Karthik Thyagarajan

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Education

Purdue University *August 2024 - May 2027*
B.S. of Computer Science & Artificial Intelligence - 4.0 GPA West Lafayette, Indiana
Relevant Coursework: Data Structures and Algorithms, Computer Architecture, Programming in C, Linear Algebra

Skills

- **Languages:** Python, Java, C++, C, JavaScript, TypeScript, SQL, HTML/CSS
- **Frameworks & Libraries:** React, Next.js, Flask, FastAPI, Node.js, NumPy, Pandas
- **Databases & Data Engineering:** PostgreSQL, NoSQL, Firebase, Vector Databases, ETL Pipelines, Data Modeling
- **Cloud & DevOps:** AWS, S3, EC2, Lambda, GCP, Docker, Git, CI/CD, Linux, REST API
- **AI/ML:** LLM (LangChain, RAG, CoT/Reasoning, RLHF), Agents, MCP, PyTorch, GAN, RL, Diffusion, Graph Neural Networks
- **Quantum Computing:** Qiskit, VQE, QAOA, Quantum ML

Experience

- **Machine Learning Engineering Intern** *Jun 2025 - Present*
  Peraton Labs (Internship & Part-Time Co-op) Silver Spring, MD
  - Developed RL agent for IoT malware detection using PyTorch and graph neural networks, reducing exploration latency by 35% and increasing detection coverage by 25% across 500K+ daily device events.
  - Built ETL pipelines and heterogeneous graph architecture with autoencoders to model device communication patterns, accelerating policy convergence by 40%.

- **Computer Vision Software Engineer** *Feb 2025 - Aug 2025*
  Memories.ai (Part-Time) Remote
  - Architected video memory framework for AR applications processing 10K+ streams using Python, Flask, and PostgreSQL, achieving 60% throughput improvement through frame sampling optimization.
  - Published Python SDK on PyPI with 2K+ downloads, implementing async processing and REST API integration for video analysis workflows.

- **Undergraduate Robotics Researcher** *Mar 2025 - Jun 2025*
  IDEAS Lab, Purdue University (Part-Time) West Lafayette, IN
  - Built real-time SLAM pipeline in C++ and Python with sensor fusion and Kalman filtering, improving 3D reconstruction accuracy by 25% and reducing latency by 30%.
  - Implemented neural radiance fields for novel view synthesis, generating photorealistic scene reconstructions for autonomous navigation.

- **Undergraduate Data Engineer** *Aug 2024 - Dec 2024*
  The Data Mine Corporate Partners, Purdue University (Part-Time) West Lafayette, IN
  - Built weed detection pipeline processing 200GB+ drone imagery with Python, TensorFlow, and PostgreSQL, optimizing ETL workflows for 40% faster retrieval.
  - Engineered U-Net and YOLOv11 segmentation models achieving 92% accuracy on 50K+ images, reducing herbicide usage by 60% and costs by $150K annually.

- **ML Science & Engineering Apprenticeship** *Jun 2023 - Aug 2023*
  Naval Research Laboratory (Full-Time) Washington, D.C.
  - Led 4-engineer team developing UNet, Transformer, and GAN models for underwater acoustics, improving transmission loss prediction accuracy by 20% over physics-based simulations.
  - Architected secure RAG system with LangChain and vector embeddings for classified document retrieval, reducing query response time by 65%.

PROJECTS

- **Frontera** *Ongoing*
  Tools: Next.js, TypeScript, FastAPI, Python, LangChain, Firebase, NoSQL, REST API, Algorithms https://frontera.app
  - Founding engineer building full-stack platform serving 500+ users with cofounder matching, project discovery, and community features; architected microservices backend with FastAPI, Firebase, NoSQL social graphs, and WebSocket real-time collaboration.
  - Engineered multi-agent LLM system with LangChain for automated roadmap generation and task decomposition; implemented recommendation engine with collaborative filtering for user matching.

- **Caladrius** *Sep 2025*
  Tools: React Native, Python, LangGraph, GPT-4, AWS S3, REST API, Cryptography https://github.com/karthikcsq/Caladrius
  - Architected cross-platform AI triage app with encrypted QR-based data transfer and zero-knowledge architecture for HIPAA compliance; awarded 2nd Place at HackGT 12.
  - Built multi-agent diagnostic system with LangGraph achieving 85% triage accuracy, integrating REST API backend with AWS S3 for secure storage.

- **Personal Portfolio & Blog Platform** *Ongoing*
  Tools: Next.js, TypeScript, React, Tailwind CSS, Pinecone, AWS S3, Python, Vercel https://github.com/karthikcsq/personalsite
  - Developed full-stack portfolio with Next.js and AWS S3 CDN on Vercel, achieving 95+ Lighthouse score and sub-1-second load times with automated CI/CD.
  - Implemented RAG-powered semantic search using Pinecone and GPT-4 embeddings, processing 100+ technical blog posts for content discovery.

- **Verbatim** *Feb 2025*
  Tools: Next.js, Python, OpenAI API, Google Cloud, Vercel, REST API https://github.com/karthikcsq/verbatim
  - Created video processing platform integrating Whisper, GPT-4o, Eleven Labs, and Twelve Labs APIs for transcription, translation, voice cloning, and lip-sync, processing 500+ videos.
  - Architected serverless async pipeline on Vercel handling 2GB files with job queues and webhook notifications, reducing wait time by 85%.

- **In The Loop** *Ongoing*
  Tools: Next.js, React, TypeScript, LangGraph, Python, FastAPI, Vercel https://in-the-loop-ai.vercel.app/
  - Built streaming AI agent platform reducing LLM token usage by 40% through intent clarification using LangGraph with WebSocket-based streaming.
  - Implemented FastAPI backend with user interrupts and thread-level state management for 100+ concurrent sessions and analytics dashboard.

- **Storytime.ai** *Ongoing*
  Tools: Next.js, React, TypeScript, GPT-4o, Pinecone, Python, Tailwind CSS https://storytime-sepia.vercel.app/
  - Developed AI news aggregation platform using GPT-4o for clustering and summarization, processing 1K+ daily articles with Pinecone vector search for duplicate detection.
  - Implemented personalization engine with collaborative filtering and ETL pipeline scraping multiple sources, increasing engagement by 55%.

- **Photonic Implementation of Quantum Key Distribution** *Oct 2023 – May 2024*
  Tools: Python, NumPy, Oscilloscope, Optics Hardware https://arxiv.org/abs/2509.04389
  - Built polarization-based QKD prototype achieving 95% photon detection rate and demonstrating secure key exchange over 5m fiber optic channel.
  - Automated signal processing pipeline with Python and NumPy for bit extraction and QBER analysis, processing 10K+ samples; published on arXiv.

- **Quantum Racer** *Aug 2022 – Dec 2022*
  Tools: Java, Android SDK, Gradle, XML https://github.com/karthikcsq/QuantumCarGame_Self
  - Designed educational Android game simulating quantum mechanics with custom physics engine and MVC architecture using Java.
  - Distributed APK for educational outreach, reaching 100+ students in quantum computing workshops.