Ruthu V Rao

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Education

- **Purdue University** **Aug 2024 – May 2026**
  Master of Science in Computer Science
- **Nitte Meenakshi Institute of Technology** **Aug 2019 – Aug 2023**
  Bachelors in Technology in Information Science

Skills

- **Languages**: C++, Java, Python, JavaScript, Go Lang, Solidity, HDL, Assembly, Circom, TypeScript, HTML
- **Libraries/Frameworks**: React, Next.js, Angular, Vue, Node.js/NestJS, Express, Spring Boot, Docker, Kafka, Redis, Foundry, Jest, GraphQL, OAuth, FastAPI, TensorFlow, PyTorch, Hugging Face Transformers, scikit-learn, XGBoost
- **Cloud Services**: Azure, AWS (S3, SNS, Lambda, Config), GCP
- **Databases**: MySQL, PostgreSQL, MongoDB
- **AI/ML Tools**: Pandas, NumPy, Matplotlib, Seaborn, OpenAI APIs, RAG pipelines, Hugging Face Transformers, spaCy, NLTK, XGBoost, Prompt Engineering, RAG, Agents (LangChain, LlamaIndex, LangGraph), Function Calling/Tool Use, Fine-tuning (PEFT/LoRA/QLoRA), Quantization (bitsandbytes, GGUF/GPTQ), Embeddings
- **Version Control and Tools**: Git, Jira, HTTP Toolkit, IPFS, Subgraphs, Kubernetes, Linux, Terraform

Experience

- **Numerikal Labs** **Aug 2024 – Present**
  Software Engineer Intern *DE, United States*
  - Engineered and optimized computational models of neuronal fluctuations, improving simulation accuracy and performance for large-scale neural datasets.
  - Developed quantum computing simulations to analyze state evolution under unitary operations, providing probabilistic insights for targeted outputs.
  - Explored AI–Biology parallels by comparing artificial parameter fluctuations to biological neuronal variability (e.g., epilepsy, drug effects, sensory fluctuations).
  - Built high-performance Go RPC servers and Python FastAPI pipelines to process, analyze, and visualize complex datasets, enabling real-time insights and scalable deployments.
- **Graduate Teaching Assistant** **Aug 2024 – Present**
  CS16100- Intro to CS II *Purdue University*
  - Instructed 40+ students in Java, covering Object-Oriented Programming and Data Structures Algorithms.
  - Led lab sessions and guided students in implementing efficient Java-based solutions.
  - Mentored students in problem-solving, debugging, and coding best practices.
- **Teaching Assistant** **Aug 2023 – Aug 2024**
  Operating Systems by Prof David Liu *Purdue University*
  - Assisted 35 students with process scheduling and memory management algorithms.
  - Graded and assisted assignments focusing on multi-threading and scheduling algorithms.
- **Push Protocol** **Nov 2023 – Apr 2024**
  Software Engineering Intern *Belize*
  - Refactored backend from Node.js to NestJS after code review, optimizing 10K+ lines of code for modularity.
  - Led the Snap product's design, implementation and product management, integrating Metamask Snap's RPC for large-scale task scheduling (100K+ requests). **https://snaps.metamask.io/snap/npm/pushprotocol/snap/**
  - Developed real-time notifications & chat with UI integration, reducing latency by 35%.
  - Improved task execution by 17% through algorithmic optimizations and Agile methodologies.
- **Nethermind** **Mar 2023 – Jun 2023**
  Software Engineering Intern *United Kingdom*
  - Developed 11+ MEV-resistant bots in TypeScript, increasing request success by 14%.
  - Designed smart contracts for a DeFi token asset fintech project using a diamond proxy system design pattern.
  - Collaborated in a fast-paced environment with attention to detail, ensuring rapid feature deployment.
  - Audited and fixed 15+ vulnerabilities in smart contracts, enhancing security.
- **ETH India** **Dec 2022 – Mar 2023**
  Fellowship *Bangalore, India*
  - Built Threshold Signature Schemes and Shamir's Secret Sharing for secure key recovery.
  - Improved Zero-Knowledge Proof performance by 40% using Lagrange Interpolation in Circom.
  - Developed 15+ cryptographic circuits to enhance security. **https://eif3.devfolio.co/fellows/**
- **StationX Network** **Mar 2022 – Dec 2022**
  Full-Stack Developer *Bangalore, India*
  - Developed 15+ REST APIs, optimizing backend-to-frontend communication by 20%.
  - Built 20+ Subgraphs to track 1000+ investor clubs, managing large-scale data pipelines.
  - Streamlined deployments for platform services using Docker & CI/CD pipelines.
  - Worked on improving front-end components with Angular, enhancing reusability and modularity.
  - Integrated with Gnosis Safe and implemented multiple filtering using React-Redux.

Projects

- **Drug-Induced Liver Injury (DILI) Prediction App — https://github.com/route-2/dili-backend**
  - Built a hybrid DILI engine combining a **rule-based expert system** (Hy's Law, R-ratio) with **ML models** (Logistic Regression, LSTM, Transformer) on longitudinal labs for early risk detection.
  - Engineered time-series pipelines for labs, drug exposures, and comorbidities (normalization, imputation, feature aggregation) and served models via APIs.
  - Delivered **explainable outputs** (SHAP/LIME) and a clinician dashboard with real-time alerts and risk classification (hepatocellular/cholestatic/mixed).
- **MealPal Telegram Bot — https://github.com/route-2/transend-be**
  - Developed a Plug-In bot that generates personalized meal plans using OpenAI APIs with a **RAG** layer over recipes/nutrition.
  - Implemented **Kroger OAuth + cart** integration to order selected items automatically; backend with Node.js/NestJS and Redis caching; Next.js UI with geolocation.
  - Added **OCR** so users can upload ingredient photos to get meal suggestions.
- **Computer from Scratch — https://github.com/route-2/nand2tetris**
  - Implemented a 16-bit CPU from logic gates: registers, ALU/control, memory interface (**HDL**).
  - Built an **assembler** and **virtual machine** translating high-level commands to machine code, forming a complete toolchain.
- **Sharelock — https://devfolio.co/projects/sharelock-a43e**
  - Built lost-key recovery using **Shamir's Secret Sharing**; published NPM package **mpc-zksnap**.

Conferences/Presentations

- Delivered 10+ technical workshops on Generative AI, Blockchain, Zero Knowledge Proofs, Computer Architecture, Operating Systems, Distributed Systems, and Blockchain, both nationally and internationally (Bali and Singapore). Presented on Ocean Protocol as an ambassador and discussed its architecture and functionality.
- Won 9 hackathons at national and international levels; engaged in open source projects like Zulip; contributed to HER DAO and Phoenix Guild to enhance tech education.