

Patrick Maxiao Ma

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Education

University of Waterloo, Waterloo, ON
Bachelor of Computer Science (Co-op Program)
Cumulative Average: 92

Sep. 2024 – Apr. 2029

Work Experience

Full Stack Developer Intern

<https://www.sparklease.com/>

May. 2025 – Aug. 2025

SparkLease, Toronto, Canada Web:

- Developed and maintained core backend services for a large-scale automotive marketplace platform selling vehicles, using **ASP.NET Core MVC**, **Azure**, and **C#**, supporting **100,000+ annual users**.
- Implemented **server-side request deduplication and caching** at the **API layer** using **ASP.NET Core** and **Azure Blob Storage**, eliminating redundant computation and **reducing network load by 50%+**.
- Built multithreaded **Azure WebJobs** for offline **data ingestion and preprocessing** from third-party APIs, shifting computation out of the request path and **reducing processing time by 83%** while stabilizing **sub-0.5s page loads**.
- Optimized vehicle search pipelines on Microsoft SQL Server, improving query execution plans and data-loading strategies to **cut filtering latency by 56%**.
- Refactored **8 core frontend pages** and optimized client-side **JavaScript logic**, **increasing page views by 17%**.

Machine Learning Intern

<https://www.naxi-tech.com/>

Jun. 2024 – Aug. 2024

NanoInsights, Beijing, China

- Trained **GAN-based super-resolution models** for **2× resolution enhancement** on electron microscopy images using **PyTorch**, achieving **7% relative PSNR improvement** through **multi-day training runs**.
- Designed and implemented automated **data preprocessing and augmentation pipelines**, achieving **80× effective data expansion per image**, leading to improved data efficiency and more stable GAN training.

Projects

SEO AI Agent 📄

- Developed a full-stack **SEO optimization agent** using **FastAPI**, **Gemini API**, and **Docker**, enabling automated **HTML auditing**, **metadata analysis**, and **SEO rule enforcement**.
- Designed a structured **agent pipeline** that orchestrates data fetching, analysis, patch generation, and validation.
- Achieved **SEO scores above 90** on Lighthouse audits with an average time of **30 seconds per page**.

Scala Compiler 📄

- Built an end-to-end compiler translating **LACS** (a **Scala-like imperative language**) into executable **MIPS**.
- Implemented the full **compiler pipeline**, including a **DFA-based scanner**, **CYK parser**, **static type checking**, and **lowering/code generation passes** handling control flow, stack frames, and nested function and closure calls.
- Engineered a runtime system with explicit **stack and heap memory management**, **closure environments**, a **copying garbage collector**, and **tail-call optimization**.

ASCII Game Engine

- Designed and implemented a reusable **C++ ASCII game engine** following a clean **MVC architecture**, with a well-structured **object-oriented design** and **RAII-based memory management**.
- Engineered a core **entity and physics system** supporting collision detection, fixed-point **sub-pixel movement**, a camera-based world view, and **infinite maps with procedural generation**.
- Built a **reinforcement learning agent** that autonomously plays a **Mario-like demo game** developed on top of the engine, validating engine extensibility and real-time interaction.

PianoFi 📄

- Core member of a group developing an **AI transcription platform** that converts audio into piano sheet music.
- Built and integrated **backend services and AI processing pipelines** using **FastAPI**, **Docker**, and **AWS**, orchestrating audio processing and model-based transcription workflows.

Skills

- **Programming Languages:** Java, Python, C, C++, C#, JavaScript, TypeScript, Racket, Scala
- **Frameworks:** React, ASP.NET Core, Razor, Node.js, Flask, FastAPI
- **Machine Learning:** PyTorch, TensorFlow, CNNs, Reinforcement Learning, data preprocessing, AI agents
- **Systems & Tools:** Docker, Azure, AWS, SQL, Linux