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

- **AI/ML:** LLM (LangChain, RAG, CoT/Reasoning, RLHF), Agents, MCP, PyTorch, Tensorflow, GAN, RL, Diffusion, Graph Neural Networks
- **Data Science:** Numpy, Pandas, PostgreSQL, NoSQL
- **Languages & Frameworks:** Python, Java, C++, C, JS/TS, HTML/CSS, React, Flask, Gradle
- **Quantum Computing:** Qiskit, VQE, QAOA, Quantum ML
- **Other:** REST API, AWS System Design, GCP, OAuth, Git, Docker, Linux

Experience

- **Machine Learning Engineering Intern** *Jun 2025 - Present*
  Peraton Labs (Internship & Part-Time Co-op) Silver Spring, MD
  - Developed a novel reinforcement learning (RL) agent for IoT malware detection, reducing exploration latency by 35% and increasing detection coverage by 25% compared to brute-force baselines.
  - Built a heterogeneous graph neural network with autoencoders to model inter-device relationships and accelerate RL policy convergence, improving anomaly detection accuracy.

- **Computer Vision Software Engineer** *Feb 2025 - Aug 2025*
  Memories.ai (Part-Time) Remote
  - Engineered and deployed a scalable video memory framework for AR applications, enabling persistent spatial and contextual awareness while optimizing throughput for speed and scalability.
  - Designed and published a Python SDK for the Mavi platform (https://pypi.org/project/pymavi/), streamlining developer workflows for video analysis.

- **Undergraduate Robotics Researcher** *Mar 2025 - Jun 2025*
  IDEAS Lab, Purdue University (Part-Time) West Lafayette, IN
  - Built real-time SLAM and novel view-synthesis pipelines in Python and C++, improving 3D scene reconstruction accuracy by 25% while ensuring deployment safety and reliability.
  - Optimized autonomous navigation algorithms, reducing mapping latency through performance tuning.

- **Undergraduate Data Engineer** *Aug 2024 - Dec 2024*
  The Data Mine Corporate Partners, Purdue University (Part-Time) West Lafayette, IN
  - Designed an end-to-end weed detection pipeline with Python, TensorFlow, and PostgreSQL; optimized queries for 40% faster data retrieval.
  - Built semantic segmentation and localization models for drone-based weed detection, reducing herbicide usage by 60% and improving efficiency 50% over ground-vehicle methods.

- **ML Science & Engineering Apprenticeship** *Jun 2023 - Aug 2023*
  Naval Research Laboratory (Full-Time) Washington, D.C.
  - Led a 4-member team applying UNets, Transformers, and GANs to underwater acoustics, improving transmission loss prediction accuracy by 20% compared to physics-based models.
  - Prototyped and deployed a secure Retrieval-Augmented Generation (RAG) system, ensuring data confidentiality and operational reliability.

PROJECTS

- **Caladrius** *Sep 2025*
  Tools: React Native, Python, LangGraph, GPT-5, AWS S3, QR-based encryption https://github.com/karthikcsq/Caladrius
  - Designed and implemented a cross-platform AI triage assistant that integrates medical history via encrypted QR-based data transfer, reducing data exposure through a least-exposure framework.
  - Built a multi-agent LLM pipeline to dynamically generate diagnostic questions and produce differential diagnoses with confidence scores, improving triage accuracy and prioritization in emergency settings; awarded 2nd Place in HackGT 12's track for social impact.

- **Frontera** *Ongoing*
  Tools: Next.js, TypeScript, FastAPI, LangChain, Firebase, React, NoSQL https://frontera.app
  - Founding engineer for Frontera, a "Cursor for projects" integrating an AI assistant for roadmap updates, intelligent planning, and issue-solving, alongside cofounder/talent matching, project discovery, and community features.
  - Built an AI agent ecosystem using LangChain and FastAPI integrated with Firebase authentication, REST APIs, and a React-based workspace interface to enable real-time roadmap updates and intelligent task resolution.

- **In The Loop** *Ongoing*
  Tools: Next.js, React, TypeScript, Tailwind CSS, Vercel https://in-the-loop-ai.vercel.app/
  - Developed a platform to streamline AI interactions by reducing token wastage and clarifying user intent, improving efficiency of LLM-driven workflows.
  - Implemented streaming with a deployed LangGraph agent backend to handle within-thread communications and user interrupts.

- **Storytime.ai** *Ongoing*
  Tools: Next.js, React, TypeScript, Tailwind CSS, Vercel https://storytime-sepia.vercel.app/
  - Built an AI-driven news aggregation platform that clusters stories and updates, reducing information overload and improving content personalization.
  - Integrated GPT-4o for dynamic summarization, making use of vector databases for efficient similarity search.

- **Personal Website** *Ongoing*
  Tools: Next.js, React, TypeScript, Tailwind CSS, Vercel, Pinecone, AWS S3, Python https://github.com/karthikcsq/personalsite
  - Developed and deployed a personal portfolio site with Vercel and AWS S3, showcasing projects, blogs, and image galleries; optimized for CDN-based global delivery.
  - Integrated a Pinecone-powered RAG pipeline to enable semantic search across Markdown-based project documentation.

- **Verbatim** *Feb 2025*
  Tools: OpenAI APIs, Google Cloud APIs, Next.js, Vercel https://github.com/karthikcsq/verbatim
  - Created a multi-function video platform for summarization, translation, voice cloning, and lip-sync, deployed at https://www.getverbatim.tech.
  - Automated workflows with Whisper (ASR), GPT-4o (summarization), Google Translate (translation), Eleven Labs (voice cloning), and Twelve Labs (video Q&A).

- **Photonic Implementation of Quantum Key Distribution** *Oct 2023 – May 2024*
  Tools: Oscilloscope, Python, NumPy https://arxiv.org/abs/2509.04389
  - Built and aligned a photonic QKD prototype using lasers, polarizers, phase modulators, and beamsplitters to implement polarization-based key exchange.
  - Automated data parsing and thresholding (0.004 mW cutoff) for bit-sequence extraction, basis sifting, and noise analysis with Python.

- **Quantum Racer (Educational Android Game)** *Aug 2022 – Dec 2022*
  Tools: Java, Android SDK, Gradle, XML Layouts https://github.com/karthikcsq/QuantumCarGame_Self
  - Designed and implemented an educational Android game translating quantum mechanics concepts (superposition, measurement, decoherence) into racing gameplay.
  - Delivered complete game physics, touch-input UI, and asset pipeline, packaging the final APK for distribution and educational outreach.