, Ken Kennaey, 2024.
31. Dana R Alsagheer,**Rabimba Karanjai**, Weidong Shi,Nour Diallo, Yang Lu, Suha Beydoun, Qiaoning Zhang, "***Evaluating Irrationality in Large Language Models and Open Research Questions***", *ACM CHI*, HEAL, 2024.

PAPERS UNDER REVIEW

32. **Rabimba Karanjai**, Lei Xu, Yang Lu, Weidong Shi, "***VerifyGen-X: Secure Cross-Chain Smart Contract Generation via Scalable Reinforcement Learning from Formal Verification Feedback***", *SANER 2026.*
33. Yilin Yang, Yuke Wang, **Rabimba Karanjai**, Weidong Shi, Chengming Zhang, "***Aligning Vision Language Models via anchor***", *CVPR 2026.*
34. **Rabimba Karanjai**, Yang Lu, Lei Xu, Weidong Shi, "***Unlocking On-Chain Intelligence: A Practical Framework for GenAI-Powered Smart Contracts***", *SAC 2026.*
35. Dana Alsagheer, Yang Lu, Lei Xu, Weidong Shi, **Rabimba Karanjai** "***Bridging Confidentiality and Reliability: Open-Weight Agents for Legal Reasoning***", *ACM Symposium on Computer Science and Law 2026.*
36. **Rabimba Karanjai**, Hemanth Hegadehalli Madhavarao, Lei Xu, Weidong Shi, "***CausalGraphX: A Counterfactual Graph Neural Network Framework for Explainable Systemic Risk Assessment***", *AAAI 2026.*
37. **Rabimba Karanjai**, Yang Lu, Lei Xu, Weidong Shi, "***Hype or Hope? Training LLMs on Decentralized GPU Clouds***", *ACM SAC 2026.*

PATENTS

These patents were applied for when working in Industry.

- Mobile Multi-Party Digitally Signed Documents and Techniques for Using These Allowing Detection of Tamper - **US 16/372,593**

TALKS

INDUSTRY/CONFERENCE TALKS

1. "From Whiteboard to Users: Making Research Accessible", Google I/O GDE Summit, 2025
2. "Unmasking the Shadows: AI Red Teaming in the Age of Gemini and VertexAI, fortified by SAIF", Drexel University, 2025
3. "LLM, Reasoning and Agentic Gemma", Google Korea, 2024
4. "Supercharging GenAI: Ray, Kubernetes, and TPUs for Lightning-Fast Inference", KubeCon 2024.
5. "LLMinABox: On Device Personalized Diary & Concierge using your voice and Gemma", Google Mt. View, 2024
6. "Mitigating Hallucinations in AI-Driven Medical Diagnosis", Rice University, 2024.
7. "SolMover: Smart Contract Code Translation Based on Concepts", Berkeley RDI, 2024.
8. "Privacy aware Zero Knowledge Login using Oauth2 and Passkey", Columbia University, 2024.
9. "LLM Applications components and design patterns Hands on Workshop", University Of Washington, 2024.
10. "Give your web apps superpower with Generative AI and Mediapipe", University of Missouri - Kansas City, 2024.
11. "An Empirical Study of AI-based Smart Contract Creation", Berkeley RDI, 2023.
12. "On Device Generative AI: Building your own Dall-E in the browser, welcome WebGPU", Google San Jose, 2023.
13. "DeepSpeech: A Journey to ¡10% Word Error Rate", Google Mt. View, 2023, NC Chapell Hill, 2023.
14. "Visualize your Data in a 3D VR world using A-Frame in WebVR", OpenVis Conf, 2018
15. "Turning sensors into signals", MIT, 2017
16. "Hardening Your IoT Endpoints: A Preventive Toolkit", LinuxCon ContainerCon, 2017
17. "Optimizing Web Virtual Reality", Web3d, 2017
18. "SecurityPI: IronClad your Raspberry PI ", Linux Foundation Open IoT & ELC 2017, 2017
19. "State of WebVR & aframe: Yesterday, Today, and Tomorrow Beyond Horizon",Open Networking Summit 2017.

GRANTS

These Grants were applied for by industry, as they are the only place a graduate student can apply as a primary investigator.

- **Sui Academic Research Award (2025)** - *Primary Investigator* - $25,000 - *Starts August,25*
- **Sui Academic Research Award (2024)** - *Primary Investigator* - $25,000
- **Sui Academic Research Award (2023)** - *Primary Investigator* - $25,000
- **Grant for Web** - *Primary Investigator* - $15,000

PROFESSIONAL ACTIVITIES

- Scientific Advisory Committee Member from University Of Houston, Texas Quantum Initiative, 2025
- Google Cloud Research Innovator, Google Research, 2024.
- Google Cloud Champions Innovator - AI & ML, 2023-2025.
- Google Developer Expert - AI, Google Cloud, 2024-2025 *and* Web, Chrome Team, 2018-2024
- Certificate of Excellence in Artificial Intelligence - University Of Houston
- Mozilla Tech Speaker, Emerging Technologies, 2019
- Mentor, Google Solutions Challenge, Google, 2024
- Mentor, Women Developer Academy, Google, 2024
- Judge, MIT Solve, 2020

SERVICE

- Associate Chair - *The 27th ACM Conference on Computer-Supported Cooperative Work and Social Computing (CSCW)*, Track Chair – ICEDEG 2026
- Reviewer (Journals) - *PLOS One, Frontiers in Blockchain, ACM Distributed Ledger Technologies: Research and Practice, ACM Transactions on Asian and Low-Resource Language Information Processing, Connection Science, ACM Transactions on the Web*
- Reviewer (Conferences) - *CHI 2026, IEEE VR 2026, AAAI 2025, ICLR 2024, IEEE ICEDEG 2025*

LANGUAGES

Proficient in English, Bengali and Hindi.

REFERENCES

FROM ACADEMIA

Dr. Weidong Shi
Associate Professor
Dept. of Computer Science, University Of Houston
wshi3@uh.edu

Dr. Lei Xu
Assistant Professor
Dept. of Computer Science, Kent State University
Phone: 330-672-9037
lxu12@kent.edu

Dr. Amin Alipour
Associate Professor
Dept. of Computer Science, University Of Houston
Phone: 7137437462
maalipou@central.uh.edu

FROM INDUSTRY

Dr. Davide Pasetto
Managing Director - Modeling Engineering
Two Sigma
davide@twosigma.com