National College of Ireland

Configuration Manual

MSc Research Project
MSc Cloud Computing

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MSc Project Submission Sheet

School of Computing

Student Name: Priyal Narendra Patil

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Programme: MSc in Cloud Computing **Year:** 2024

Module: MSc Research Project

Lecturer: Prof. Jitendra Kumar Sharma

Submission Due Date: 12/08/2024

Project Title: Optimizing Movie Recommendations with MLOps in AWS

Word Count: .....1004..... **Page Count:** .....

I hereby certify that the information contained in this (my submission) is information pertaining to research I conducted for this project. All information other than my own contribution will be fully referenced and listed in the relevant bibliography section at the rear of the project.
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Signature: Priyal Patil

Date: 12/08/2024

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Configuration Manual

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1. Introduction

This manual documents about all the used tools, technologies as well as some steps for building the framework. The manual is further divided into few parts such as environment setup, tools technology used and some screenshot's of code, implementation.

2. Project Requirements

This section has the essential requirements needed to successfully implement the Movie Recommendation System using MLOps tools on AWS. It covers hardware as well as the software specifications, along with the necessary cloud services and development tools:

a. Hardware requirements:

Device: MacBook air m2 with 16GB and 512 gb SSD as a local device. However, the complete project was executed over AWS Public cloud using their hardware in background.

b. Software requirements:

- **Operating System:** macOS Ventura./ Amazon Linux2
- **Programming Language:** Python 3.11
- **Framework:** Flask Framework
- **IDE:** AWS Cloud9

c. Cloud Services:

- AWS IAM User: Essential as to develop and deploy a serverless function and manage the API gateways as well along with Lambda.
- Sagemaker: SageMaker is a fully managed machine learning (ML) as a service in AWS ("What is Amazon SageMaker? - Amazon SageMaker," n.d.). SageMaker simplifies the process of developing, training, and deploying machine learning models on a large scale.
- AWS ECS (Elastic Container Service): ECS is a container management service that is highly scalable and high-performance, it supports Docker containers and enables you to run applications on a managed cluster of servers.
- AWS Lambda: Lambda enables you to execute code without the need to allocate or oversee servers. It is utilized to carry out behind-the-scenes operations in reaction to AWS service events (such as modifications in an S3 bucket).

- AWS CloudWatch: CloudWatch: CloudWatch keeps track of the AWS resources and the applications that run on AWS. It is utilized for gathering and monitoring metrics, logs, setting alarms, and automatically responding to changes in AWS resources, it is essential for managing and optimizing machine learning models.
- AWS Elastic Container Registry (ECR): ECR is a Private Docker container registry that makes it easy for developers to store, manage, and deploy Docker container images.
- AWS Cloud9: Cloud9 is an online integrated development environment (IDE) based on the AWS that allows to write, execute, and troubleshoot code in a web browser
- Simple Storage Solution (S3): S3 is a service for storing objects that provides scalability, data availability, security, and performance. It is utilized in this project for the storing and accessing of various data types, like training datasets, model artifacts, and output results.

d. Development tools

- **Github:** GitHub is a hosting service for Git repositories that also offers tools for version control and teamwork. Enables multiple developers to collaborate on projects remotely, a critical aspect of team-based software development.

3. Starting ML Pipeline

1. Login to AWS Management Console.
2. Go to AWS Sagemaker.
3. Click on Domains.
4. Start a Domain.
5. Create an user.
6. Launch the studio.

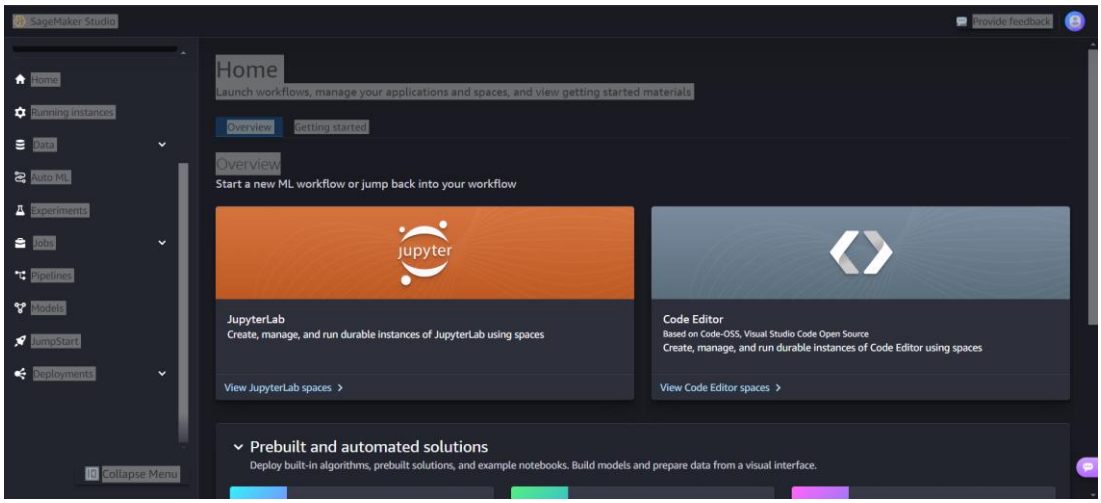

Fig 1: SageMaker Dashboard

7. Click on Juypter Space.
8. Create a new space.
9. Copy my notebooks to the new space.
10. Run each cell.
11. Create a S3 bucket with names mentioned in my Notebook.

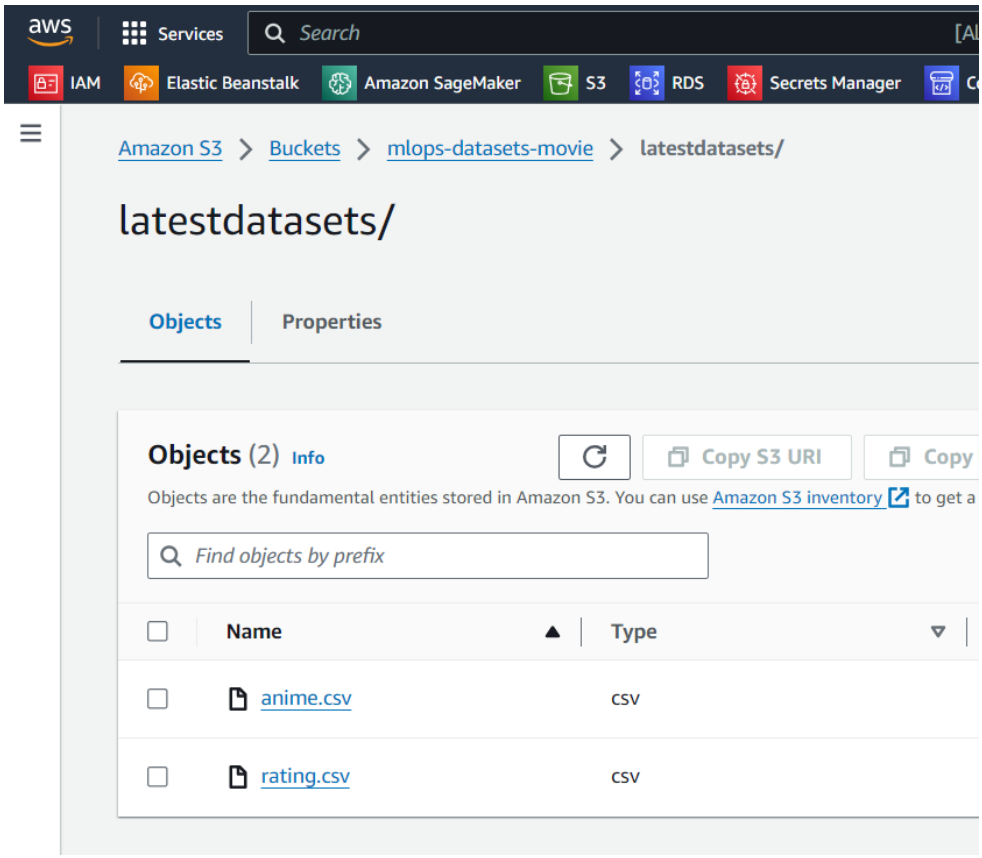

Fig 2: S3 Bucket

12. Create a Lambda function.

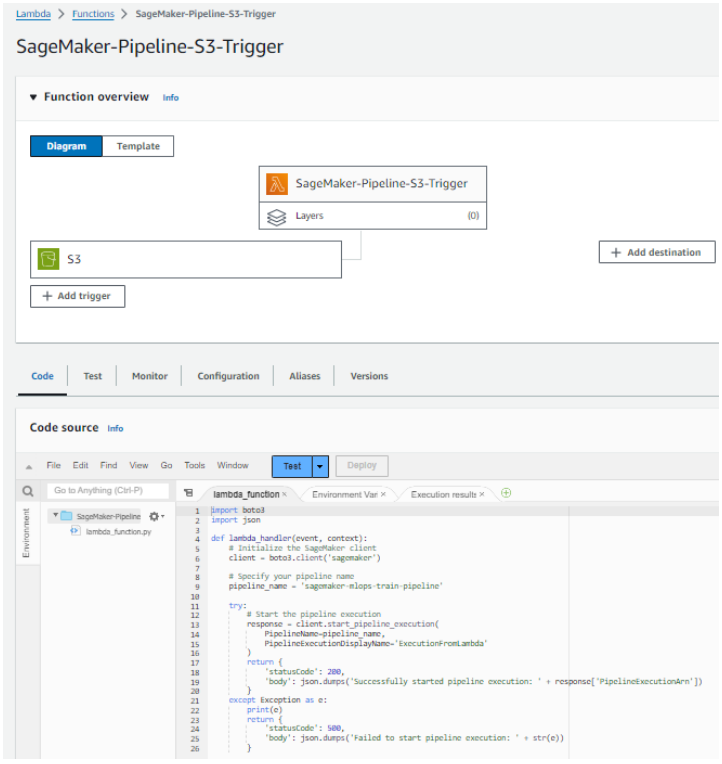

Fig 3: Lambda Function and Code

13. Add a trigger as S3 (PUT action only)
14. Insert dataset files into S3 bucket.
15. Re enter into Sagemaker and click on Pipelines from left panel.
16. There will be a pipeline executing due to new dataset uploaded in the S3 bucket.

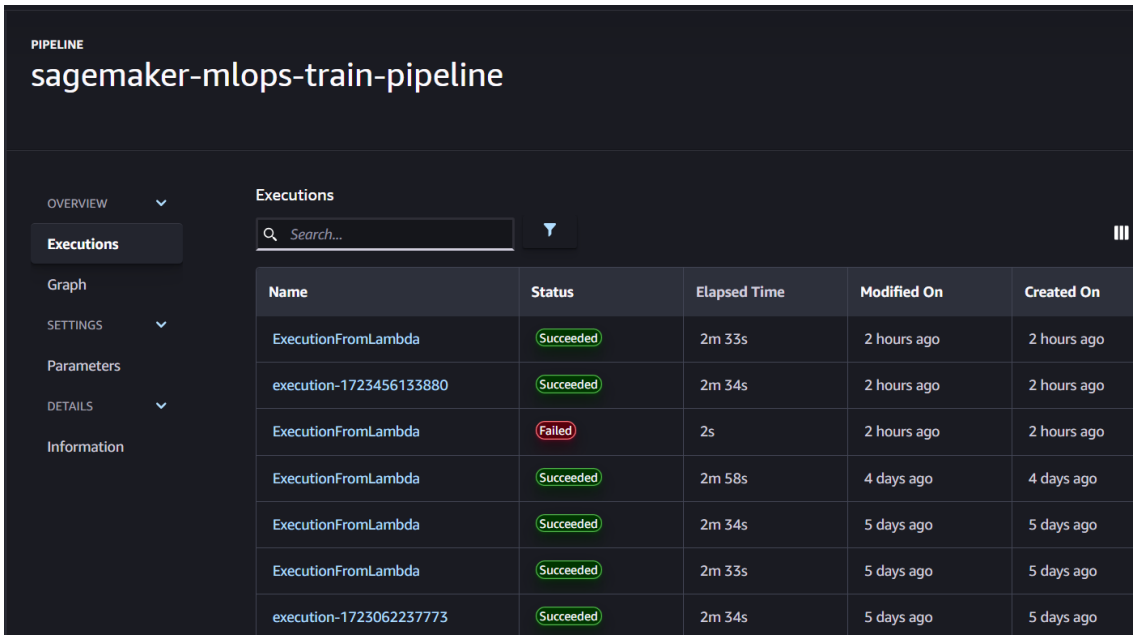

Fig 4: SageMaker Pipeline

4. Starting CI/CD Pipeline

1. Start an Cloud9 instance.

2. Git clone: https://github.com/priyalpatil98/Movie-Recommendation-System-MLOps.git

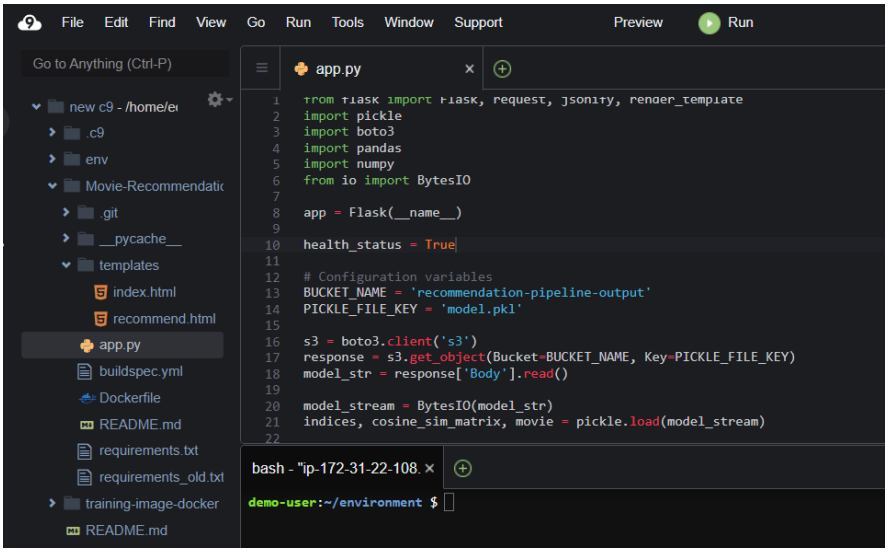

Fig 5: Cloud9 IDE

3. Create CodePipeline.

4. Add Source as Github.
5. Create CodeBuild project.
6. Use Buildspec.yml file to build project.
7. Create Deploy stage and add ECS.
8. Create a ECR and build an Image on Cloud9 using DockerFile and push to the ECR.

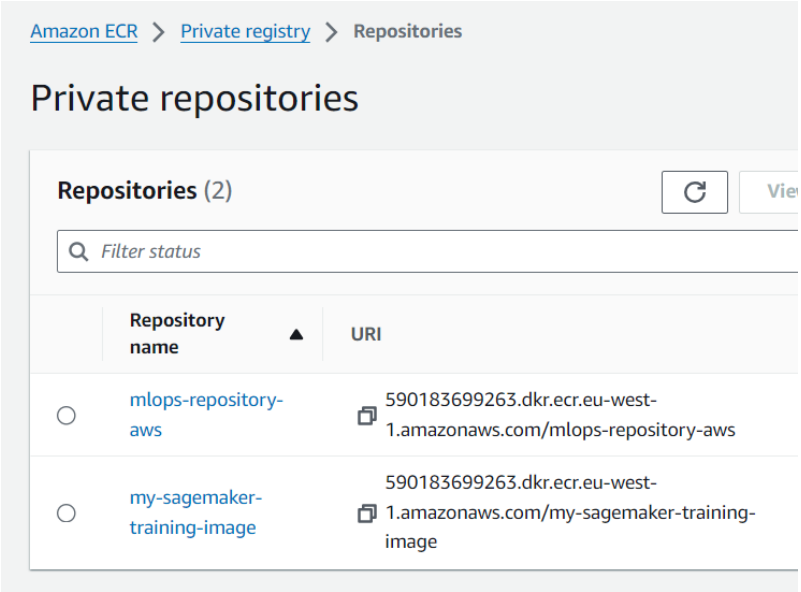

Fig 6: AWS ECR Repo

9. Trigger the pipeline by a git push to the main branch.
10. Wait until all three phases are implemented.

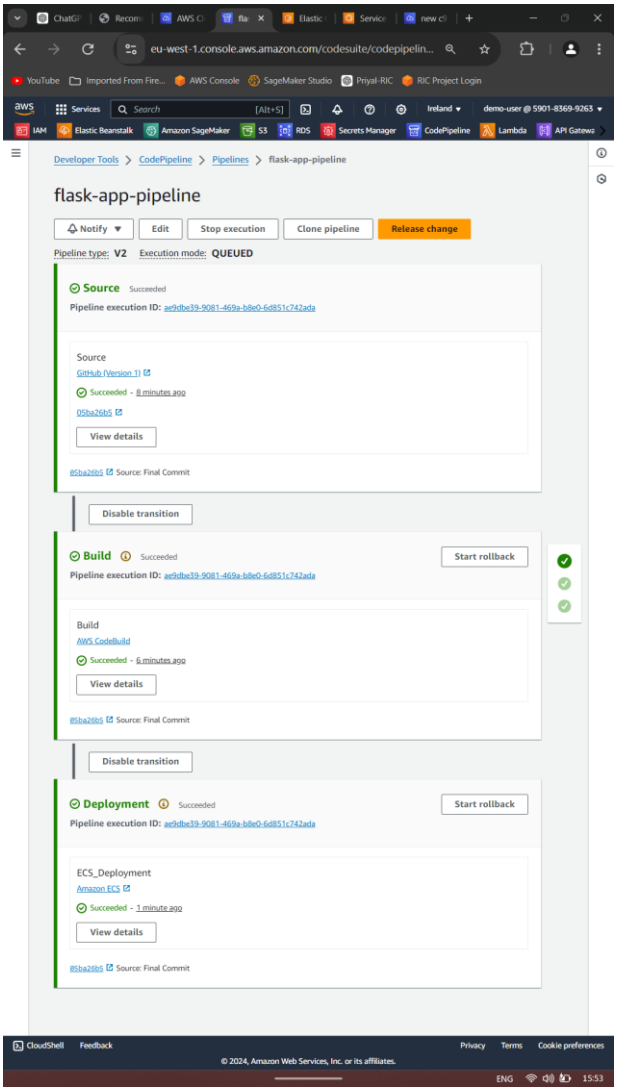

Fig 7: CI/CD CodePipeline

References

What is Amazon SageMaker? - Amazon SageMaker [WWW Document], n.d. URL https://docs.aws.amazon.com/sagemaker/latest/dg/whatis.html (accessed 8.12.24).