# Pranav Ramanathan

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## Executive Summary

Mathematics undergraduate specialising in AI and Combinatorial Mathematics research. Experience building transformers, reinforcement learning agents, and constraint solvers to tackle combinatorial problems. Skilled in Python, PyTorch, C++, Julia, and HPC systems. Proven ability to move research ideas into production, from prototyping RAG systems to deploying LLM applications.

## Education

**Queen Mary University of London** **London**

*BSc Mathematics, Predicted 1st Class* *Graduating June 2026*

- **Relevant Coursework**: Programming in Python I (89.9), Programming in Python II (95.3), Data Structures and Algorithms (84.0), Statistical Modelling (83.8), Machine Learning, Neural Networks and Deep Learning, Numerical Computing in C and C++

**Planned Masters**

*MSc Artificial Intelligence* *Graduating June 2027*

## Experience

**STRIDE Research Intern | Queen Mary University of London** **June 2025 – August 2025**

- Led comparative research on AI vs. classical optimisation solvers using No-Three-in-Line problem as benchmark for evaluating modern vs. traditional methods.
- Implemented PatternBoost methodology for the No-Three-in-Line problem, building a DeepSeek-style transformer in PyTorch to generate potential configurations.
- Developed AI agents using reinforcement learning (PPO) with trial-and-error methodology, creating a custom Gymnasium environment where agents learn optimal point placement strategies through experiential learning and penalty-based feedback systems.
- Managed large-scale HPC experiments on Apocrita cluster using bash scripting for automated batch job submission and resource management.

**AI Engineer Intern | TinyMagiq (Part-time during studies)** **June 2024 – June 2025**

- Built advanced multi-document AI system supporting 30+ concurrent documents, implementing multiple RAG techniques including semantic chunking, agentic chunking, and Graph RAG for enhanced document understanding.
- Optimised query processing pipeline with real-time streaming, reducing the response time from 30 seconds to 0.5 seconds.
- Designed email tutor AI agent using RAG architecture with algorithmic similarity scoring for communication analysis.
- Reduced inference costs by over 95% by migrating from GPT-4o to Llama 3.3-70B on Groq infrastructure.

**Software Engineer Intern | Deep Data Mart** **May 2024 – September 2024**

- Developed migration system for enterprise mainframe (legacy IBM systems) to Google Cloud Platform storage, using parallel processing to reduce transfer times by 50% while ensuring data integrity.
- Designed robust error recovery and data validation systems for high-stakes enterprise migration, maintaining data consistency across mainframe and Google Cloud Platform architectures.

**Software Engineer Intern | iamneo** **July 2023 – August 2023**

- Built NLP-powered HR chatbot with GPT-3 and Microsoft Teams integration, automating policy queries via SharePoint REST APIs.
- Achieved 75% reduction in response times and 30% decrease in direct HR requests, allowing HR staff to focus on high-priority employee support issues.

## Skills

**Programming Languages:** Python, C++, Julia, SQL, R, Scala, Bash

**Tools:** UV, Git, Docker, CI/CD, Vim, Gemini CLI, Ollama, Opencode

**Libraries:** PyTorch, LangChain, LangGraph, LlamaIndex, Gymnasium, GurobiPy, Flask, FastAPI, Streamlit, Pandas, NumPy, ortools

**Databases:** MySQL, ChromaDB, Neo4J

**Cloud/Infrastructure:** Google Cloud Platform (GCP), Amazon Web Services (AWS), HPC Computing (Apocrita)

**Languages:** Native: English, Tamil, Malayalam | Intermediate: German, Spanish

## Certifications

**Scientific Machine Learning**: Visuara AI Labs, July 2025

**C++ Fundamentals**: Udemy, April 2023

**100 Days of Code: The Complete Python Pro Bootcamp**: Udemy, October 2022

**The Complete Flutter Development Bootcamp**: Udemy, December 2022

## Research & Technical Projects

**HP Protein Folding | PyTorch, Google OR-Tools, Gymnasium** **September 2025 – Present**

- Benchmarking HP protein folding using three methods: constraint programming (CP-SAT), reinforcement learning (PPO agents), and a hybrid solver-transformer approach, to test if modern optimisation and learning can outperform traditional techniques.
- Aiming to find new best-known foldings, speed up solution times under fixed limits, cut training costs with solver-guided data, and produce a wider range of high-quality foldings.

**Multilingual Sales Agent | Python, Twilio, LiveKit, Whisper, Groq** **February 2024 – March 2024**

- Deployed a real-time multilingual voice agent on AWS, containerised with Docker, and hosted LiveKit independently for low-latency streaming.
- Integrated agent into website footer for natural voice interaction, guiding users through store and controlling page elements via JavaScript.
- Engineered a speech pipeline combining Whisper transcription, Cartesia voice synthesis, and RAG-based retrieval, optimised to handle concurrent sessions with minimal latency.

**Flight Price Tracker | Automation, Cron, Python, Twilio, Tequila** **October 2022 – December 2022**

- Designed an automated system to track flight prices twice daily for 3 months, sending alerts via email and SMS.
- Saved over £1000 on flight bookings by implementing a notification system to alert users of price drops.

## Additional Experience

**Outlier AI | AI Model Trainer** **October 2024 – Present**

- Enhanced AI performance on complex graduate-level mathematical problems through rigorous data validation and targeted fine-tuning.
- Analysed model outputs to diagnose failure modes and provided specific feedback, improving the AI's problem-solving strategies.

**Maths Ambassador | Queen Mary University of London** **September 2024 – Present**

- Coordinated university outreach events (e.g., Mathematician Like Me) for over **160 attendees**, collaborating with faculty and student groups to ensure successful execution.
- Represented the university in outreach programmes, effectively communicating mathematical topics and student life experiences to diverse audiences.

## Leadership & Achievements

**Queen Mary University of London | STRIDE Research Intern** **June 2025 – August 2025**

- Delivered technical presentation on machine learning optimisation research to audience of 50+ including faculty, researchers, and students.

**Queen Mary Football Club | Goalkeeper** **September 2023 – Present**

- Coordinated collaborative fundraising events, raising £1800 for men's mental health initiatives.
- Demonstrated analytical thinking and quick decision-making as goalkeeper (recognised 2024 Best 3's Goalkeeper).

**Chelmsford City Football Club | Goalkeeper** **September 2021 – August 2023**

- Won the National Alliance U-19 league and Champions of Champions tournament (2022).
- Named "Best U-19 Non-Professional Academy in the UK" by talkSPORT (2022).