

# NATHAN HALKO

## FULL STACK FINANCIAL SYSTEMS ENGINEER

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### SUMMARY

Highly skilled Full Stack Developer and Cloud Engineer with deep expertise in building fault-tolerant, scalable applications using **Python**, **Node.js**, **React**, and **AWS**. Uniquely qualified with a background in **Actuarial Science** and financial modeling, adept at translating complex annuity logic (FIAs/Variable Annuities) into robust, automated software solutions. Proven track record of transitioning manual workflows into resilient realities using rigorous testing methodologies (Jest, Pytest). Expert in architecting microservices, managing **Kubernetes** clusters, and bridging the gap between development and operations in fast-paced financial environments. Possesses deep, cutting-edge knowledge of custom AI solutions. Strong technical communicator capable of articulating complex architectural decisions to diverse stakeholders.

### CORE SKILLS

- **Cloud & DevOps:** AWS (S3, EC2, Transfer Family, Lambda, Route53, CloudWatch), Kubernetes (K8s, ArgoCD, K9s), Tilt.dev, Docker, CI/CD (GitHub Actions, Jenkins), Infrastructure as Code
- **Backend Development:** Node.js, Python (Boto3, Pandas), REST APIs, Express, Django, FastAPI/Flask, WebSockets, Celery/Inngest, RabbitMQ, Jinja2, LangChain/LangGraph
- **Frontend Development:** React, Next.js, TypeScript, Tailwind CSS, Material UI, HTML5, CSS3
- **Database & Data:** MySQL, PostgreSQL, DynamoDB, Redis, Prisma ORM, Django ORM, SQL Optimization
- **Testing & Quality:** Jest, Vitest, Pytest, Cypress (E2E and Component), Automated Regression Testing, TDD

### KEY TECHNICAL PROJECT

#### Interactive Streaming Control Platform

Personal Project

*Tech Stack: Node.js, React, Kubernetes, AWS Services, ArgoCD, Prisma, MySQL, Jest, Django, RabbitMQ, Celery*

- Architected a fault-tolerant **microservices CI/CD pipeline** using YAML-based workflow orchestration (GitHub Actions + ArgoCD), automatically gating deployments via **Jest** and **Pytest** integration tests.
- Built a high-performance **Node.js** backend serving real-time control data to **React** clients, optimizing for sub-100ms latency using **WebRTC/WebSockets**.
- Managed a **Kubernetes** cluster on DigitalOcean, optimizing resource usage by identifying sidecar overhead and resizing node pools.
- Designed and managed a **MySQL** schema using **Prisma** to track high-volume analytic data, including precise timestamped button presses and command-per-hour metrics for behavioral trend analysis.
- Orchestrated full-stack microservice environments for local development and CI using **Tilt.dev**, enabling fully integrated test containers and end-to-end browser/component testing with **Cypress**.
- Engineered a custom **stress testing suite** simulating 100+ concurrent users with "guided intent" algorithms to verify system stability under high load.
- Resolved critical networking bottlenecks, including **DNS resolution failures** and **ngrok tunneling** stability for local-to-cloud workflows.
- Developed a high-throughput interactive stream overlay microservice using **Django**, **Celery**, and **RabbitMQ** to decouple web interactions via a **WebSocket bridge**.

## WORK EXPERIENCE

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### AI Code Quality Specialist

Jul 2023 – Present

#### *Data Annotation*

West Des Moines, IA (Remote)

- Evaluated and annotated complex **AI-generated code** for accuracy, security, and performance, serving as a technical subject matter expert to improve model quality.
- Leveraged deep domain expertise in **Actuarial Science** to evaluate and correct specialized financial modeling code, ensuring the accuracy of AI-generated actuarial data and formulas.
- Ran and debugged **containerized** code with **Docker**, then rewrote fixes into polished, AI-ready “golden” commits for accurate model training.
- Diagnosed and fixed critical backend logic errors in **Node.js** API responses, documenting root causes to prevent frontend crashes and ensure strict schema compliance.
- Refactored **React** component code to implement optimization techniques like memoization and virtualization, correcting patterns that caused unnecessary re-renders.
- Enforced code quality standards by writing comprehensive test suites using **Jest** and **Pytest** to verify AI-generated solutions against edge cases.
- Authored highly detailed technical rationales for code evaluations, articulating specific flaws in logic, security, and performance.

### Embedded Test Automation Engineer

Jan 2022 – Jun 2023

#### *John Deere*

Urbandale, IA

- Architected a hybrid cloud data ingestion pipeline using **Python (Boto3)** to securely transfer high-volume telemetry data from on-premises systems to **AWS S3**.
- Implemented secure data transfer protocols using **AWS Transfer Family (SFTP)** to ingest critical telemetry data from test farm tractor computers into S3, ensuring compliance.
- Managed and maintained a mission-critical embedded test lab of 5 tractor computers, ensuring **90%+ uptime** for nightly regression suites.
- Enforced coding best practices by developing a custom Python **AST-based linter** to automatically validate architectural patterns, eliminating subjective debates in code reviews.
- Authored comprehensive Python test suites using context managers for robust setup/teardown, verifying intricate hardware state transitions and validating machine sync protocols.
- Extended a custom Python testing framework to improve error handling and implement intelligent retry logic, significantly reducing flaky test failures.
- Developed automated **HTML/Jinja2** test reports that visualized nightly regressions and code diffs, enabling rapid root cause analysis for development teams.

### Actuarial Software Developer

Jun 2019 – Sep 2021

#### *Athene*

West Des Moines, IA

- Engineered a Python-based financial modeling pipeline that reduced quarterly liability processing from **5 days to 1 hour**, effectively freeing up 1 FTE and eliminating human error.
- Implemented a rigorous regression testing protocol using self-hosted **Jenkins** and **Pytest** to generate automated HTML reports, providing stakeholders with verifiable proof of model stability.
- Deeply integrated with **MG-ALFA** to develop data feeds and implement stochastic calculation features for Fixed Index Annuities (FIAs) and Variable Annuities.
- Optimized data processing performance using Python (Pandas), reducing execution time from three hours to 15 minutes through efficient algorithm design.

## EDUCATION

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BS Actuarial Science, Mathematics

Aug 2014 – May 2018

*University of Iowa*