

# Deploying ML Sales Prediction application on GCP

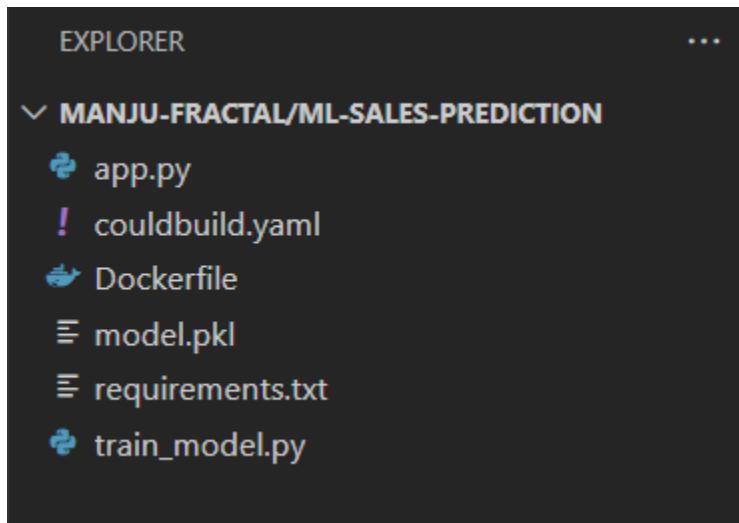
Name	Manjunath KO
Email	manjunath.ko@fractal.ai

## Task 1:

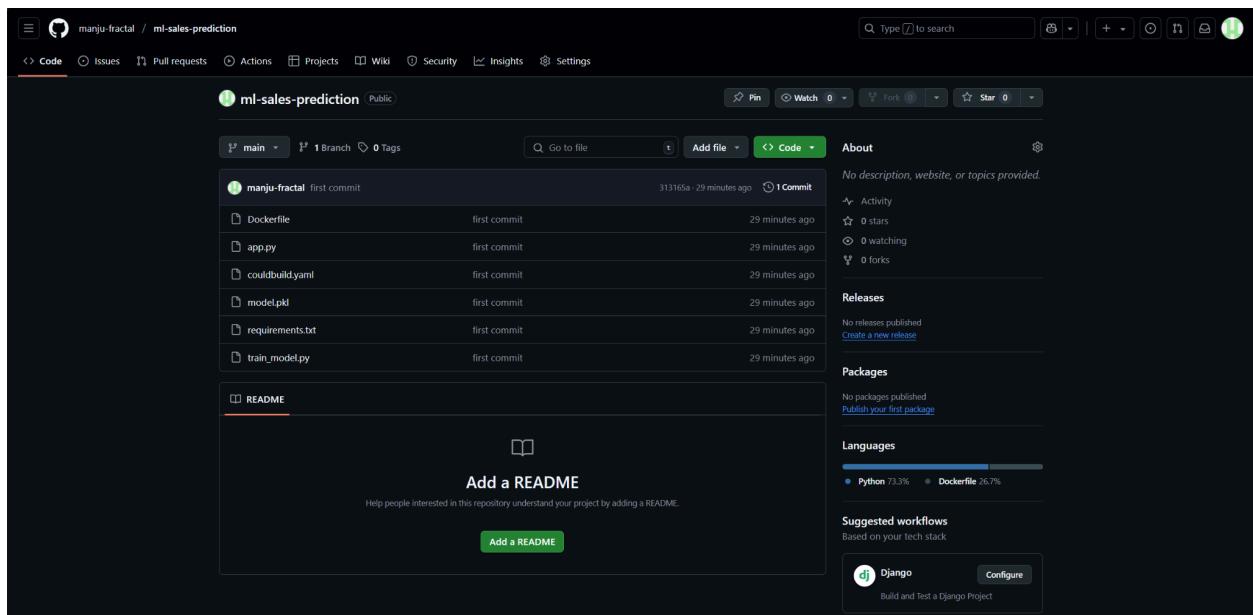
Deploy a Sales Prediction ML Application with CI/CD Pipeline Using GitHub, Cloud Build, and Cloud Run

### 1. Project Structure:

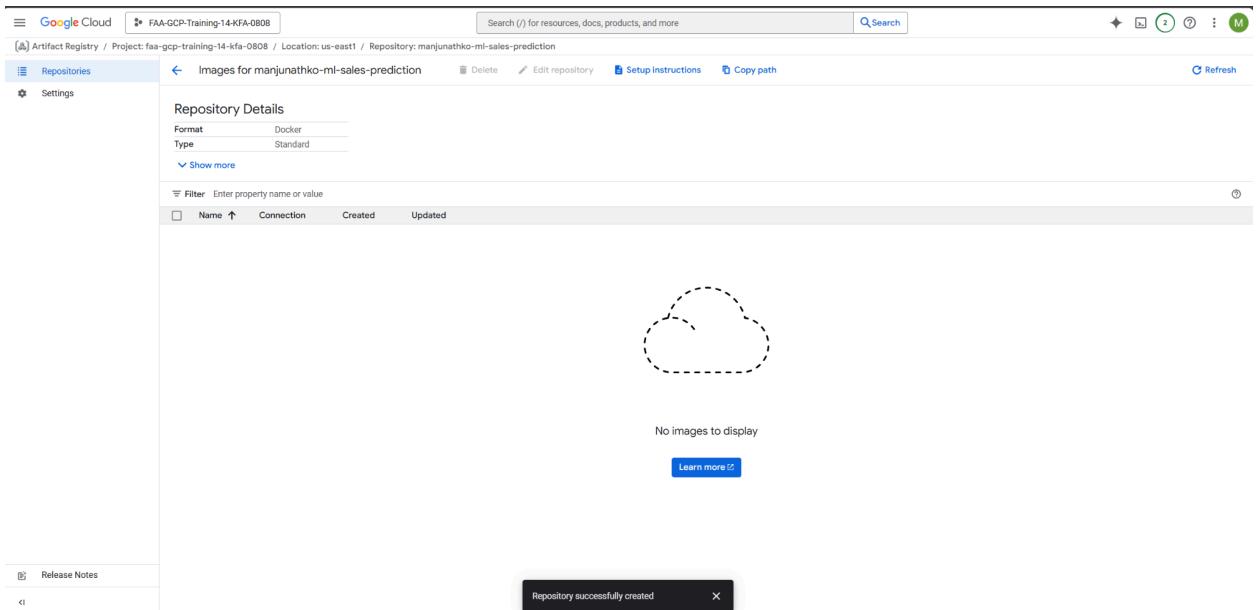
Created all necessary project files including `app.py`, `Dockerfile`, `requirements.txt`, and `cloudbuild.yaml`. Additionally, generated a `model.pkl` file using the `train_model.py` script.



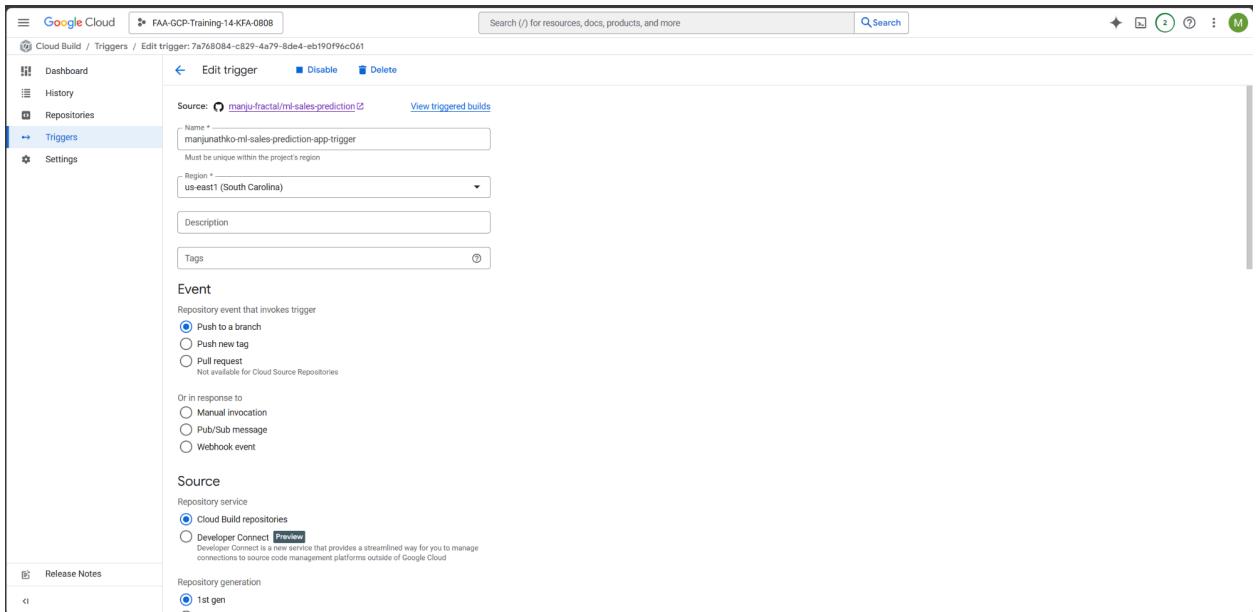
## 2. Pushed the code to the **main** branch on GitHub.



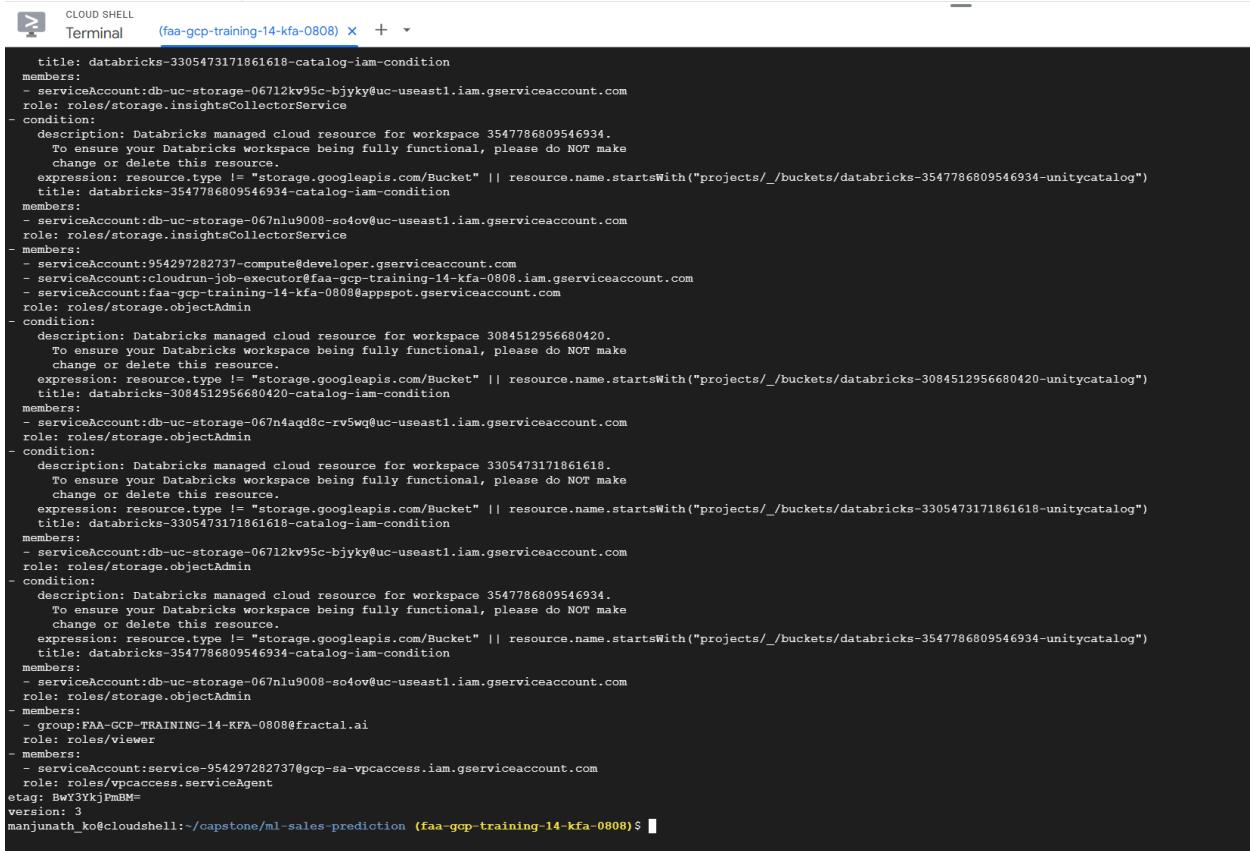
## 3. Created a repository in Artifact Registry to store container images.



#### 4. Configured a Cloud Build trigger to automatically deploy the application to Cloud Run upon code changes in the connected GitHub repository.

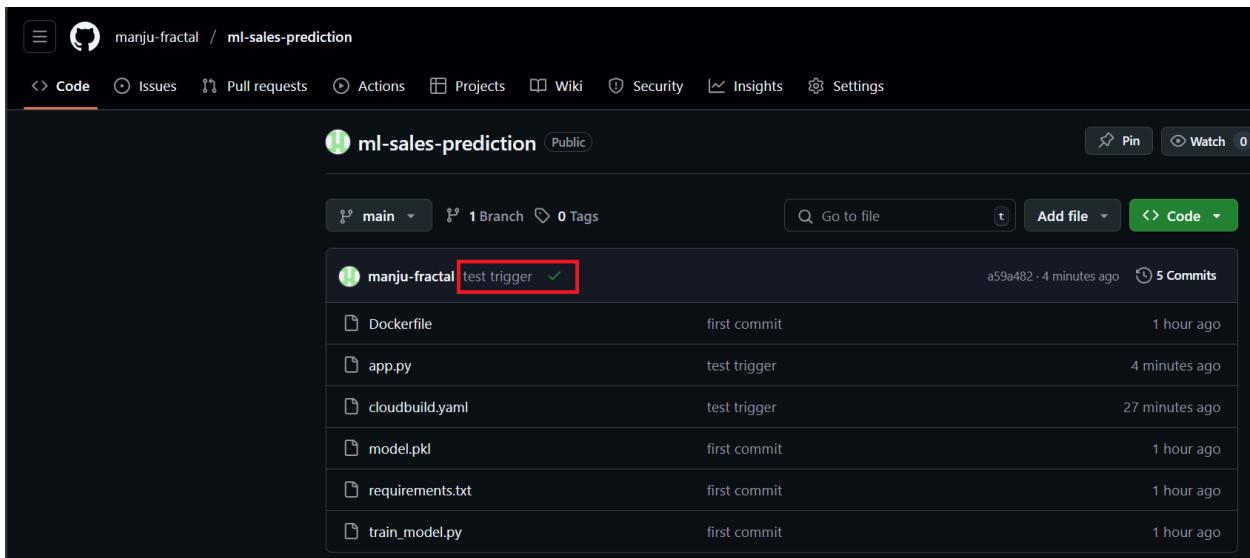


## 5. Granted the necessary CI/CD permissions.



```
title: databricks-3305473171861618-catalog-iam-condition
members:
- serviceAccount:db-uc-storage-06712kv95c-bjyky@uc-useast1.iam.gserviceaccount.com
role: roles/storage.insightsCollectorService
- condition:
  description: Databricks managed cloud resource for workspace 3547786809546934.
  To ensure your Databricks workspace being fully functional, please do NOT make
  change or delete this resource.
  expression: resource.type != "storage.googleapis.com/Bucket" || resource.name.startsWith("projects/_/buckets/databricks-3547786809546934-unitycatalog")
title: databricks-3547786809546934-catalog-iam-condition
members:
- serviceAccount:db-uc-storage-067nlu9008-so4ov@uc-useast1.iam.gserviceaccount.com
role: roles/storage.insightsCollectorService
- members:
  - serviceAccount:954297282737-compute@developer.gserviceaccount.com
  - serviceAccount:cloudrun-job-executor@faa-gcp-training-14-kfa-0808.iam.gserviceaccount.com
  - serviceAccount:faa-gcp-training-14-kfa-0808.appspot.gserviceaccount.com
role: roles/storage.objectAdmin
- condition:
  description: Databricks managed cloud resource for workspace 3084512956680420.
  To ensure your Databricks workspace being fully functional, please do NOT make
  change or delete this resource.
  expression: resource.type != "storage.googleapis.com/Bucket" || resource.name.startsWith("projects/_/buckets/databricks-3084512956680420-unitycatalog")
title: databricks-3084512956680420-catalog-iam-condition
members:
- serviceAccount:db-uc-storage-067n4aqd8c-rv5wq@uc-useast1.iam.gserviceaccount.com
role: roles/storage.objectAdmin
- condition:
  description: Databricks managed cloud resource for workspace 3305473171861618.
  To ensure your Databricks workspace being fully functional, please do NOT make
  change or delete this resource.
  expression: resource.type != "storage.googleapis.com/Bucket" || resource.name.startsWith("projects/_/buckets/databricks-3305473171861618-unitycatalog")
title: databricks-3305473171861618-catalog-iam-condition
members:
- serviceAccount:db-uc-storage-06712kv95c-bjyky@uc-useast1.iam.gserviceaccount.com
role: roles/storage.objectAdmin
- condition:
  description: Databricks managed cloud resource for workspace 3547786809546934.
  To ensure your Databricks workspace being fully functional, please do NOT make
  change or delete this resource.
  expression: resource.type != "storage.googleapis.com/Bucket" || resource.name.startsWith("projects/_/buckets/databricks-3547786809546934-unitycatalog")
title: databricks-3547786809546934-catalog-iam-condition
members:
- serviceAccount:db-uc-storage-067nlu9008-so4ov@uc-useast1.iam.gserviceaccount.com
role: roles/storage.objectAdmin
- members:
  - group:FAA-GCP-TRAINING-14-KFA-0808@fractal.ai
role: roles/viewer
- members:
  - serviceAccount:service-954297282737@gcp-sa-vpcaccess.iam.gserviceaccount.com
role: roles/vpcaccess.serviceAgent
etag: BwYYkjPmBM=
version: 3
manjunath_ko@cloudshell:~/capstone/ml-sales-prediction (faa-gcp-training-14-kfa-0808)$
```

## 6. Push changes to trigger build & deploy



## 7. Checked the build status.

The screenshot shows the Google Cloud Build details page for a successful build. The build ID is ae00714f-c4f5-498d-93ea-583918f9f3a2, triggered by manjunathko-ml-sales-prediction-app-trigger, on branch main at commit ad5d450. The build started on Jun 12, 2025, at 11:10:28 PM. It consists of three steps:

- 0: Build Docker image build-4-us-central1-docker.pkg.dev/faa-gcp-training-14-kfa-08... duration 00:00:34
- 1: Push to Artifact Registry push-us-central1-docker.pkg.dev/faa-gcp-training-14-kfa-0808... duration 00:00:23
- 2: Deploy to Cloud Run cloud run deploy cloud-run-ml-sales-prediction-app --image u... duration 00:01:37

The build summary table shows the steps and their durations. The build log tab displays the detailed logs for each step, including deployment to Cloud Run and pushing to Artifact Registry. The execution details and build artifacts tabs are also visible.

## 8. Confirmed the Docker image was built and stored correctly in the configured Artifact Registry repository.

Google Cloud

Artifact Registry / Project: faa-gcp-training-14-kfa-0808 / Location: us-central1 / Repository: manjunathko-ml-sales-prediction

Repositories

Settings

Images for manjunathko-ml-sales-prediction

Repository Details

Format: Docker  
Type: Standard

Show more

Filter: Enter property name or value

Name	Connection	Created	Updated
cloud-run-ml-sales-prediction-app	-	4 minutes ago	4 minutes ago

Release Notes

## 9. Verified that the Cloud Run service was created.

Google Cloud

Cloud Run

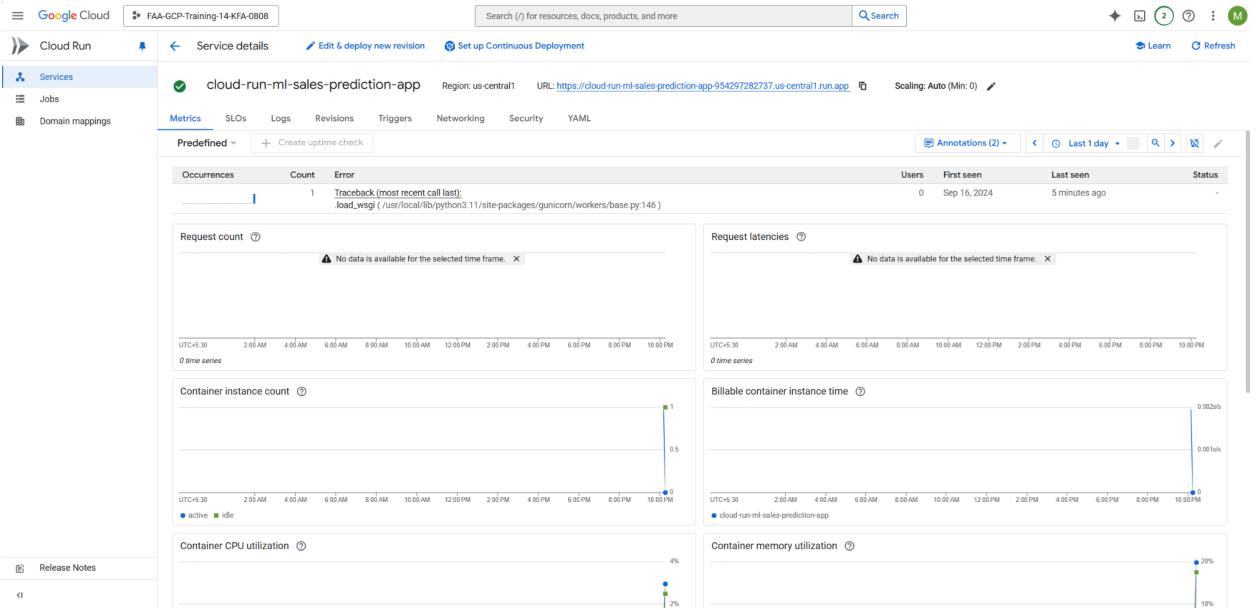
Services Deploy container Connect repo Write a function

A service exposes a unique endpoint and automatically scales the underlying infrastructure to handle incoming requests.  
Deploy a container image, source code or a function to create a service.

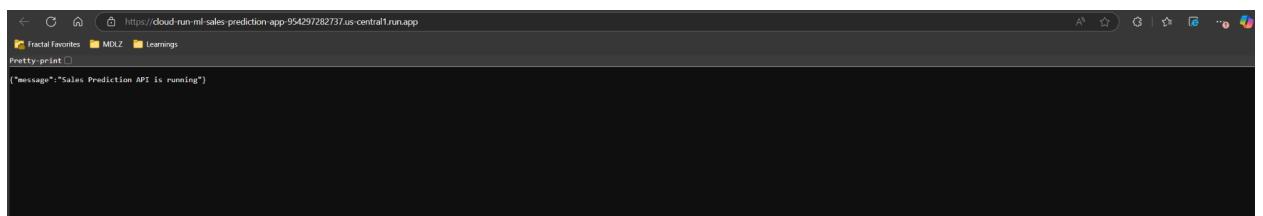
Filter: Filter services

Name	Deployment type	Req/sec	Region	Authentication	Ingress	Last deployed	Deployed by	Recommendation
cloud-run-app	Container	0	us-central1	Allow unauthenticated	All	9 hours ago	cd-tut-build-sa@faa-gcp-training-14-kfa-0808.iam.gserviceaccount.com	-
cloud-run-app-12	Container	0	us-central1	Allow unauthenticated	All	9 hours ago	cd-tut-build-sa@faa-gcp-training-14-kfa-0808.iam.gserviceaccount.com	-
cloud-run-app-hina	Container	0	us-central1	Allow unauthenticated	All	9 hours ago	cd-tut-build-sa@faa-gcp-training-14-kfa-0808.iam.gserviceaccount.com	-
cloud-run-app-manju	Container	0	us-central1	Allow unauthenticated	All	9 hours ago	cd-tut-build-sa@faa-gcp-training-14-kfa-0808.iam.gserviceaccount.com	-
cloud-run-app-sanskar	Container	0	us-central1	Allow unauthenticated	All	6 hours ago	cd-tut-build-sa@faa-gcp-training-14-kfa-0808.iam.gserviceaccount.com	-
cloud-run-app-vg1	Container	0	us-central1	Allow unauthenticated	All	9 hours ago	cd-tut-build-sa@faa-gcp-training-14-kfa-0808.iam.gserviceaccount.com	-
cloud-run-ml-sales-prediction-app	Container	0	us-central1	Allow unauthenticated	All	6 minutes ago	cd-tut-build-sa@faa-gcp-training-14-kfa-0808.iam.gserviceaccount.com	-
ik-cloud-run-app	Container	0	us-central1	Allow unauthenticated	All	9 hours ago	cd-tut-build-sa@faa-gcp-training-14-kfa-0808.iam.gserviceaccount.com	-

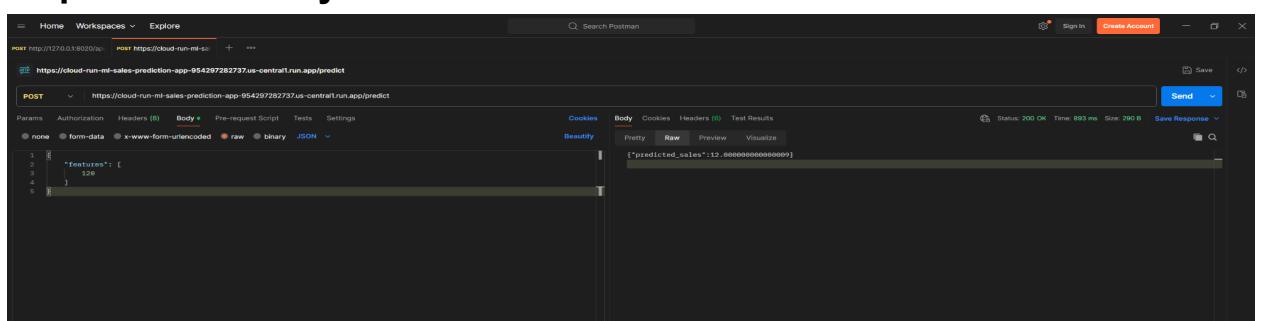
Release Notes



## 10. Visited the deployed service URL to verify its availability and response.



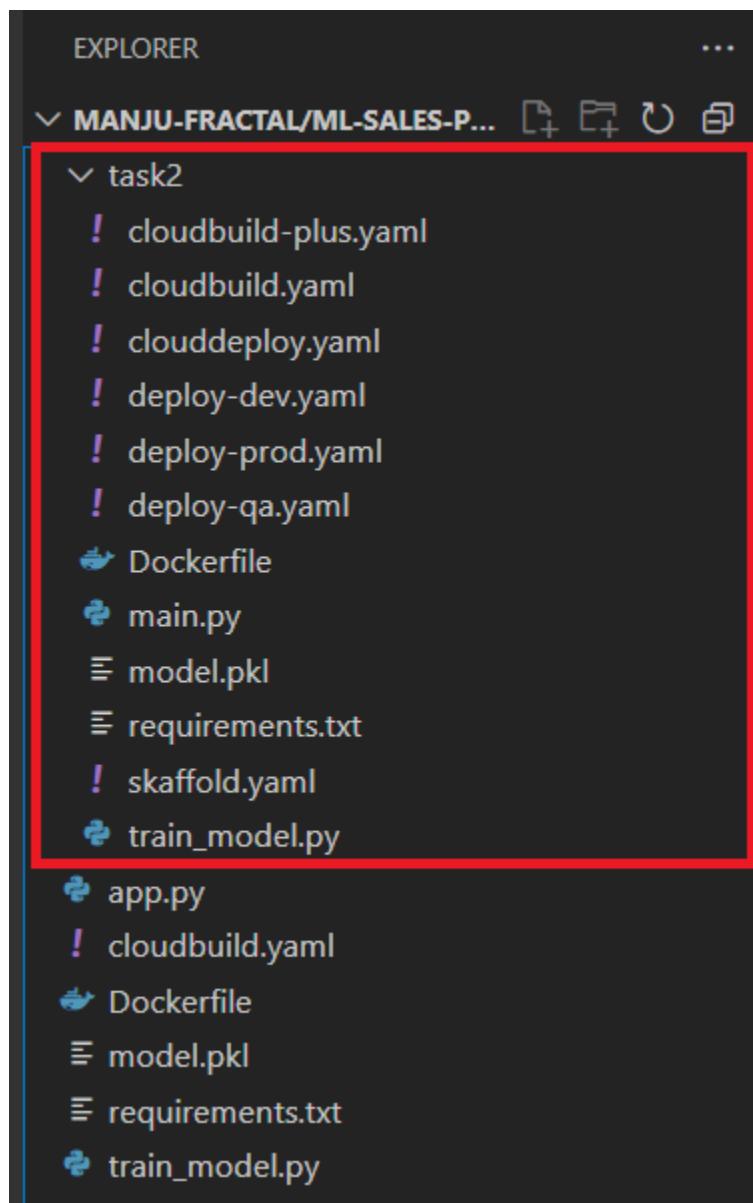
## 11. Tested the /predict endpoint in Postman to verify that it responds correctly and is reachable.



## Task 2:

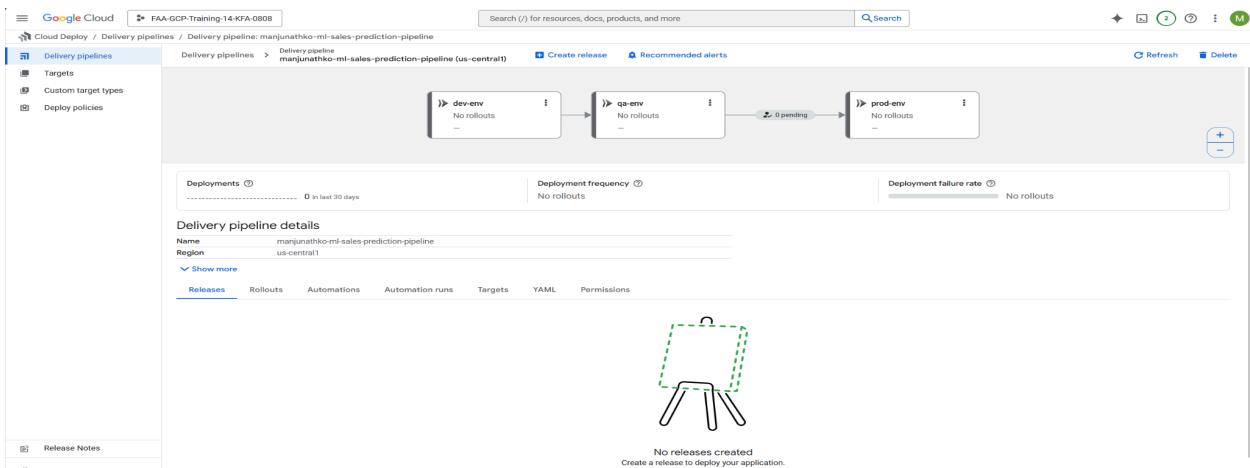
**Delivering the ML app from Cloud Run to a Dev target using Google Cloud Deploy with a canary deployment strategy**

1. All necessary project resources and configuration files have been successfully created.



## 2. The Cloud Deploy delivery pipeline has been configured to support three deployment targets: Dev, QA, and Prod environments.

```
manjunath_ko@cloudshell:~/capstone/ml-sales-prediction/task2 (faa-gcp-training-14-kfa-0808)$ gcloud deploy apply \
--file=clouddeploy.yaml \
--region=${REGION} \
--project=${PROJECT_ID}
Waiting for the operation on resource projects/faa-gcp-training-14-kfa-0808/locations/us-central1/deliveryPipelines/manjunathko-ml-sales-prediction-pipeline...done.
Created Cloud Deploy resource: projects/faa-gcp-training-14-kfa-0808/locations/us-central1/deliveryPipelines/manjunathko-ml-sales-prediction-pipeline.
Waiting for the operation on resource projects/faa-gcp-training-14-kfa-0808/locations/us-central1/targets/dev-env...done.
Created Cloud Deploy resource: projects/faa-gcp-training-14-kfa-0808/locations/us-central1/targets/dev-env.
Waiting for the operation on resource projects/faa-gcp-training-14-kfa-0808/locations/us-central1/targets/qa-env...done.
Created Cloud Deploy resource: projects/faa-gcp-training-14-kfa-0808/locations/us-central1/targets/qa-env.
Waiting for the operation on resource projects/faa-gcp-training-14-kfa-0808/locations/us-central1/targets/prod-env...done.
Created Cloud Deploy resource: projects/faa-gcp-training-14-kfa-0808/locations/us-central1/targets/prod-env.
manjunath_ko@cloudshell:~/capstone/ml-sales-prediction/task2 (faa-gcp-training-14-kfa-0808)$
```



The screenshot shows the Google Cloud Platform Cloud Deploy interface displaying a list of delivery pipelines. The top navigation bar includes 'Google Cloud', a search bar, and a 'Search' button. Below the navigation is a breadcrumb trail: 'Cloud Deploy / Delivery pipelines'. On the left, there's a sidebar with 'Delivery pipelines' selected, along with options for 'Targets', 'Custom target types', and 'Deploy policies'. The main area is a table titled 'Filter Filter delivery pipelines' with columns: Name, Region, Description, Targets, Latest release, Latest release description, Rollout status, Deployment frequency, and Deployment failure rate. The table lists several pipelines: 'cloud-run-pipeline-nitin' (us-central1, application deployment pipeline, latest release 05/2029, 0% failure), 'manjunathko-ml-sales-prediction-pipeline' (us-central1, application deployment pipeline, latest release 05/2029, 0% failure), 'my-canary-demo-app-004' (us-central1, main application pipeline, latest release 05/2029, 0% failure), 'my-canary-demo-app-1-hina' (us-central1, main application pipeline, latest release 05/2029, 0% failure), 'my-canary-demo-app-san' (us-central1, main application pipeline, latest release 05/2029, 0% failure), 'my-canary-demo-app-sk' (us-central1, main application pipeline, latest release 05/2029, 0% failure), and 'my-canary-demo-app-vidhi' (us-central1, main application pipeline, latest release 05/2029, 0% failure). A red box highlights the 'manjunathko-ml-sales-prediction-pipeline' row.

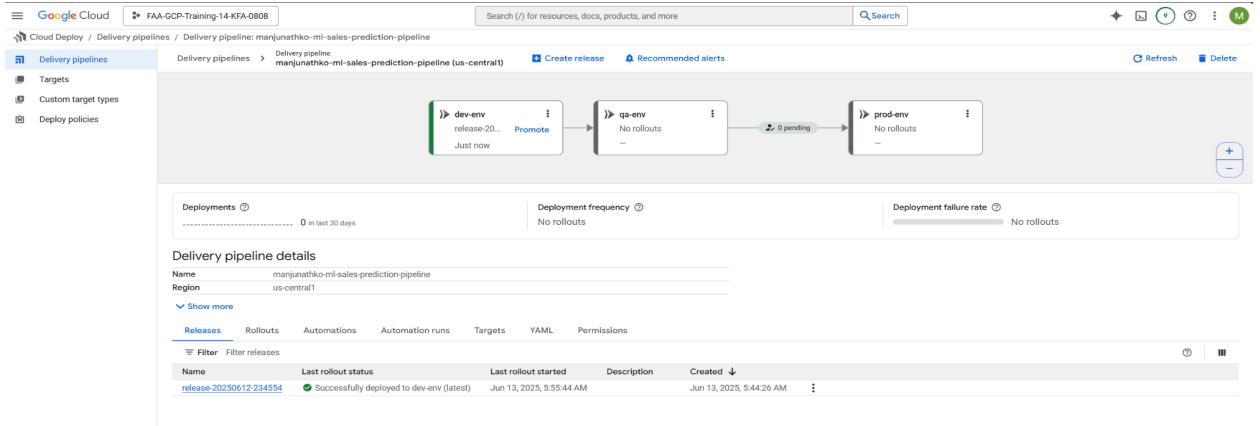
Name	Region	Description	Targets	Latest release	Latest release description	Rollout status	Deployment frequency	Deployment failure rate
cloud-run-pipeline-nitin	us-central1	application deployment pipeline	dev-env qa-env prod-env	release_20250611-052029	—	dev-env qa-env prod-env	Monthly	0%
manjunathko-ml-sales-prediction-pipeline	us-central1	application deployment pipeline	dev-env qa-env prod-env	—	—	dev-env qa-env prod-env	No rollouts	—
my-canary-demo-app-004	us-central1	main application pipeline	prod	test-release-002	—	prod	Monthly	0%
my-canary-demo-app-1-hina	us-central1	main application pipeline	prod	test-release-002	—	prod	Monthly	0%
my-canary-demo-app-san	us-central1	main application pipeline	prod	test-release-001	—	prod	Monthly	0%
my-canary-demo-app-sk	us-central1	main application pipeline	prod	test-release-002	—	prod	Monthly	0%
my-canary-demo-app-vidhi	us-central1	main application pipeline	prod	test-release-002	—	prod	Monthly	0%

### 3. A Cloud Deploy delivery pipeline was created using the Canary deployment strategy. Initially, 25% of traffic was routed to the Dev service to validate deployment behavior and test service accessibility.

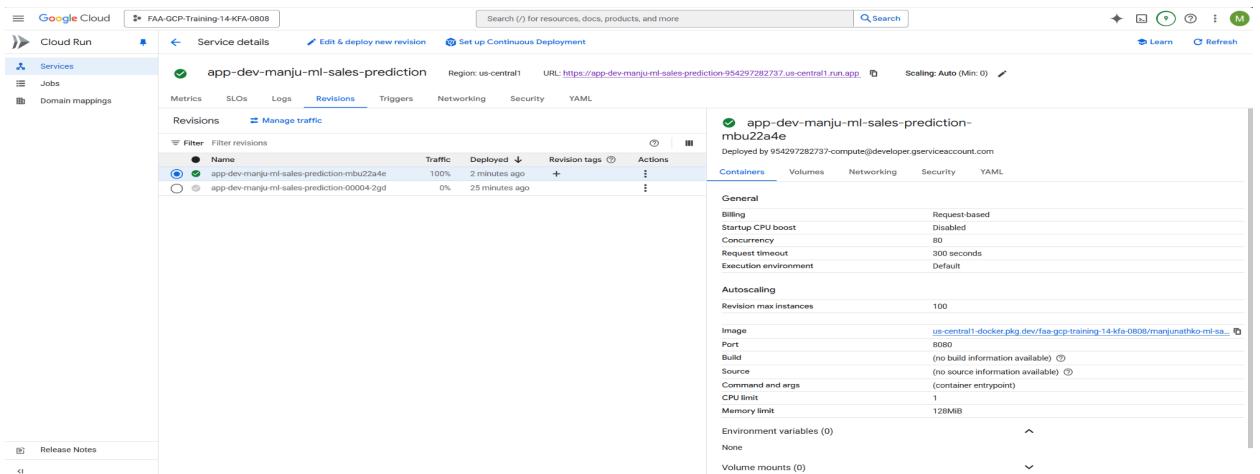
The screenshots illustrate the setup of a Cloud Deploy delivery pipeline. The first screenshot shows the Artifact Registry interface where the 'app' image has been pushed. The second screenshot shows the Cloud Deploy interface where a delivery pipeline is configured with three environments: dev-env, qa-env, and prod-env. The dev-env stage is set to 25% traffic, while qa-env and prod-env have no rollouts. The pipeline details show the name 'manjunathko-ml-sales-prediction-pipeline' and region 'us-central1'. The releases tab shows a single release named 'release-20250612-234554' which is currently pending advance to dev-env.

### 4. Implemented a Canary deployment strategy that progressively shifts traffic to the new Cloud Run revision—starting with 25%, increasing to 75%, and ultimately reaching 100% once the deployment is validated and considered stable.

```
manjunath_ko@cloudshell:/capstone/ml-sales-prediction/task2 [faa-gcp-training-14-kfa-0808]$ gcloud deploy rollouts advance release=20250612-234554-to-dev-env-0002 --release=release-$[RELEASE_TIMESTAMP] --delivery-pipeline=manjunathko-ml-sales-prediction-pipeline --region=$[REGION] --quiet
Advancing rollout projects/фаа-gcp-training-14-kfa-0808/locations/us-central1/deliveryPipelines/manjunathko-ml-sales-prediction-pipeline/releases/release-20250612-234554/rollouts/release-20250612-234554-to-dev-env-0002 to phase canary-50.
manjunath_ko@cloudshell:/capstone/ml-sales-prediction/task2 [faa-gcp-training-14-kfa-0808]$
```



## 5. Redirecting traffic to the latest stable revision deployed in the Dev environment.



## 6. Promoted the deployment release from the Dev environment to the QA environment.

The screenshot shows the Google Cloud Run Services page. It displays a table of services with columns for Name, Deployment type, Req/sec, Region, Authentication, Ingress, Last deployed, Deployed by, and Recommendation. Two services are listed:

- app-dev-manju-ml-sales-prediction**: Container, 0 req/sec, us-central1, Allow unauthenticated, All, 6 minutes ago, 954297282737-compute@developer.gserviceaccount.com, -
- app-qa-manju-ml-sales-prediction**: Container, 0 req/sec, us-central1, Require authentication, All, Just now, 954297282737-compute@developer.gserviceaccount.com, -

The screenshot shows the Google Cloud Deploy Delivery pipelines page. It displays a delivery pipeline named "manjunathko-ml-sales-prediction-pipeline" with three stages: dev-env, qa-env, and prod-env. The stages are connected by arrows labeled "Promote". The status for each stage is: dev-env (Just now), qa-env (Just now), and prod-env (0 pending). Below the pipeline, there are sections for Deployments, Deployment frequency, and Deployment failure rate.

**Delivery pipeline details**

Name	Region
manjunathko-ml-sales-prediction-pipeline	us-central1

**Releases**

Name	Last rollout status	Last rollout started	Description	Created
release-20250612-234554	Successfully deployed to qa-env (latest)	Jun 13, 2025, 6:25:56 AM		Jun 13, 2025, 5:44:26 AM

## 7. Promoted the deployment release from the QA environment to the Prod environment.

The screenshot shows the Google Cloud Deploy Delivery pipelines page. The delivery pipeline "manjunathko-ml-sales-prediction-pipeline" is displayed. The qa-env stage has a yellow "Promote" button labeled "I pending". The prod-env stage shows "No rollouts". The pipeline status is: dev-env (Just now), qa-env (I pending), prod-env (0 pending).

The screenshot shows the Google Cloud Deploy Delivery pipelines page. The delivery pipeline "manjunathko-ml-sales-prediction-pipeline" is displayed. The qa-env stage has a blue "Promote" button labeled "Review". The prod-env stage shows "2 minutes ago". The pipeline status is: dev-env (9 minutes ago), qa-env (3 minutes ago), prod-env (2 minutes ago).

**Deployments**

1 in last 30 days
release-20250612-234554

**Deployment frequency**

Monthly
averaging 0 days per months

**Deployment failure rate**

0% failure in last 30 days
----------------------------

**Delivery pipeline details**

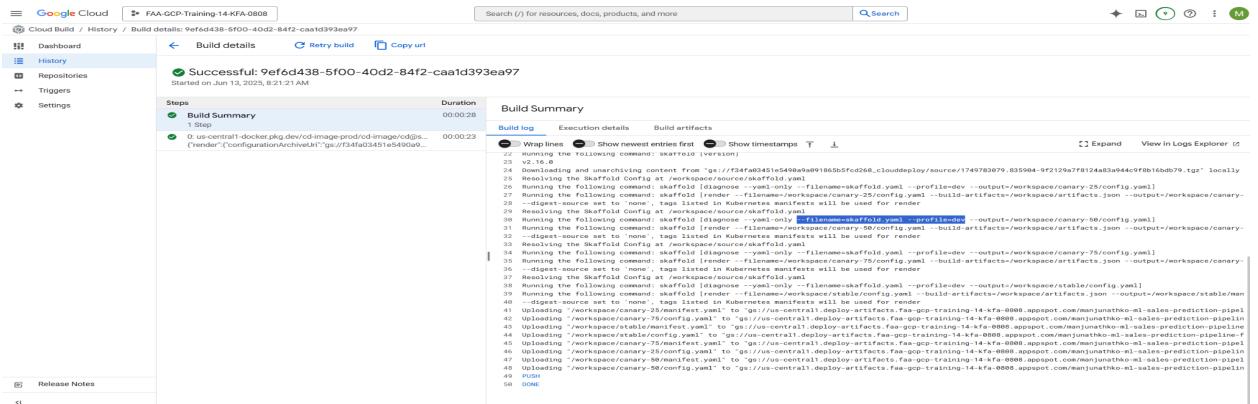
Name	Region
manjunathko-ml-sales-prediction-pipeline	us-central1

**Releases**

Name	Last rollout status	Last rollout started	Description	Created
release-20250612-234554	Successfully deployed to prod-env (latest)	Jun 13, 2025, 6:31:23 AM		Jun 13, 2025, 5:44:26 AM

## 8. Updated the existing CI/CD pipeline to automatically trigger Cloud Deploy releases upon code pushes.

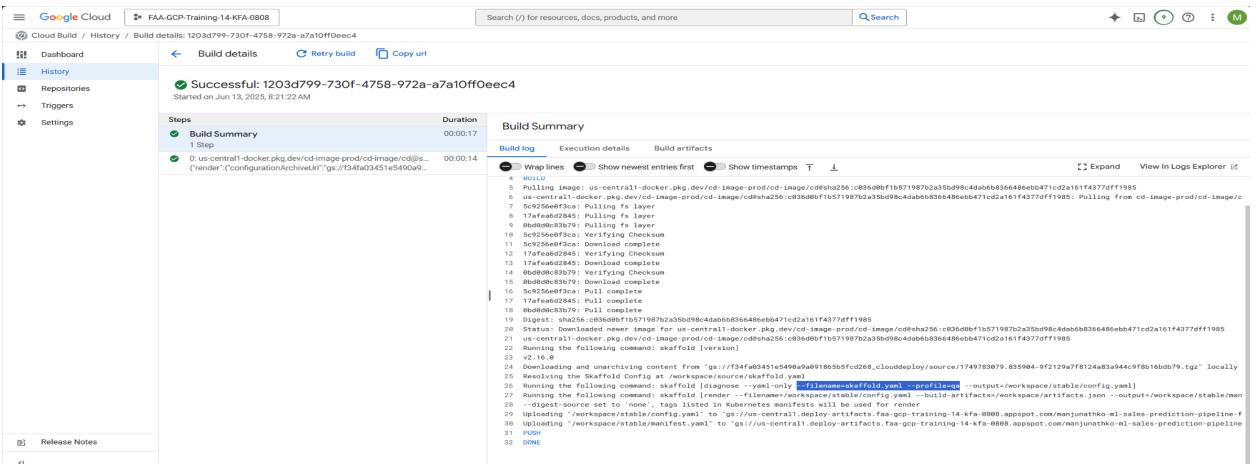
### A. Below are the logs generated during the Dev environment build process



The screenshot shows the Google Cloud Build History interface. A successful build is selected, with the details page open. The build summary indicates it was started on Jun 13, 2025, at 8:21:21 AM. The build log displays the command execution, including steps like pulling images, resolving Skaffold config, and running Skaffold commands to build artifacts and push them to a repository. The log ends with a 'PUSH' command.

```
Build log
22 Running the following command: skaffold [version]
23
24 Downloading and unarchiving content from gs://734fa02451e540ba9e091865fc2d68_clooddeploy/source/1749783079_835984-972129a7f8124a83a044c9fb16bd79.tgz` locally
25 Resolving the Skaffold config at /workspace/source/canary-25/config.yaml
26 Running the following command: skaffold --target=canary-25 --tags listed in Kubernetes manifest will be used for render
27 Running the following command: skaffold [render --filename=/workspace/canary-25/config.yaml --build-artifacts=/workspace/artifacts.json --output=/workspace/canary-25/stable/config.yaml]
28 Resolving the Skaffold Config at /workspace/source/canary-25.yaml
29 Running the following command: skaffold [diagnose --yaml-only --filename=/workspace/canary-90/config.yaml --build-artifacts=/workspace/artifacts.json --output=/workspace/canary-90/stable/config.yaml]
30 Running the following command: skaffold [render --filename=/workspace/canary-90/config.yaml --build-artifacts=/workspace/artifacts.json --output=/workspace/canary-90/stable/config.yaml]
31 -digest-source set to 'none', tags listed in Kubernetes manifest will be used for render
32 Running the following command: skaffold [diagnose --yaml-only --filename=/workspace/canary-75/config.yaml --build-artifacts=/workspace/artifacts.json --output=/workspace/canary-75/stable/config.yaml]
33 Running the following command: skaffold [render --filename=/workspace/canary-75/config.yaml --build-artifacts=/workspace/artifacts.json --output=/workspace/canary-75/stable/config.yaml]
34 Running the following command: skaffold [diagnose --yaml-only --filename=/workspace/canary-75/config.yaml --build-artifacts=/workspace/artifacts.json --output=/workspace/canary-75/stable/config.yaml]
35 Resolving the Skaffold Config at /workspace/source/canary-75.yaml
36 Running the following command: skaffold [render --filename=/workspace/stable/config.yaml --build-artifacts=/workspace/artifacts.json --output=/workspace/stable/config.yaml]
37 Running the following command: skaffold [diagnose --yaml-only --filename=/workspace/stable/config.yaml --build-artifacts=/workspace/artifacts.json --output=/workspace/stable/config.yaml]
38 Uploading /workspace/canary-25/config.yaml to gs://us-central1-deploy-artifacts.firebaseio.google.com/manjunathko-m1-sales-prediction-pipeline
39 Uploading /workspace/canary-90/config.yaml to gs://us-central1-deploy-artifacts.firebaseio.google.com/manjunathko-m1-sales-prediction-pipeline
40 Uploading /workspace/canary-75/config.yaml to gs://us-central1-deploy-artifacts.firebaseio.google.com/manjunathko-m1-sales-prediction-pipeline
41 Uploading /workspace/canary-75/config.yaml to gs://us-central1-deploy-artifacts.firebaseio.google.com/manjunathko-m1-sales-prediction-pipeline
42 Uploading /workspace/canary-75/config.yaml to gs://us-central1-deploy-artifacts.firebaseio.google.com/manjunathko-m1-sales-prediction-pipeline
43 Uploading /workspace/canary-75/config.yaml to gs://us-central1-deploy-artifacts.firebaseio.google.com/manjunathko-m1-sales-prediction-pipeline
44 Uploading /workspace/stable/config.yaml to gs://us-central1-deploy-artifacts.firebaseio.google.com/manjunathko-m1-sales-prediction-pipeline
45 Uploading /workspace/stable/config.yaml to gs://us-central1-deploy-artifacts.firebaseio.google.com/manjunathko-m1-sales-prediction-pipeline
46 Uploading /workspace/canary-90/config.yaml to gs://us-central1-deploy-artifacts.firebaseio.google.com/manjunathko-m1-sales-prediction-pipeline
47 Uploading /workspace/canary-90/config.yaml to gs://us-central1-deploy-artifacts.firebaseio.google.com/manjunathko-m1-sales-prediction-pipeline
48 Uploading /workspace/canary-75/config.yaml to gs://us-central1-deploy-artifacts.firebaseio.google.com/manjunathko-m1-sales-prediction-pipeline
49 PUSH
```

### B. Below are the logs generated during the QA environment build process



The screenshot shows the Google Cloud Build History interface. A successful build is selected, with the details page open. The build summary indicates it was started on Jun 13, 2025, at 8:21:22 AM. The build log displays the command execution, including steps like pulling images, resolving Skaffold config, and running Skaffold commands to build artifacts and push them to a repository. The log ends with a 'PUSH' command.

```
Build log
1 Pulling image: us-central1-docker.pkg.dev/cd-image/prod/cd-image/od@gs://734fa02451e540ba9e091865fc2d68_clooddeploy/source/1749783079_835984-972129a7f8124a83a044c9fb16bd79.tgz` locally
2 Resolving the Skaffold Config at /workspace/source/canary-25.yaml
3 Running the following command: skaffold [render --yaml-only --filename=/workspace/canary-25/config.yaml --build-artifacts=/workspace/artifacts.json --output=/workspace/canary-25/stable/config.yaml]
4 Resolving the Skaffold Config at /workspace/source/canary-90.yaml
5 Running the following command: skaffold [render --filename=/workspace/canary-90/config.yaml --build-artifacts=/workspace/artifacts.json --output=/workspace/canary-90/stable/config.yaml]
6 -digest-source set to 'none', tags listed in Kubernetes manifest will be used for render
7 Running the following command: skaffold [diagnose --yaml-only --filename=/workspace/canary-75/config.yaml --build-artifacts=/workspace/artifacts.json --output=/workspace/canary-75/stable/config.yaml]
8 Uploading /workspace/canary-25/config.yaml to gs://us-central1-deploy-artifacts.firebaseio.google.com/manjunathko-m1-sales-prediction-pipeline
9 Uploading /workspace/canary-90/config.yaml to gs://us-central1-deploy-artifacts.firebaseio.google.com/manjunathko-m1-sales-prediction-pipeline
10 Uploading /workspace/canary-75/config.yaml to gs://us-central1-deploy-artifacts.firebaseio.google.com/manjunathko-m1-sales-prediction-pipeline
11 Uploading /workspace/stable/config.yaml to gs://us-central1-deploy-artifacts.firebaseio.google.com/manjunathko-m1-sales-prediction-pipeline
12 Uploading /workspace/canary-90/config.yaml to gs://us-central1-deploy-artifacts.firebaseio.google.com/manjunathko-m1-sales-prediction-pipeline
13 Uploading /workspace/canary-75/config.yaml to gs://us-central1-deploy-artifacts.firebaseio.google.com/manjunathko-m1-sales-prediction-pipeline
14 Uploading /workspace/stable/config.yaml to gs://us-central1-deploy-artifacts.firebaseio.google.com/manjunathko-m1-sales-prediction-pipeline
15 Uploading /workspace/canary-75/config.yaml to gs://us-central1-deploy-artifacts.firebaseio.google.com/manjunathko-m1-sales-prediction-pipeline
16 Uploading /workspace/canary-90/config.yaml to gs://us-central1-deploy-artifacts.firebaseio.google.com/manjunathko-m1-sales-prediction-pipeline
17 Uploading /workspace/canary-75/config.yaml to gs://us-central1-deploy-artifacts.firebaseio.google.com/manjunathko-m1-sales-prediction-pipeline
18 Uploading /workspace/stable/config.yaml to gs://us-central1-deploy-artifacts.firebaseio.google.com/manjunathko-m1-sales-prediction-pipeline
19 Digest: sha256:c89d0ff8b105719782a3a3b09c4dabb0b86486eb0b71c22a161f4737dff1985
20 Status: Downloaded newer image for us-central1-docker.pkg.dev/cd-image/prod/cd-image/od@gs://734fa02451e540ba9e091865fc2d68_clooddeploy/source/1749783079_835984-972129a7f8124a83a044c9fb16bd79.tgz` locally
21 Resolving the Skaffold Config at /workspace/source/canary-25.yaml
22 Running the following command: skaffold [diagnose --yaml-only --filename=/workspace/canary-25/config.yaml --build-artifacts=/workspace/artifacts.json --output=/workspace/canary-25/stable/config.yaml]
23 Uploading /workspace/canary-25/config.yaml to gs://us-central1-deploy-artifacts.firebaseio.google.com/manjunathko-m1-sales-prediction-pipeline
24 Uploading /workspace/stable/config.yaml to gs://us-central1-deploy-artifacts.firebaseio.google.com/manjunathko-m1-sales-prediction-pipeline
25 Uploading /workspace/canary-90/config.yaml to gs://us-central1-deploy-artifacts.firebaseio.google.com/manjunathko-m1-sales-prediction-pipeline
26 Uploading /workspace/canary-75/config.yaml to gs://us-central1-deploy-artifacts.firebaseio.google.com/manjunathko-m1-sales-prediction-pipeline
27 Uploading /workspace/stable/config.yaml to gs://us-central1-deploy-artifacts.firebaseio.google.com/manjunathko-m1-sales-prediction-pipeline
28 Uploading /workspace/canary-90/config.yaml to gs://us-central1-deploy-artifacts.firebaseio.google.com/manjunathko-m1-sales-prediction-pipeline
29 Uploading /workspace/canary-75/config.yaml to gs://us-central1-deploy-artifacts.firebaseio.google.com/manjunathko-m1-sales-prediction-pipeline
30 Uploading /workspace/stable/config.yaml to gs://us-central1-deploy-artifacts.firebaseio.google.com/manjunathko-m1-sales-prediction-pipeline
31 PUSH
```

## C. Below are the logs generated during the Prod environment build process

The screenshot shows the Google Cloud Build interface. On the left, there's a sidebar with 'Dashboard', 'History' (which is selected), 'Repositories', 'Triggers', and 'Settings'. The main area shows a successful build summary for a Docker image. The build log is displayed in a large text area, showing the command history and output of the build process.

```

Cloud Build / History / Build details: Oed0baac-4031-4e5e-9c04-c31b5100fc88
Successful: Oed0baac-4031-4e5e-9c04-c31b5100fc88
Started on Jun 13, 2023, 8:21:22 AM
Duration: 00:00:24
Build Summary
1 Step
Build log Execution details Build artifacts
Show newest entries first Show timestamps Expand View in Logs Explorer ↗
4  null
5  Pulling image: us-central1-docker.pkg.dev/cd-image-prod/cd-image/cd@sha256:c836d0bf1b571987b2a35bd98c4dab6b8366486eb471cd2a161f4377dff1985
6  us-central1-docker.pkg.dev/cd-image-prod/cd-image/cd@sha256:c836d0bf1b571987b2a35bd98c4dab6b8366486eb471cd2a161f4377dff1985: Pulling from cd-image-prod/cd-image
7  Scanning: us-central1-docker.pkg.dev/cd-image-prod/cd-image/cd@sha256:c836d0bf1b571987b2a35bd98c4dab6b8366486eb471cd2a161f4377dff1985
8  0@sha256:d3b79: Pulling fs layer
9  0@sha256:d3b79: Pulling fs layer
10  0@sha256:d3b79: Pulling fs layer
11  0@sha256:d3b79: Verifying Checksum
12  0@sha256:d3b79: Download complete
13  0@sha256:d3b79: Pulling fs layer
14  0@sha256:d3b79: Verifying Checksum
15  0@sha256:d3b79: Download complete
16  0@sha256:d3b79: Pull complete
17  0@sha256:d3b79: Pull complete
18  0@sha256:d3b79: Pull complete
19  0@sha256:d3b79: Pull complete
20  Status: Downloaded newer image for us-central1-docker.pkg.dev/cd-image-prod/cd-image/cd@sha256:c836d0bf1b571987b2a35bd98c4dab6b8366486eb471cd2a161f4377dff1985
21  us-central1-docker.pkg.dev/cd-image-prod/cd-image/cd@sha256:c836d0bf1b571987b2a35bd98c4dab6b8366486eb471cd2a161f4377dff1985
22  Running the following command: skaffold {version}
23  v2.16.0
24  Resolving and unarchiving content from "gs://r74fed2845e1c49ab9e91865b5fc2d88_clouddescriptor/source/skafolder.yaml"
25  Resolving the Skaffold Config at "/workspace/source/skafolder.yaml"
26  Running the following command: skaffold {diagnose --yaml-only --filename=skafolder.yaml --profile=prod --output=/workspace/stable/config.yaml}
27  Running the following command: skaffold {render --filename=/workspace/stable/config.yaml --build-artifacts=/workspace/artifacts.json --output=/workspace/stable/main}
28  --digest-source set to 'none', tags listed in Kubernetes manifests will be used for render
29  Uploading "/workspace/stable/manifest.yaml" to "gs://us-central1-deploy-artifacts.faa-gcp-training-14-kfa-0888.appspot.com/manjunathko-m1-sales-prediction-pipeline-f"
30  Uploading "/workspace/stable/config.yaml" to "gs://us-central1-deploy-artifacts.faa-gcp-training-14-kfa-0888.appspot.com/manjunathko-m1-sales-prediction-pipeline-f"
31  PUSH
32  DONE

```

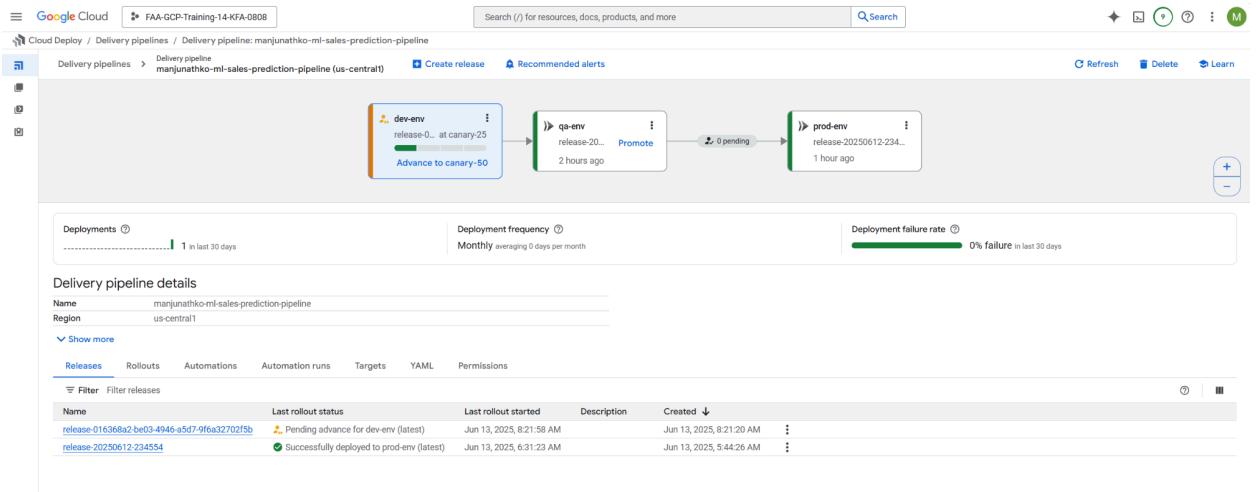
## 9. Among the three Cloud Run services, only the Dev environment service has been invoked. The QA and Prod services are pending traffic shifts as part of the ongoing Canary deployment process.

The screenshot shows the Google Cloud Run interface. On the left, there's a sidebar with 'Cloud Run', 'Services' (selected), 'Jobs', and 'Domain mappings'. The main area shows a table of deployed services. The 'app-dev-manju-m1-sales-prediction' service is highlighted with a red box.

Name	Deployment type	Req/sec	Region	Authentication	Ingress	Last deployed	Deployed by	Recommendation
app-dev-manju-m1-sales-prediction	(A) Container	0	us-central1	Allow unauthenticated	All	8 minutes ago	954297282737-compute@developer.gserviceaccount.com	-
app-prod-manju-m1-sales-prediction	(A) Container	0	us-central1	Require authentication	All	1 hour ago	954297282737-compute@developer.gserviceaccount.com	-
app-qa-manju-m1-sales-prediction	(A) Container	0	us-central1	Require authentication	All	2 hours ago	954297282737-compute@developer.gserviceaccount.com	-
cloud-run-app	(A) Container	0	us-central1	Allow unauthenticated	All	19 hours ago	cd-tut-build-sa@faa-gcp-training-14-kfa-0808.lam.gserviceaccount.com	-
cloud-run-app-12	(A) Container	0	us-central1	Allow unauthenticated	All	19 hours ago	cd-tut-build-sa@faa-gcp-training-14-kfa-0808.lam.gserviceaccount.com	-
cloud-run-app-hina	(A) Container	0	us-central1	Allow unauthenticated	All	19 hours ago	cd-tut-build-sa@faa-gcp-training-14-kfa-0808.lam.gserviceaccount.com	-
cloud-run-app-manju	(A) Container	0	us-central1	Allow unauthenticated	All	19 hours ago	cd-tut-build-sa@faa-gcp-training-14-kfa-0808.lam.gserviceaccount.com	-
cloud-run-app-sanskar	(A) Container	0	us-central1	Allow unauthenticated	All	16 hours ago	cd-tut-build-sa@faa-gcp-training-14-kfa-0808.lam.gserviceaccount.com	-
cloud-run-app-vg1	(A) Container	0	us-central1	Allow unauthenticated	All	19 hours ago	cd-tut-build-sa@faa-gcp-training-14-kfa-0808.lam.gserviceaccount.com	-
cloud-run-m1-sales-prediction-app	(A) Container	0	us-central1	Allow unauthenticated	All	1 hour ago	cd-tut-build-sa@faa-gcp-training-14-kfa-0808.lam.gserviceaccount.com	-
jk-cloud-run-app	(A) Container	0	us-central1	Allow unauthenticated	All	20 hours ago	cd-tut-build-sa@faa-gcp-training-14-kfa-0808.lam.gserviceaccount.com	-

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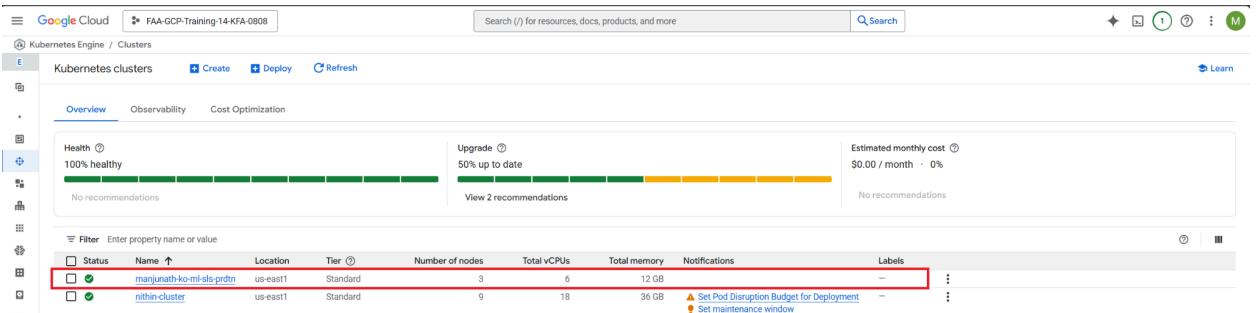
10. The delivery pipeline has routed 25% of traffic to the Dev environment, while the QA and Prod environments continue to serve the last stable release.



## **Task 3**

## Deploy Sales Prediction Application to GKE(Manually)

## 1. Created a Standard mode Kubernetes cluster using GKE.



## 2. Built a docker image

### 3. Perform gcloud authentication to access GCP resources.

```
manjunath_ko@cloudshell:~/capstone/ml-sales-prediction/task3 (faa-gcp-training-14-kfa-0808)$ gcloud auth configure-docker us-east1-docker.pkg.dev
WARNING: Your config file at [/home/manjunath_ko/.docker/config.json] contains these credential helper entries:
{
  "credHelpers": {
    "gcr.io": "gcloud",
    "us.gcr.io": "gcloud",
    "eu.gcr.io": "gcloud",
    "asia.gcr.io": "gcloud",
    "staging-k8s.gcr.io": "gcloud",
    "marketplace.gcr.io": "gcloud",
    "africa-south1-docker.pkg.dev": "gcloud",
    "asia-docker.pkg.dev": "gcloud",
    "asia-east1-docker.pkg.dev": "gcloud",
    "asia-east2-docker.pkg.dev": "gcloud",
    "asia-northeast1-docker.pkg.dev": "gcloud",
    "asia-northeast2-docker.pkg.dev": "gcloud",
    "asia-northeast3-docker.pkg.dev": "gcloud",
    "asia-south1-docker.pkg.dev": "gcloud",
    "asia-south2-docker.pkg.dev": "gcloud",
    "asia-southeast1-docker.pkg.dev": "gcloud",
    "asia-southeast2-docker.pkg.dev": "gcloud",
    "australia-southeast1-docker.pkg.dev": "gcloud",
    "australia-southeast2-docker.pkg.dev": "gcloud",
    "docker-europe-west3.rep.pkg.dev": "gcloud",
    "docker-europe-west8.rep.pkg.dev": "gcloud",
    "docker-europe-west9.rep.pkg.dev": "gcloud",
    "docker-me-central2.rep.pkg.dev": "gcloud",
    "docker-us-central1.rep.pkg.dev": "gcloud",
    "docker-us-central2.rep.pkg.dev": "gcloud",
    "docker.us-east1.rep.pkg.dev": "gcloud",
    "docker.us-east4.rep.pkg.dev": "gcloud",
    "docker.us-east5.rep.pkg.dev": "gcloud",
    "docker.us-east7.rep.pkg.dev": "gcloud",
    "docker.us-south1.rep.pkg.dev": "gcloud",
    "docker.us-west1.rep.pkg.dev": "gcloud",
    "docker.us-west2.rep.pkg.dev": "gcloud",
    "docker.us-west3.rep.pkg.dev": "gcloud",
    "docker.us-west4.rep.pkg.dev": "gcloud",
    "europe-central2-docker.pkg.dev": "gcloud",
  }
}
```

### 4. Uploaded the container image to Google Artifact Registry.

```
manjunath_ko@cloudshell:~/capstone/ml-sales-prediction/task3 (faa-gcp-training-14-kfa-0808)$ docker push us-east1-docker.pkg.dev/faa-gcp-training-14-kfa-0808/manjunathko-kub-img-repo/manjunathko-ml-sales-prdtcn:v1
The push refers to repository [us-east1-docker.pkg.dev/faa-gcp-training-14-kfa-0808/manjunathko-kub-img-repo/manjunathko-ml-sales-prdtcn]
f3186c9331: Pushed
6037671a44: Pushed
89d8fcfb24c: Pushed
3adcafae931: Pushed
9447778593: Pushed
7939150b1: Pushed
d731454f914: Pushed
905dadfa3a0ed: Pushed
7fd72a7d1a8e: Pushed
7f123a25866413014f84f2de80023de7bbaab9e3d3f972af16e5396cfaf0b0c6fcab5eab size: 2199
manjunath_ko@cloudshell:~/capstone/ml-sales-prediction/task3 (faa-gcp-training-14-kfa-0808)$
```

The screenshot shows the Google Cloud Artifact Registry interface. The top navigation bar includes icons for Home, Compute Engine, Storage, Functions, Big Data, Container Registry, and Monitoring. Below the navigation, a breadcrumb trail indicates the path: Artifactory Registry / Project: faa-gcp-training-14-kfa-0808 / Location: us-east1 / Repository: manjunathko-kub-img-repo. The main content area displays the 'Repository Details' section for the 'manjunathko-kub-img-repo'. It shows the format as Docker and the type as Standard. A 'Show more' link is visible. A table lists a single item: 'manjunathko-ml-sales-prdtcn' with a connection status of '-' and created/updated times of 'Just now'. A 'Copy path' button is also present.

### 5. Deployed the Docker image as a pod on a GKE cluster node.

## 6. Exposed the application port via a Kubernetes Service(Load balancer) and accessed it using the web preview.