Department of Computer Science and Engineering,

Amrita School of Computing, Coimbatore

19CSE445- CLOUD COMPUTING

2024-2025-Even

Case Study Report

Topic: MultiCloud Stock Forecasting and Analytical System

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Problem Statement

This project aims to integrate various cloud services with advanced deep learning architectures, such as Long Short-Term Memory (LSTM), to build a scalable, interpretable, and production-ready stock price forecasting system. It processes historical market data to train predictive models, generates future stock price estimates, and stores the results in a database for efficient retrieval and analysis. The system also provides data visualization and financial insights, enabling users to make informed investment decisions based on real-time predictions and trend analysis.

Project Objectives:

1. Develop a cloud-based multivariate stock forecasting system using LSTM models.
2. Automate data processing and model training using AWS Glue and SageMaker.
3. Enable secure and scalable data storage with AWS S3 and DynamoDB.
4. Ensure cross-cloud data integration by transferring predictions from AWS to Azure.
5. Store and manage forecasted data efficiently in Azure Blob Storage.
6. Provide real-time stock trend analysis through Azure Power BI Embedded.
7. Optimize model performance using hyperparameter tuning in SageMaker.
8. Ensure security and compliance while accessing and visualizing data across cloud platforms.

Project Modules:

1. Data Collection & Storage (AWS S3) – Fetch stock data from Yahoo Finance and store it in structured S3 buckets.
2. Data Preprocessing (AWS Glue) – Clean, normalize, and structure the dataset for model training.
3. Model Training & Deployment (AWS SageMaker) – Train an LSTM model and store it in AWS S3 for future use.
4. Prediction & Data Storage (AWS DynamoDB & Azure Blob) – Store forecasted values in DynamoDB and sync with Azure Blob Storage.
5. Visualization & Reporting (Azure Power BI Embedded) – Load predictions from Azure Blob and create interactive dashboards.
6. Cross-Cloud Integration & Automation – Ensure smooth data transfer and model execution across AWS & Azure services.

Cloud Services Used:

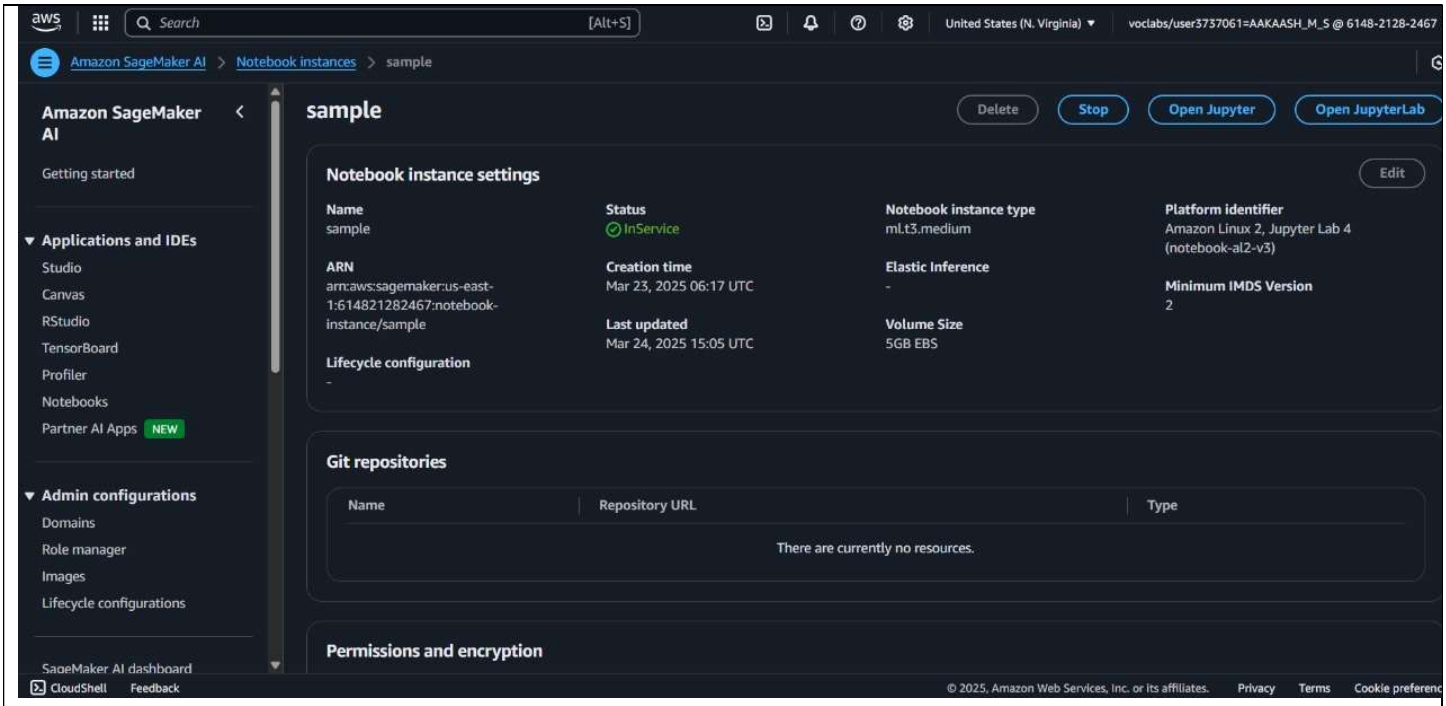
1. **AWS Services:**
    a. Sage Maker AI
    b. AWS Glue
    c. AWS DynamoDB
    d. AWS S3 storage
2. **Azure Services:**
    a. Azure Blob Containers
    b. Azure Power BI Embedded

Project Execution Steps:

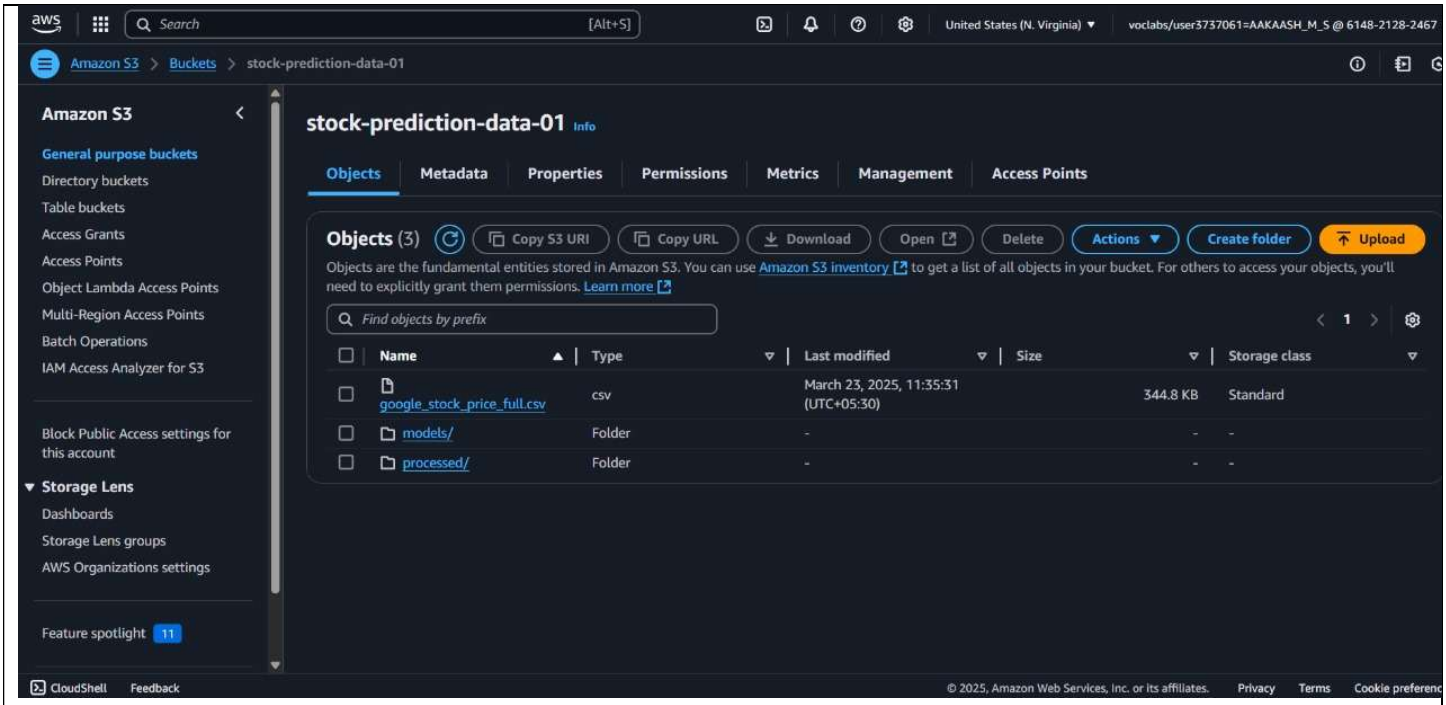
1. Setup AWS SageMaker AI Notebook:
    a. Create a notebook instance
    b. Choose instance type **ml.t3.medium**
2. Setup AWS S3 buckets:
    a. Create a new bucket
    b. Structured the bucket as given below:
        i. Original Dataset
        ii. Models(Store Model)
        iii. Processed(Store preprocessed data)
3. Setup AWS DynamoDB:
    a. Create a table in DynamoDB with Date as the Primary Key and prediction as another column

4. Azure service:
    a. Create a storage account and resource group
5. Azure Blob:
    a. Create a blob container using the storage container
    b. Make the access level from public to private
6. Use Jupyter Lab from notebook instance:
    a. Code to fetch the data from S3 bucket
    b. Preprocess the data and save it in S3 bucket(in processed folder)
    c. Create the model and save it in S3 bucket (models)
    d. Fetch the data and model. Predict the output.
    e. Save the predicted output in DynamoDB table using AWS Glue.
    f. Save the predicted output from DynamoDB to Azure Blob Container
7. Azure Power BI Embedded visualization:
    a. Fetch the data from Azure blob container using valid key
    b. Transform the json data to column data by accessing the storage and proceed with visualization.

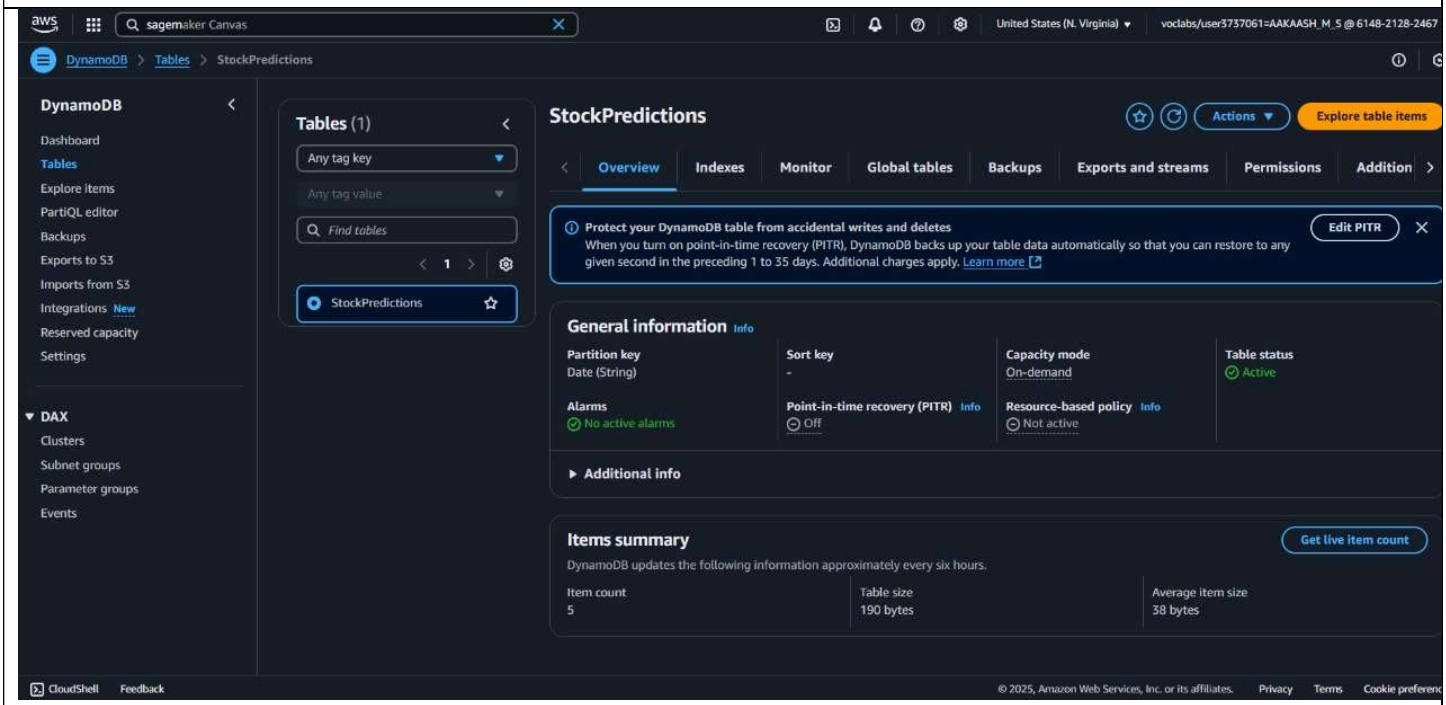
Screenshots:



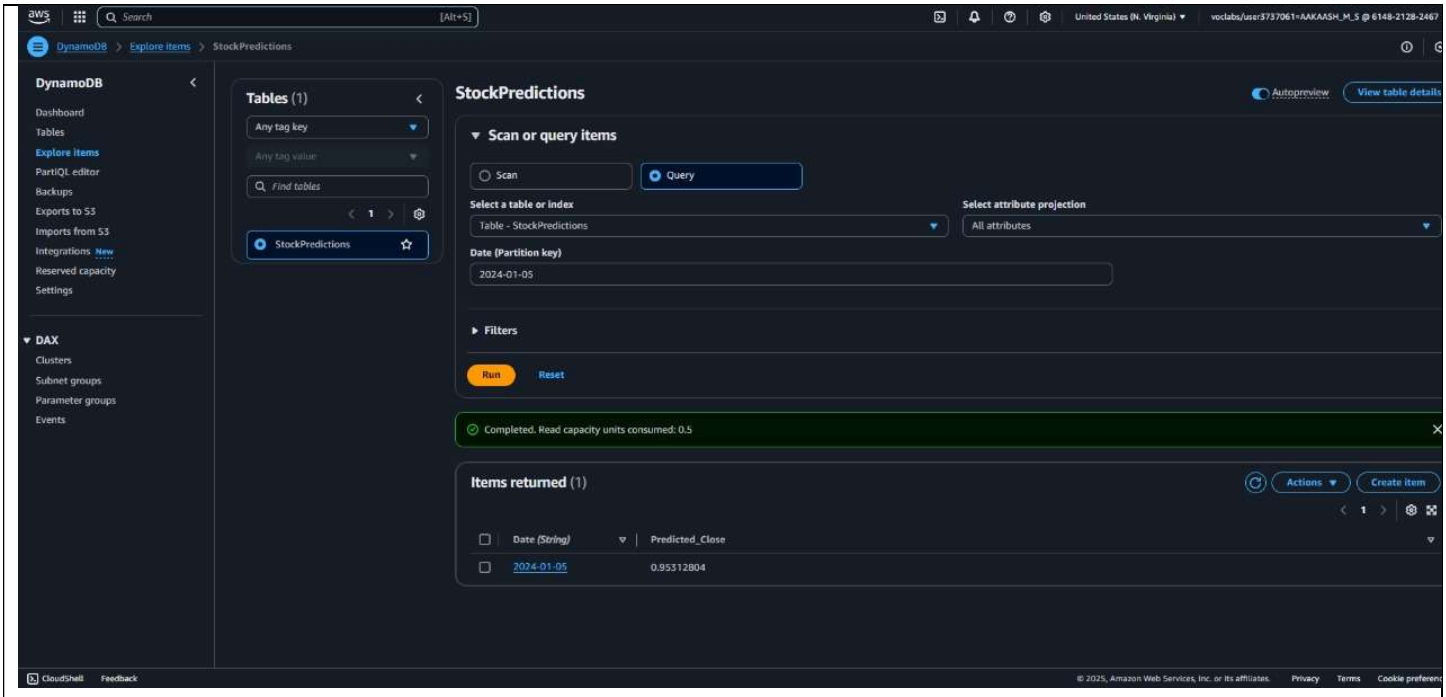
AWS SageMaker notebook instance



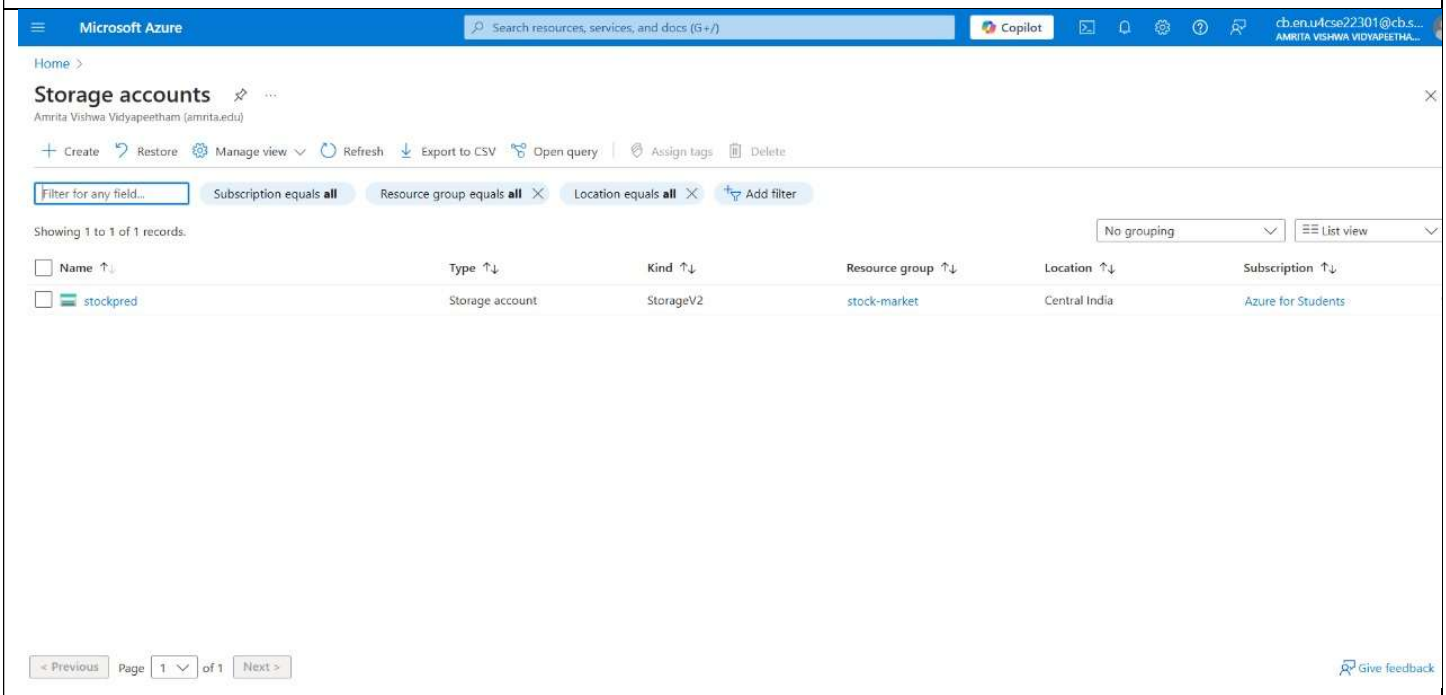
AWS S3 bucket structure



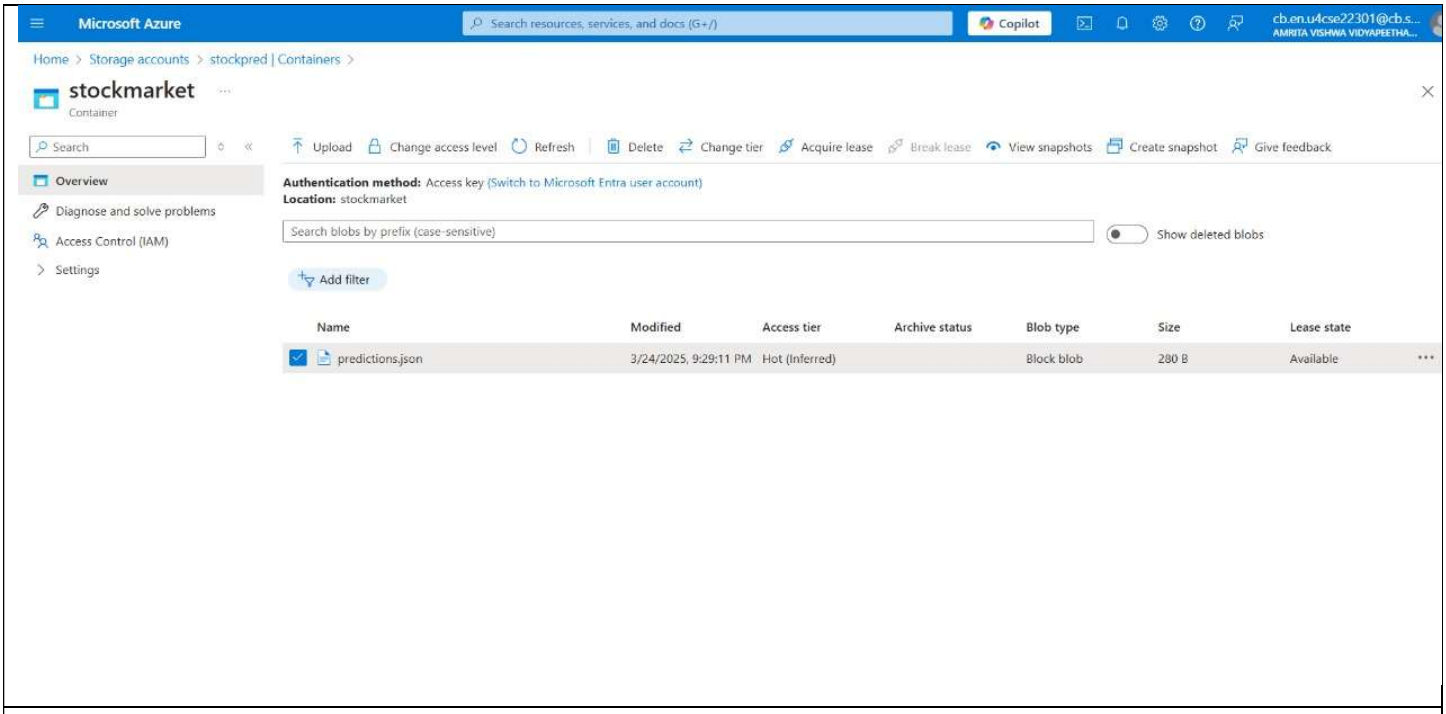
AWS DynamoDB table details



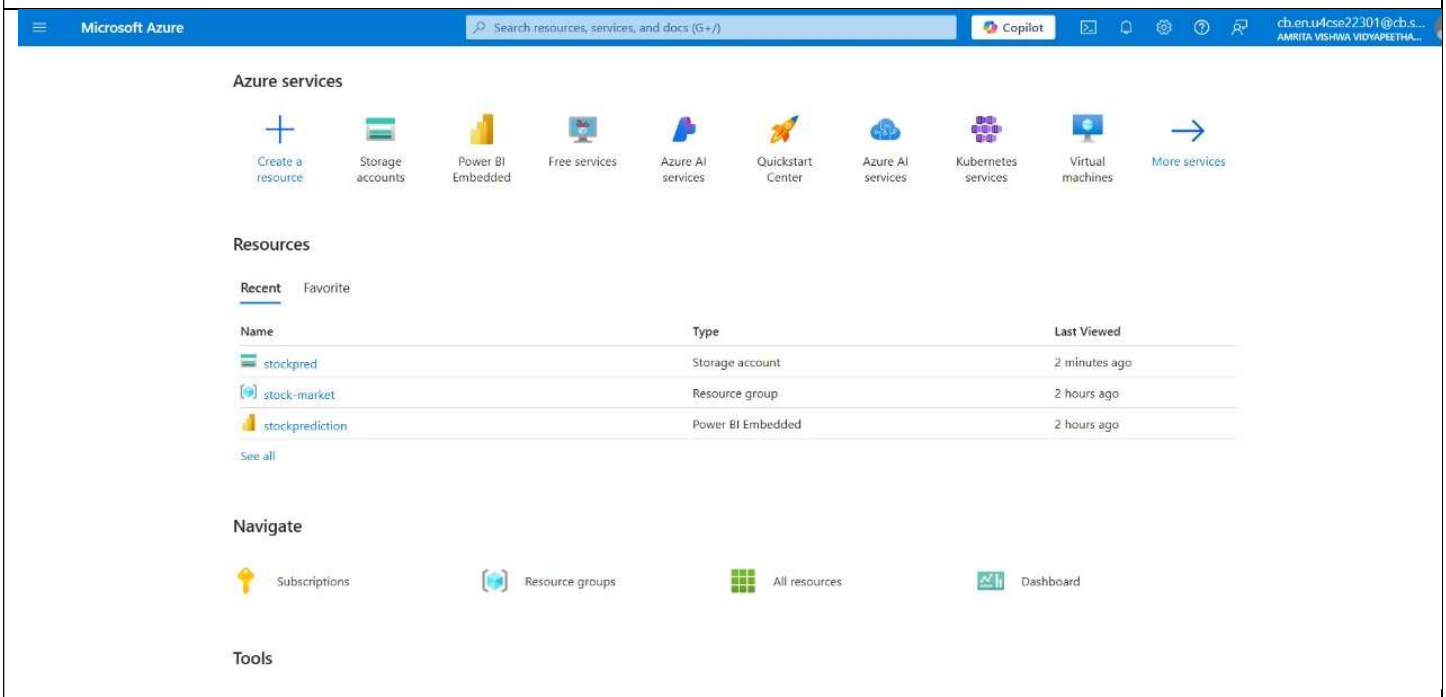
Sample querying in AWS DynamoDB



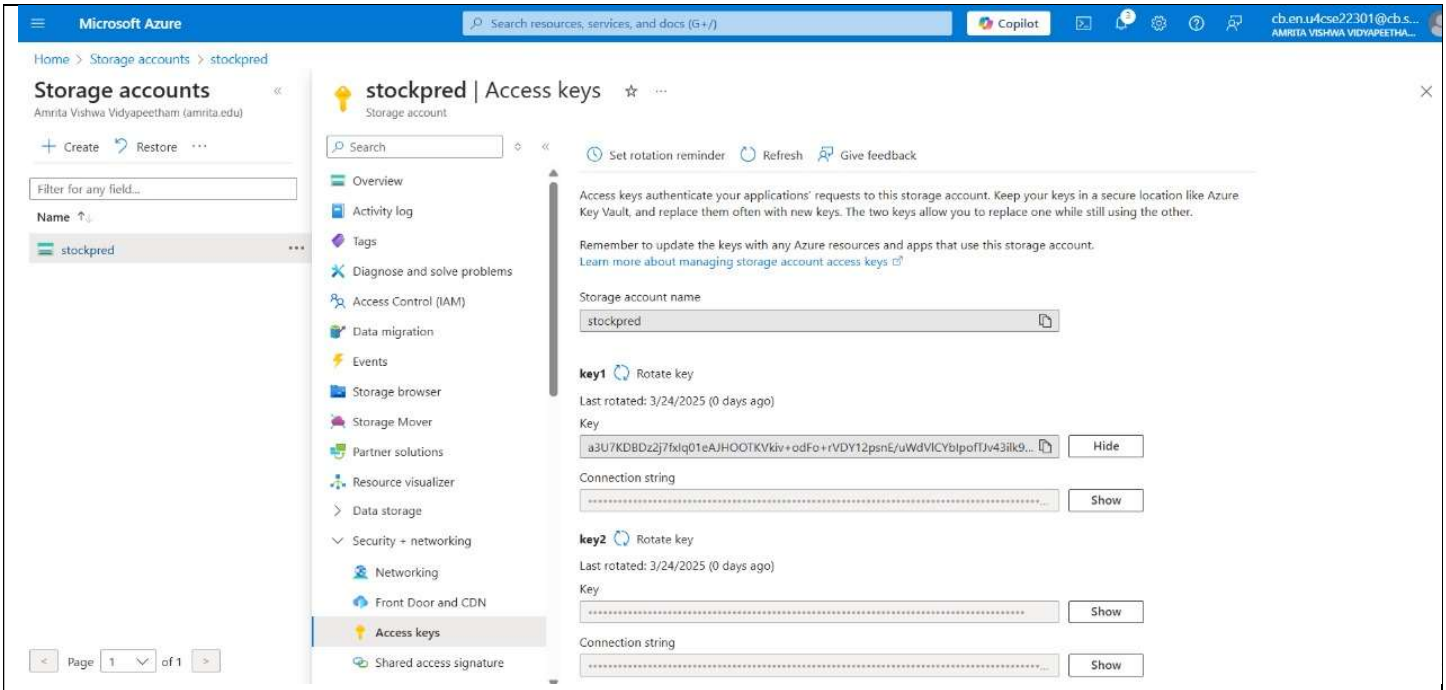
Azure Storage Account



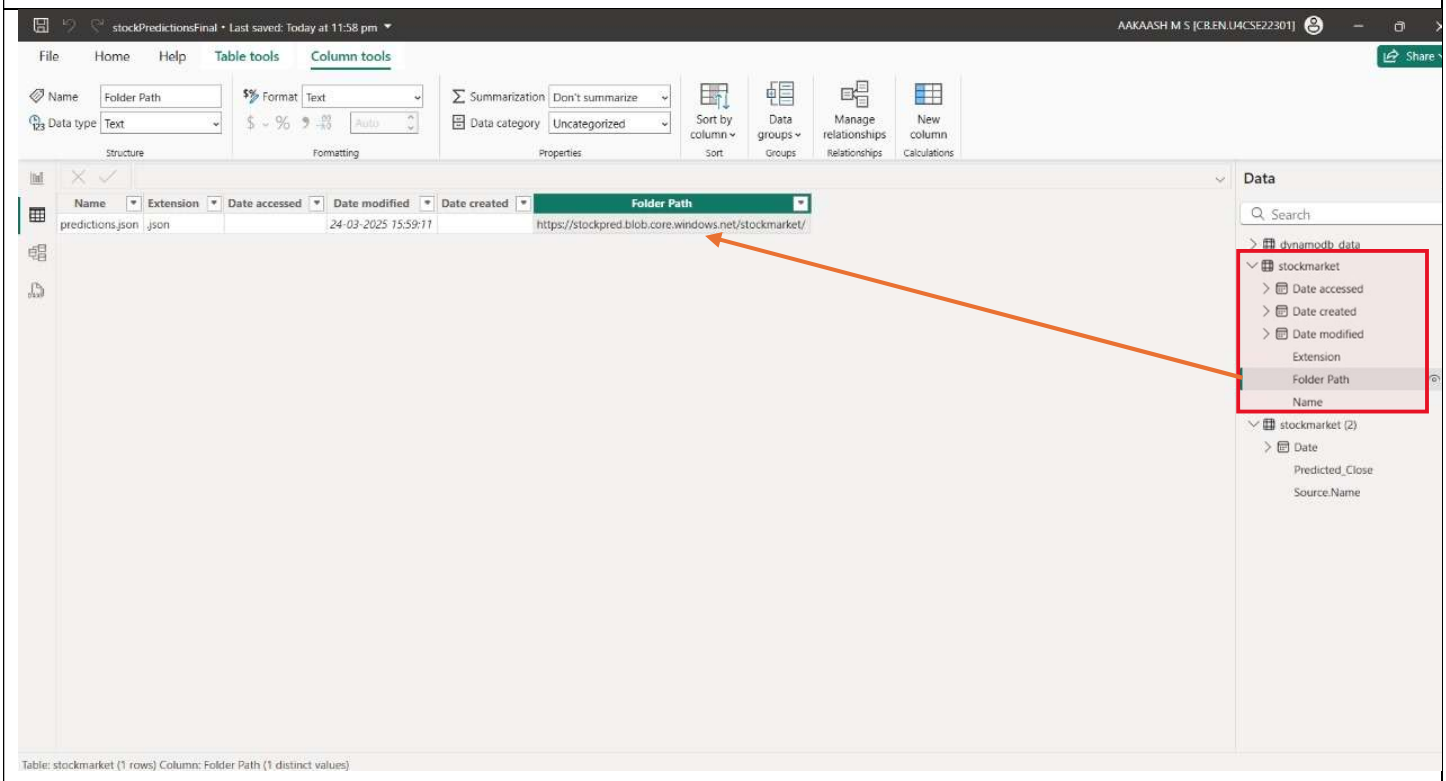
Azure Blob Container



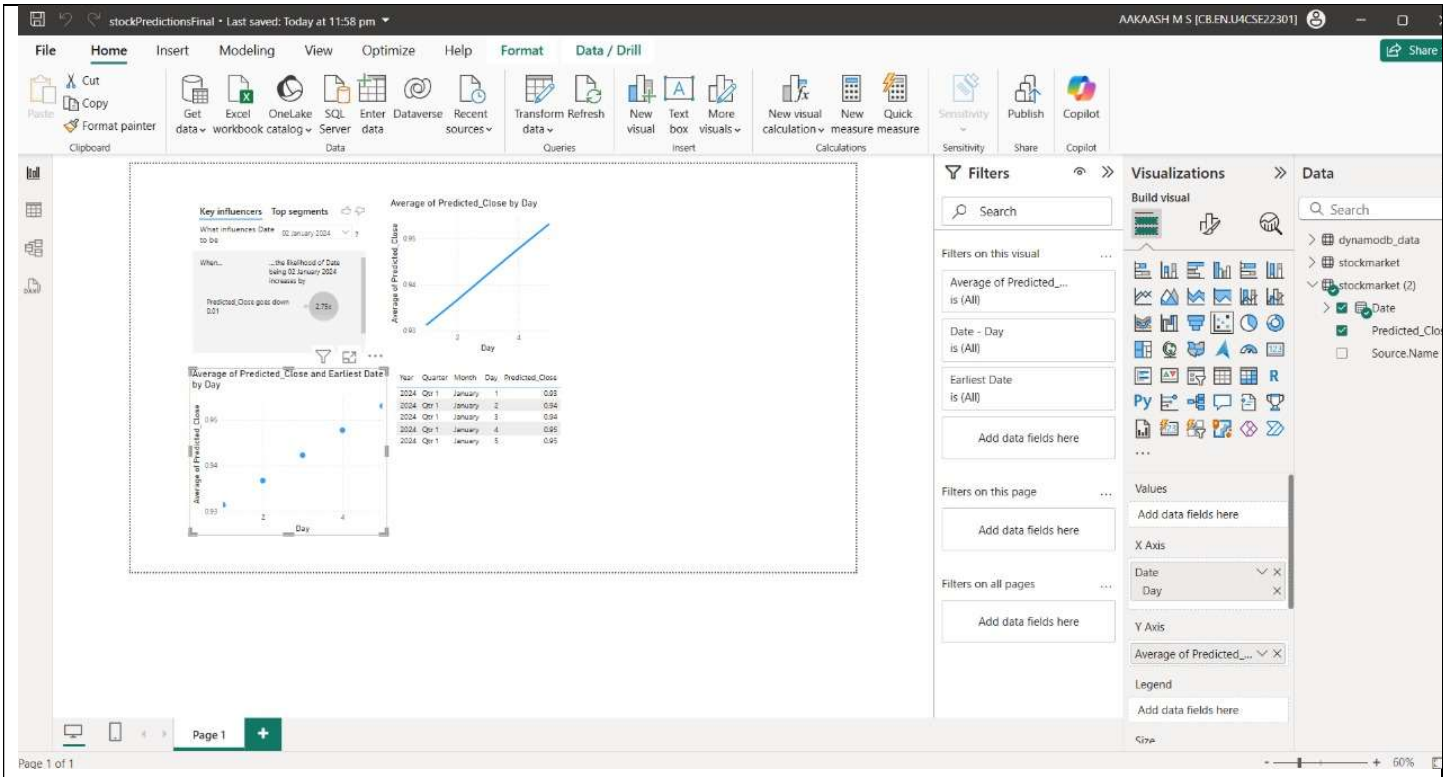
Azure resources used



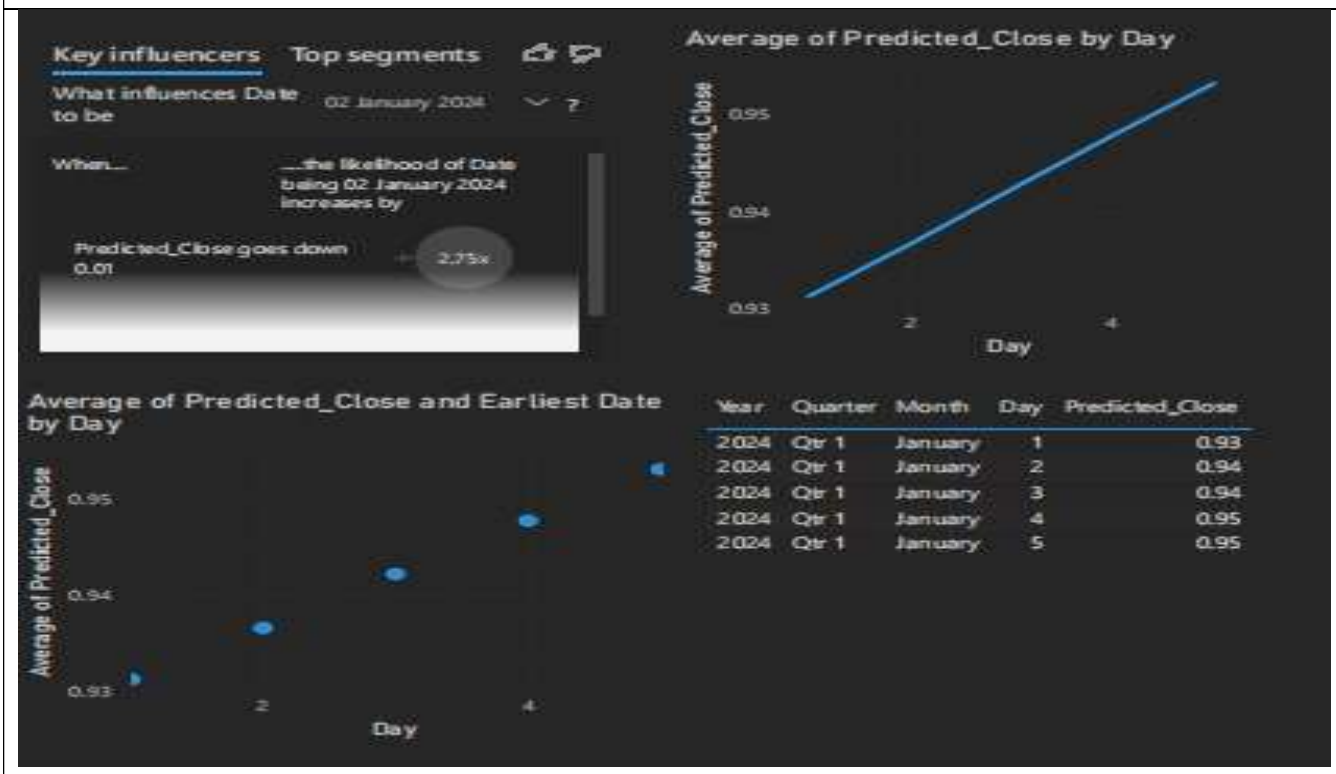
Azure Key fetching details



Azure access details



Azure PowerBI overview and data view



Visualization in Azure PowerBI for the predicted sample data

Github Link: https://github.com/msaakaash/MultiCloud-Stock-Forecasting-Analytics