

# Karthik Thyagarajan

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## EDUCATION

### Purdue University

B.S. of Computer Science & Artificial Intelligence - 4.0 GPA

August 2024 - May 2027

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, MongoDB
- **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
- **Quantum Computing:** Qiskit, VQE, QAOA, Quantum ML

## EXPERIENCE

### • Machine Learning Engineering Intern

Peraton Labs (Internship & Part-Time Co-op)

Jun 2025 - Present

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

Memories.ai (Part-Time)

Feb 2025 - Aug 2025

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

IDEAS Lab, Purdue University (Part-Time)

Mar 2025 - Jun 2025

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

The Data Mine Corporate Partners, Purdue University (Part-Time)

Aug 2024 - Dec 2024

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

Naval Research Laboratory (Full-Time)

Jun 2023 - Aug 2023

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

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### • Frontera

Ongoing

- Tools: *Next.js, TypeScript, FastAPI, Python, LangChain, Firebase, NoSQL, REST API, WebSocket* <https://frontera.app>
- Founding engineer for full-stack platform for 100+ users, architected a backend to support cofounder matching, project discovery, communities, and events.
  - Developed multi-agent LangChain LLM pipeline for automated roadmap generation and task decomposition; added collaborative-filtering recommender for user matching.

### • Caladrius

Sep 2025

- Tools: *React Native, Python, LangGraph, GPT-5, AWS S3, REST API, Next.js* <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](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.