Arman Tavakoli

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Summary

I am a Doctor of Mathematics with expertise in software engineering.

As a software engineer in Amazon's S3 Index Control Plane, I have led projects spanning multiple functional teams regarding capacity planning via traffic forecasts, adoption of secure communication protocols, migration of internal tools to native AWS, and automation of allocating and releasing of capacity. My work included building consensus with managers, technical leads, and project coordinators, design, implementation, and testing of software solutions for the above projects, and responding to the dynamic needs of customers.

As a mathematician, I have published fundamental results in the foundations of data processing with applications to machine learning. Please see my Google Scholar profile here.

Education

Ph.D. in Applied Mathematics @ Michigan State University. Aug 2016 - Dec 2021

M.S. in Applied Mathematics @ Waterloo University. Aug 2012 - June 2014

B.S. in Physics and Mathematics @ University of British Columbia. Sept 2007 - June 2012

Work Experience

Software Development Engineer (SDE) with S3 @ Amazon Web Services (AWS), Aug 2022 – Nov 2023

Project: S3 Index Capacity Forecasting

- Designed and implemented a platform for forecasting demand and capacity needs of S3 Index teams.
- Created data pipelines, feature creation, forecasting models, and data visualization.
- **Impact**: Real-time visibility into capacity needs and risks, elimination of wasted capacity and repeated manual, tedious calculations.
- **Tech stack**: Java, Kotlin, Python, AWS SageMaker, AWS S3, AWS IAM, AWS QuickSight.

Project: S3 Index Secure Communication Adoption

- Onboarded 2 services to a network encryption protocol.
- Tested, sanity checked and verified the first adoption of the encryption protocol in a production environment.
- **Impact**: Provided an onboarding guide for 20+ AWS teams to follow, speeding up the onboarding from 4 months to 1, saving developer time for the above teams, provided visibility into the network security for S3 Index services.
- **Tech stack**: Ruby, Kotlin, Java, TOML, AWS IAM, AWS Identity Authority.

Project: S3 Index Migration of RedShift Client to AWS SageMaker

- Migrated from the internal RedShift client Eider to AWS SageMaker.
- Coordinated a migration plan with stakeholders, reimplemented existing scripts for SageMaker, configured network VPC and RedShift ingestion.
- **Impact**: Deprecation of Eider, access to AWS ecosystem for processing RedShift data.
- **Tech stack**: Python, AWS SageMaker.

Project: S3 Index Automation for Allocating and Release of Capacity

- Designed and implemented a host selection algorithm for grouping hosts for ideal traffic management.
- Worked with AWS EC2 security to set the minimum set of privileges needed for host identification.
- **Impact**: Release of 500+ extra hosts from production services in a safe manner, saving S3 operational budget.
- **Tech stack**: Kotlin, AWS EC2, AWS S3, AWS DynamoDB.

Project: S3 Index Disaster Mitigation (1.5 years)
I contributed to the long-term S3 initiative to reduce the blast radius of a catastrophic failure to 5% of customers via migrations to independent cells.

- On-call response to stop migrations if migration traffic conflicted with customer traffic.
- Resolved long term cleanup failures that were causing operator manual work every week.
- Created retry commands for failed migrations.
- Enabled metadata clean up to unblock full CI/CD pipelines.
- Identified ideal customers for moving hot PUT traffic.
- **Impact**: Continuous migration of customer traffic into independent sets, improved resiliency of S3 against catastrophic failures.
- **Tech stack**: Kotlin, Java, Python, AWS SWF, AWS S3.

Project: S3 Index Traffic Analysis

- Identified customers with the largest volume of traffic without bursts of heat over the last 2 years.
- Provided a grouping of incoming traffic based on prefix to enable migrations while avoiding hot traffic.
- **Impact**: Changing traffic migration strategy from customer by customer to prefix based, resulting in improved distribution of heat and traffic among S3 Index cells.
- **Tech stack**: SQL, Python, AWS RedShift, AWS SageMaker.

Graduate Research Assistant @ Michigan State University, Aug 2016 – Dec 2021

Project: Dimension Reduction for Manifolds in High Dimensions

- **Impact**: Publications in Discrete & Computational Geometry and Applied and Computational Harmonic Analysis. See Google Scholar
- **Tech stack**: High-Dimensional Probability: An Introduction with Applications in Data Science, A Mathematical Introduction to Compressive Sensing.

Project: Instructor for Undergraduate Mathematics Courses

- Instructor for 9 undergraduate courses including 300+ students.
- Emphasized student centered learning with group work as primary form of instruction.
- **Impact**: Adoption of modern education methods for calculus curriculum.
- **Tech stack**: Flipped learning, Interactive teaching.

Software Engineer @ MDA, Dec 2014 - July 2015

Project: Aviation Safety, Testing and Verification of Airplane Route Designer

- Created a library of 300 unsafe flying routes as test cases. Verified 1k+ legal requirements.
- **Impact**: Built trust and confidence in the route design software, successful live demo for customer.
- **Tech stack**: Global Procedure Designer (GPD), Manual Testing, Atlassian Jira.

Graduate Research Assistant @ University of Waterloo, Sept 2012 – June 2014

Project: Finding Optimal Sensor Location for Heat Sensors

- **Impact**: Published a master's thesis available here.
- **Tech stack**: Python, MATLAB, Simulink, Latex.

Intern in Software Engineering @ IBM, Sept 2010 – April 2011

Project: Migrate Tooling Scripts to OOP Design

- **Impact**: Provided clean code for tooling scripts with easier long-term maintenance and extensibility.
- **Tech stack**: Perl, Bash, Unix, Jenkins.

Project: Increase Parallelization in the Build Compilation for the Java Just-In-Time Compiler

- **Impact**: Reduced compile time by 30 minutes.
- **Tech stack**: GNU Make, Bash, Unix, Jenkins.