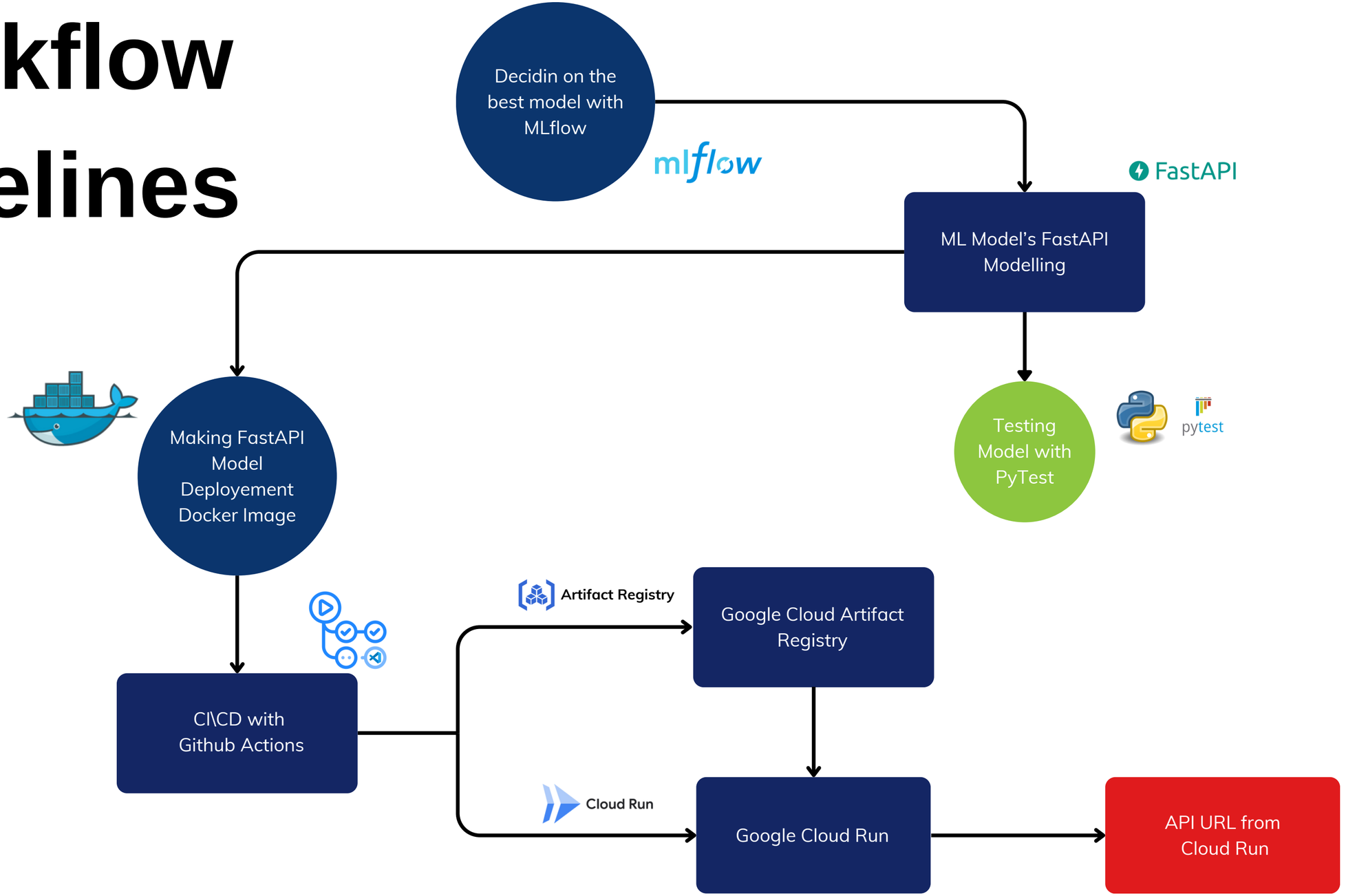
MLOps End-to-End Project

Presented by Ezgi Demirer

ISTDSA-MLOPS Final Project

Workflow Pipelines



Credit Approval Prediction with MLOps

Vision

- The Credit Approval Prediction model aims to streamline loan approval processes by leveraging machine learning for accurate and fair credit risk assessment, helping financial institutions make data-driven decisions efficiently.

Mission

- The Credit Approval Prediction model is designed to enhance the efficiency and accuracy of loan approval processes by leveraging CI/CD pipelines with GitHub Actions and deploying on Google Cloud Run. This ensures seamless integration, scalability, and real-time credit risk assessment for financial institutions.

Goals

- Improve the credit approval prediction process using machine learning to enhance financial institutions' risk assessment procedures.
- Provide a reliable, transparent, and accessible service to accelerate financial decision-making.
- Promote data-driven decision-making to establish fair and objective credit evaluation systems.

Data

	income	credit_score	debt_ratio	age	employment_years	approved
0	9270	765	0.79	30	27	0
1	2860	833	0.74	57	17	0
2	7390	704	0.25	25	33	1
3	7191	812	0.34	22	21	1
4	13964	532	0.73	26	10	0

This dataset contains 1000 rows and 6 columns.

Full dataset: https://github.com/EzgiDemirer/mlops_endtoend

Approved: Credit approval status (0 = Rejected, 1 = Approved)	Debt Ratio: Ratio of debt to income
Income: Applicant's income	Age: Applicant's age
Credit Score: Credit rating score	Employment Years: Length of employment in years

MLflow

Model Selection Evaluation

Overall Performance (Accuracy, F1 Score, Recall)

- XGBoost achieved the highest Accuracy (0.985) score.
- It also performed well in F1 Score (0.96) and Recall (0.93).
- AdaBoost and DecisionTree showed competitive performance in Recall and F1 Score.

Selection Based on Business Requirements

- If reducing false negatives is crucial, models with high Recall should be preferred.
- If overall accuracy is the priority, XGBoost is the best choice.
- If balance is important, F1 Score should be considered (XGBoost and AdaBoost perform well here).

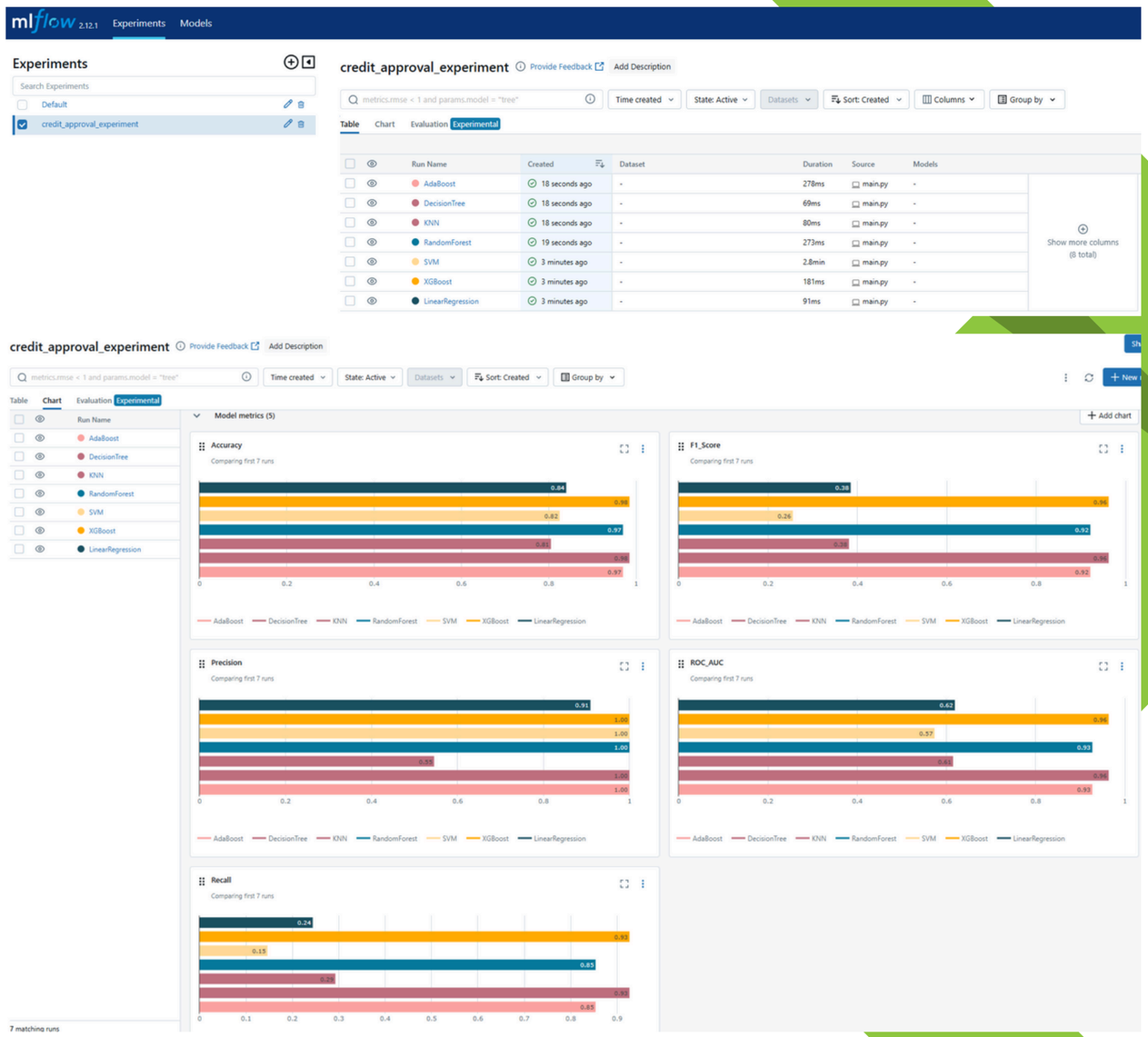
MLOps and Production Suitability

- XGBoost is a fast and efficient model, well-suited for production environments.
- AdaBoost and DecisionTree train faster but may not scale as well as XGBoost for large datasets.

Conclusion:

For an end-to-end MLOps project, the best choice is **XGBoost**.

- High overall performance
- Lower error costs
- Optimized for production deployment
- Alternatively, if speed and model size are priorities, AdaBoost or DecisionTree can be considered, but XGBoost delivers the best results.



FastAPI

Credit Approval Prediction API with FastAPI

FastAPI is a modern, high-performance web framework for building APIs with Python.

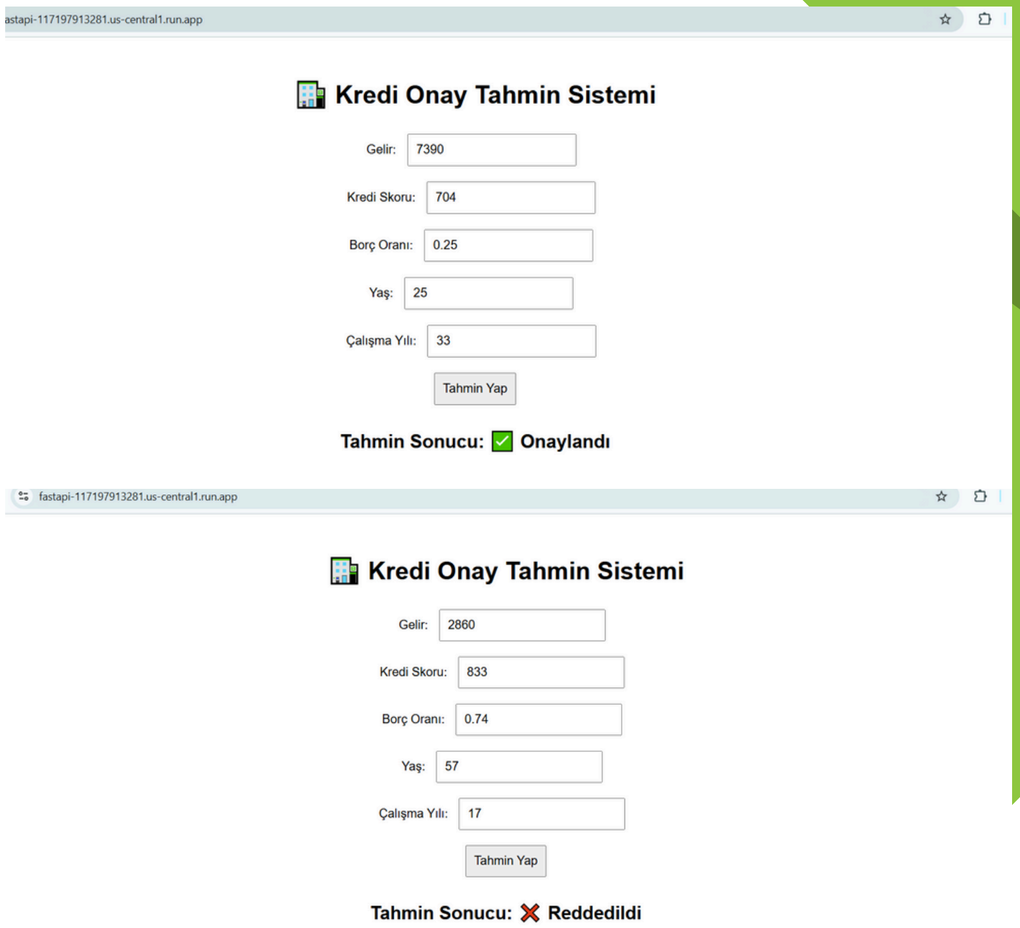
This API predicts credit approval based on applicant details such as income, credit score, debt ratio, age, and employment years.

Example Predictions:

- Approved (Green Check)
- Rejected (Red Cross)

Users input their financial details.

- The API processes the data and makes a prediction.
- The result is either Approved or Rejected.



CI/CD PROCESSES

GitHub Actions

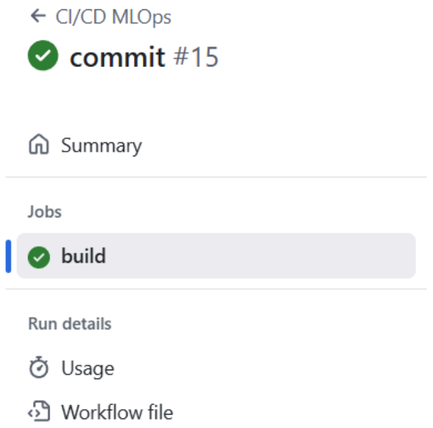
Build Processes in GitHub Actions

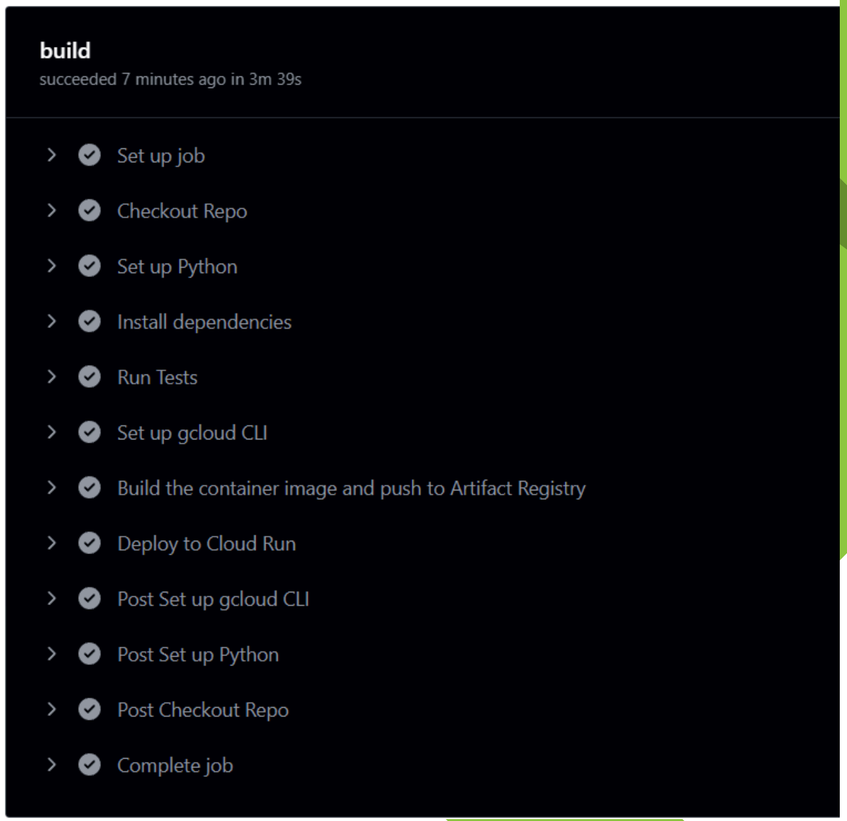
This build workflow automates the MLOps pipeline, ensuring efficient and repeatable deployments.

Key steps in the GitHub Actions build process:

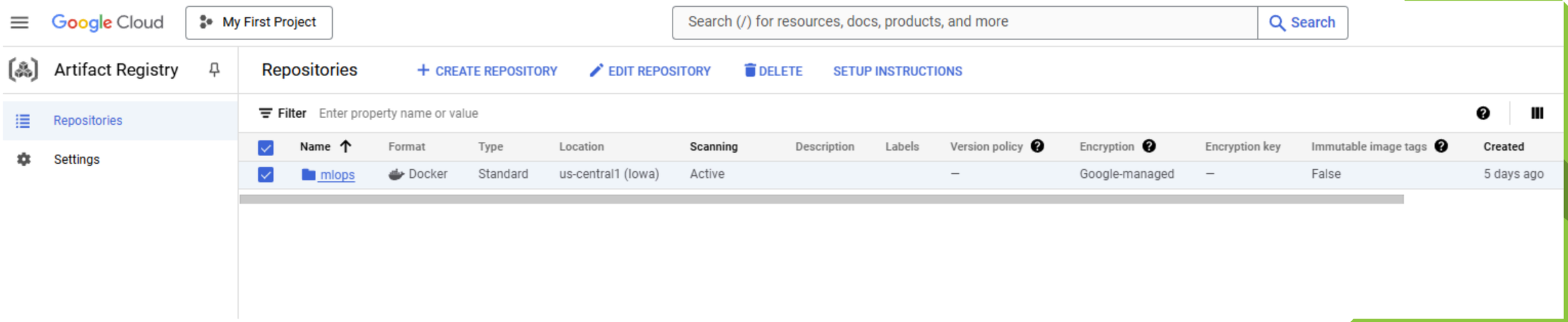
- Set up the environment (Python, dependencies, Google Cloud CLI)
- Run unit tests to validate the code
- Build and push the container image to Artifact Registry
- Deploy the model/service to Google Cloud Run

This setup ensures continuous integration and deployment (CI/CD) for machine learning applications.





Artifact Registry



Google Cloud Artifact Registry

- Artifact Registry is a fully managed repository for storing and managing Docker images and other artifacts used in CI/CD pipelines.
- In MLOps, Artifact Registry helps store containerized machine learning models, ensuring secure and scalable deployments.
- It integrates seamlessly with CI/CD workflows, enabling automated builds and deployments with GitHub Actions.

Cloud Run

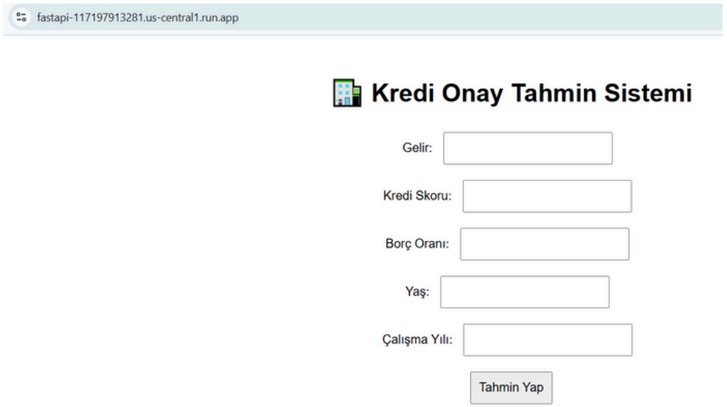
Deploying FastAPI on Google Cloud Run

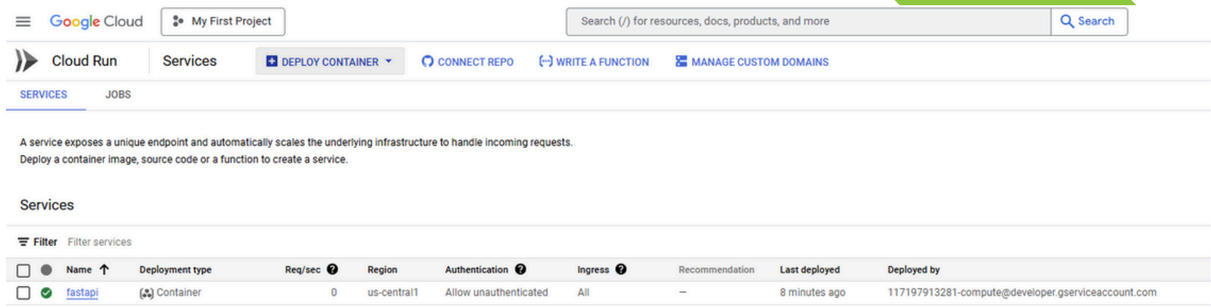
Google Cloud Run is a fully managed serverless platform that allows deploying containerized applications with automatic scaling. Our FastAPI application has been successfully deployed and is now accessible via a unique URL.

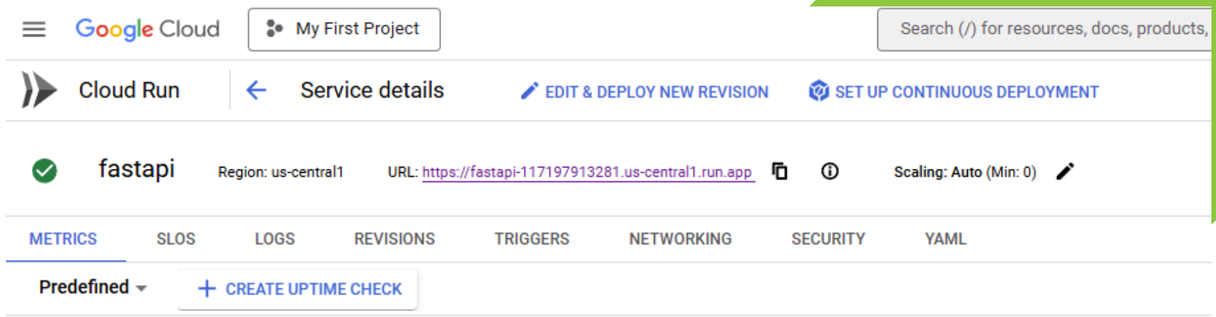
Key Features of Cloud Run Deployment:

- Scalability: Automatically scales up and down based on traffic.
- Security: Supports authentication and networking configurations.
- Continuous Deployment: Integrated with GitHub Actions for seamless updates.

FastAPI is live at: https://fastapi-117197913281.us-central1.run.app







Thank You

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