

# Sami Hatoum

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## Education

BSc Computer Science, University of St Andrews

First Class Honours, Dean's List, 2021 - 2025

MSc Artificial Intelligence and Medical Imaging, University College London

Predicted First Class, 2025 - 2026

AWS Certified Cloud Practitioner, Amazon Web Services

2023

## Experience

PricewaterhouseCoopers (PwC)

Jun 2023 – Jul 2023

Software Consulting Intern (AI)

- Built a client sentiment analysis prototype using **TensorFlow LSTM** architecture, achieving **91% F1-score** on imbalanced customer review dataset (3:1 negative:positive ratio)
- Containerised the model with Flask API wrapper and deployed to **AWS EC2** with auto-scaling, load tested to handle **150 req/s** with average **400ms response time**
- Conducted monitoring via CloudWatch and established a model retraining pipeline triggered by accuracy degradation below **85% threshold**
- Optimised preprocessing pipeline with pandas vectorisation, reducing daily batch **processing time by 60%**

## Projects

### Database Query Optimisation Tool

- A **PostgreSQL** performance analyser that parses **query ASTs** and evaluates **EXPLAIN plans** to recommend indexes, reducing query execution time from **2.4s to 420ms** on table scans over **500K rows**
- Analysed **200+ production queries** from a **five-million-row database** across 12 tables, identifying **17 missing indexes** that reduced average query time by **65%** and eliminated full table scans on **89% of frequently-run queries**
- Deployed on **AWS** using **ECS** with **RDS PostgreSQL**, implementing **CloudWatch monitoring** with alerts for query latency over 5s and configuring **auto-scaling groups** to handle traffic spikes during batch analysis runs
- Built interactive **D3.js dashboard** visualizing query execution plans as **flame graphs** and **index coverage heatmaps**
- Implemented **cost-based recommendation engine** that prioritises indexes by expected performance gain, preventing over-indexing that degrades write performance by estimating **15-20% INSERT/UPDATE overhead** per additional index

### Food Waste Manager

- A **React Native** food tracking app to help reduce household food waste, with 30+ beta users testing over 3 months
- Deployed Node.js REST API on **Vercel** with **RDS** (PostgreSQL) backend with automated daily backups
- Integrated **Recipe APIs** with **Redis caching**, reducing average response time from **1.8s to 120ms**
- Established push notifications using **AWS SNS** triggering on approaching expiration dates, achieving **68% user engagement rate** with 2.3 average notifications per user per week
- Conducted UI/UX accessibility review using **Android Accessibility Scanner** and verified consistent 60 FPS rendering on mid-tier devices using **Android Studio Profiler**

### Sokoban Procedural Puzzle Generator

- A procedural content generation tool written in **Java** for a **PSPACE-Complete Sokoban** problem
- Combines **stochastic generation**, entity-mapping constraints, and a **Two-Archive evolutionary algorithm** to generate **10,000+ unique, playable puzzles** capable of exceeding hand-crafted puzzle difficulty

### Cryptographically Secure File Server

- An end-to-end encrypted file storage system in **Java** with **zero-knowledge architecture**, ensuring complete data privacy through **AES-256 encryption** with **RSA-2048 key exchange** and **HMAC-SHA256 integrity verification**
- Designed granular **capability-based access control** system managing permissions without revealing any plaintext usernames, filenames, or file contents to the server
- Implemented **secure multi-party computation protocols** for collaborative access grants, allowing users to share encrypted files through **cryptographic capabilities** while maintaining **zero-trust server architecture**
- Load tested with **JMeter** at 50 concurrent sessions performing **200 operations/second** (upload, download, share), achieving average latency of **180ms** for file retrieval and **450ms** for encrypted uploads up to 10MB
- Validated security against **OWASP Top 10** with penetration testing for **man-in-the-middle** and **replay attacks**

## Skills

Core: Java, JavaScript, TypeScript, Python, SQL

Frameworks: React, Next.js, Node.js, Flask, React Native

Cloud & DevOps: AWS, Docker, Git, Kubernetes, Jira, CI/CD (GitHub Actions, Jenkins)

AI & Data: TensorFlow, PyTorch, Pandas, Scikit-learn