Rishikanth Chandrasekaran, PhD

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Current Position

2024–Present

Applied Researcher | Ebay Inc, Seattle

Fraud Detection: Architected a high-precision collusion classifier using Transformer architectures, optimizing detection for buyer-seller fraud while successfully addressing extreme class imbalance to achieve SoTA precision.

Vector Search & VSA: Designed and implemented a novel Vector Database to encode multi-modal data (embeddings + metadata) into a single high-dimensional vector, enabling atomic SQL-like operations via pure vector search, an open problem in the industry.

Audio Intelligence: Authored a novel Transformer architecture for Blind Source Separation, enabling real-time, simultaneous transcription of multi-speaker overlapping audio.

Education

2017–2024 **PhD in Computer Science**, University of California, San Diego.

2016–2017 **MS in Computer Engineering**, Columbia University, New York.

2011–2015 **BE in Electrical & Electronics Engineering**, Anna University, India.

Research Experience

2017–2024

PhD Candidate | SEELab | *University of California, San Diego*

Thesis: *Enhancing Deep Learning Efficiency: A Hyperdimensional Computing Approach*

Designed and implemented hybrid ML architectures using Deep Learning and Vector Symbolic Architectures for efficient learning.

Developed novel transformer architectures for large-scale text classification that are **200× smaller** than traditional approaches.

Authored and published 8 research papers.

Built and optimized **distributed training infrastructure on shared GPU cluster**, achieving **>95% GPU utilization** under strict resource constraints. Developed large-scale data processing pipelines for **large-scale datasets** with comprehensive monitoring and profiling tools.

2016–2017

Graduate Research Assistant | Intelligent and Connected Systems Lab | *Columbia University*

Built custom acoustic headphones for pedestrian safety using Machine Learning to detect and warn users of approaching vehicles.

Implemented an energy footprinting system to provide occupants personalized, actionable, real-time insights into their energy usage.

Deployed a building sensor network, backend infrastructure, and interactive dashboard for real-time personal energy consumption monitoring.

Authored and published 6 research papers, winning 5 awards.

2013–2015

Undergraduate Research Assistant | Solarillion Foundation, India

Implemented a $10 Intelligent Prepaid Energy Meter that monitored consumption patterns and provided personalized recommendations for energy savings.

Developed a $5 Gesture Recognition Glove using custom-designed flex sensors, reducing cost by **100×** compared to commercial alternatives.

Authored and published 2 research papers, winning 2 awards at MIT.

Personal Projects & Open Source

Scriberr (Open Source): Developed an Open-source completely offline audio transcription app using state-of-the-art AI models. **1.6k stars on GitHub and over 130k downloads**.

Personal LLM Fine-tuning & Deployment: Fine-tuned **4B parameter models** on personal notes using **LoRA** for writing style adaptation and domain-specific tasks. Experimented with multi-domain LoRA adapters and prompt engineering strategies. Deployed local inference server on homelab infrastructure for experimentation.

RAG & Knowledge Retrieval: Built retrieval-augmented generation pipeline for personal knowledge base (markdown notes). Implemented **vector database with multiple embedding models**, experimented with chunking strategies and retrieval. Used for semantic search and custom MCP for LLM-based information extraction.

Homelab & Infrastructure: Built and maintain a **12U server rack** hosting a **Kubernetes cluster with 30+ services** including personal cloud storage, media servers, Ollama, and development environments. Fully automated with **Infrastructure-as-Code, CI/CD pipelines, and comprehensive monitoring**. Hosts distributed LLM training and inference experiments, including **multi-GPU fine-tuning jobs and local model serving endpoints**.

Technical Skills

AI/ML: LLMs · Distributed Training · Deep Learning · Transformer Architectures · Vector Symbolic Architectures · Model Optimization · Time Series Forecasting · Computer Vision · Bayesian Methods

Development: Python · PyTorch · Jax · DevOps · Kubernetes · Distributed Systems · Docker · PySpark · SQL · Embedded Systems · Go · C · React · Svelte

Industry Internships

Summer 2021 — **Research Intern** | ARM Research, Austin

Developed transformer models for predicting malicious code using hardware performance counters.

Assisted in developing methods for identifying models polluted by data poisoning attacks, using Vector Symbolic Architectures.

Secured a **Patent** for detecting unknown anomalies in Time Series Forecasting applications.

Summer 2018 — **Mobile Sensing Intern** | Huawei Research, Santa Clara

Designed Fast Machine Learning algorithms for inertial activity recognition using smartphone sensors.

Provided optimized implementation for real-time activity recognition on smartphones.

Implementation was **integrated into Huawei smartphones** for production deployment.

Scholastic Achievements

2022 Best Demo Award | SenSys
2017 Best Paper Runner Up | *BuildSys*
2017 Best Poster Award | *BuildSys*
2017 Best use of AWS | *HackRU*
2016 Best Demo Runner Up | *SenSys*
2016 Google Research Pilot Award
2016 Best Dev Tool Award | *HackRU*
2014 Best Poster Award | *MIT IoT*
2014 Winner | *MIT IoT Hackathon*

Publications

2025 **Federated Hyperdimensional Computing: Comprehensive Analysis and Robust Communication**.
ACM Transactions on Internet of Things
Ye Tian, Rishikanth Chandrasekaran, Kazim Ergun, Xiaofan Yu, Tajana Rosing

2024 **Multi-Model Inference Composition of Hyperdimensional Computing Ensembles**.
IEEE 42nd International Conference on Computer Design (ICCD)
R Chandrasekaran; F Ponzina; V Wang; S Minowada; S Sharma; T Rosing.

2023 **Federated Hyperdimensional Computing**.
ACM Transactions on Internet of Things (Under Review)
Preprint: 10.48550/arXiv.2312.15966.
K Ergun; R Chandrasekaran; T Rosing.

2023 **Multi-Label Classification with Hyperdimensional Representations**.
IEEE Access Journal
DOI: 10.1109/ACCESS.2023.3299881.
R Chandrasekaran; F Asgareinjad; J Morris; T Rosing.

2022 **Fhdnn: Communication Efficient and Robust Federated Learning for AIoT networks**.
Proceedings of the 59th ACM/IEEE Design Automation Conference
DOI: 10.1145/3489517.3530394.
R Chandrasekaran; K Ergun; J Lee; D Nanjunda, J Kang, T Rosing.

2022 **Hdnn-pim: Efficient in memory design of hyperdimensional computing with feature extraction**.
Proceedings of the Great Lakes Symposium on VLSI
DOI: 10.1145/3526241.3530331.
A Dutta, S Gupta, B Khaleghi, R Chandrasekaran, W Xu, T Rosing.

2021 **A drone-based system for intelligent and autonomous homes**.
Proceedings of the 19th ACM Conference on Embedded Networked Sensor Systems
DOI: 10.1145/3485730.3492881.
S Xia, R Chandrasekaran, Y Liu, C Yang, TS Rosing, X Jiang

2019 **Efficient Sparse Processing for Smart Home Applications**.
Proceedings of the 17th ACM Conference on Embedded Networked Sensor Systems
DOI: 10.1145/3362743.3362963.
R Chandrasekaran, Y Guo, A Thomas, M Menarini, M Ostertag, T Rosing

2018 **A Scalable System for Apportionment and Tracking of Energy Footprints in Commercial Buildings**.
ACM Transaction on Sensor Networks (TSON)
DOI: 10.1145/3218582.
P Wei, X Chen, J Vega, S Xia, R Chandrasekaran, X Jiang

2018 **PAWS: A Wearable Acoustic System for Pedestrian Safety**.
IEEE/ACM Third International Conference on Internet-of-Things Design and Implementation (IoTDI)
DOI: 10.1109/IoTDI.2018.00031.
D de Godoy, B Islam, S Xia, MT Islam, R Chandrasekaran, YC Chen, S Nirjon, P Kinget, X Jiang

2017 **ePrints a real-time and scalable system for fair apportionment and tracking of personal energy footprints in commercial buildings**
ACM International Conference on Systems for Energy-Efficient Built Environments (BuildSys)
DOI: 10.1145/3137133.3137150
P Wei, X Chen, J Vega, S Xia, R Chandrasekaran, X Jiang

2016 **Adaptive and Personalized Energy Saving Suggestions for Occupants in Smart Buildings**
ACM International Conference on Systems for Energy-Efficient Built Environments (BuildSys)
DOI: 10.1145/2993422.2996412
P Wei, X Chen, R Chandrasekaran, F Song, X Jiang

2016 **SEUS: A Wearable Multi-Channel Acoustic Headset Platform to Improve Pedestrian Safety**
ACM Conference on Embedded Network Sensor Systems (SenSys)
DOI: 10.1145/2994551.2996547
R Chandrasekaran, D de Godoy, S Xia, MT Islam, B Islam, S Nirjon, P Kinget, X Jiang

2016 **Personal energy footprint in shared building environment**
International Conference on Information Processing in Sensor Networks (IPSN)
DOI: 10.1145/2993422.2996412
P Wei, X Chen, R Chandrasekaran, F Song, X Jiang

2014 **Low-cost intelligent gesture recognition engine for audio-vocally impaired individuals**
Global Humanitarian Technology Conference (GHTC)
DOI: 10.1109/GHTC.2014.6970349
C Rishikanth, H Sekar, G Rajagopal, R Rajesh, V Vijayaraghavan

Teaching

CSE 255	Data Mining and Analytics
CSE 151	Intro to A.I. Stats Approach
CSE 150A	AI: Probabilistic Models
CSE 152A	Intro to Computer Vision
CSE 101	Design and Analysis of Algorithm
W4701	Artificial Intelligence
E4764	Intelligent and Connected Systems