KATIE AMARAL

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EXPERIENCE

TECHNICAL LEAD — OCTOBER 2024 – PRESENT

Harvard University — Library Technology Services

Architecture Leadership

- Lead the architectural design and technical implementation of Collections Explorer, a public hybrid search application for exploring Harvard Library's vast digital collections through natural language interaction

Search Infrastructure

- Design and implement high-performance search infrastructure using Elasticsearch, supporting multimodal hybrid search retrieval (KNN + BM25) across ~10 million records with Cohere Multilingual v3 dense vector embeddings, reducing memory utilization by 95% with BBQ compression
- Develop relevancy evaluation scripts using the Elasticsearch Rank Evaluation API to calculate precision and recall for tuning search performance; evaluate embedding models with Hugging Face transformers and PyTorch

Large Language Models and Model Context Protocol

- Implement retrieval augmented generation (RAG) with LLMs on AWS Bedrock; Build MCP services for agentic search capabilities and query augmentation with dynamic faceting

Security

- Conduct assessments and implement controls based on OWASP standards, including validation with Pydantic, input sanitization, CSPs, network controls, auth (OAuth2/OIDC), vulnerability scanning, LLM guardrails, etc.

Data Engineering

- Build Apache Airflow ETL pipelines to extract and transform data from a variety of diverse data sources, performing validation, normalization, chunking, and ingestion into Elasticsearch

Full-Stack Software Development

- Build backend API services using Python FastAPI and internal PyPI packages for code reuse; build frontend UI with NextJS, React, and a reusable component library in Storybook

Open Source

- Contribute to Digital Collections Explorer, a multimodal vector search application by University of Washington

SENIOR DIRECTOR, SOFTWARE ENGINEERING — APRIL 2024 – OCTOBER 2024

OnCorps, Inc — Financial Reporting

ML Operations

- Built ML Operations pipelines on the Databricks platform: data ingestion, data transformation, feature engineering, model training and fine-tuning, model deployment, inference, monitoring, and data validation

ML Model Training and Evaluation

- Trained and fine-tuned Computer Vision and NER models for classification tasks using Python libraries such as SciKit-Learn, PyTorch, and Hugging Face transformers; Implemented statistical methods for model performance evaluation, including F1 score, precision, and recall

Data Validation

- Wrote data validation classes using Python libraries such as Pandas and NumPy to confirm the accuracy of financial statements in preparation for clients to report to stakeholders, investors, and regulatory agencies

SENIOR SOFTWARE ENGINEER **APRIL 2019 – APRIL 2024**

Harvard University Library Technology Services

Distributed Systems

- Built large-scale, performant distributed systems interconnected with asynchronous task queues (Celery + RabbitMQ) and streaming APIs to process ~3 million individual assets per day for mission-critical applications supporting ~500,000 monthly visitors worldwide for to access hundreds of millions of digital multimedia assets

Full-Stack Software Development

- Built backend services with Python FastAPI, Javascript NodeJS, and TypeScript NestJS; built SPAs in Angular

Artificial Intelligence

- Developed pilot project to modernize library discovery by enabling natural language interaction with catalog services using Python LangChain and GenAI models (Anthropic Claude Instant and OpenAI GPT 3.5)

CI/CD

- Implemented unit and integration tests with CI/CD pipelines, orchestrating containerized deployments (Docker), Kubernetes workloads (Rancher), and secure secrets management using GitHub Actions and ArgoCD on AWS

Database Systems

- Designed relational and NoSQL schemas with SQLAlchemy (PostgreSQL) and Mongoose (MongoDB)

SDLC

- Work within Agile/Scrum methodologies across the full software development lifecycle, contributing to iterative development, peer code review, and continuous delivery; Certified ScrumMaster (CSM)

SOFTWARE ENGINEER **MARCH 2015 - APRIL 2019**

Broad Institute of Harvard and MIT Technology Services

Biomedical Research Support

- Built a secure web portal for transferring terabyte-scale genomic sequencing data with IBM Aspera APIs, applying encryption and access controls to ensure compliance with NIH data policy requirements

Full-Stack Development

- Designed and built custom web applications working on all levels of the tech stack including frontend, backend, databases, authentication & authorization, security, testing, and CI/CD deployment automation

EDUCATION

GRADUATE CERTIFICATE HARVARD EXTENSION SCHOOL

Artificial Intelligence with Python, Data Science & Engineering, Deep Learning, Large Language Models In Progress

MASTER OF SCIENCE BOSTON UNIVERSITY

Computer Information Systems IT Security GPA 4.0 Graduated 2015

BACHELOR OF ARTS BERKLEE COLLEGE OF MUSIC

Music Business and Music Synthesis GPA 3.8 Graduated 2008