📋 MLOps Assignment 2 — Group 81

Project: Binary Image Classification for a Pet Adoption Platform
Repository: BinaryImageClassification_For_A_Pet_Adoption_Platform
Date: February 21, 2026

🎬 Screen Recording — Complete MLOps Project

▶ WATCH DEMO GOOGLE DRIVE

🔗 **Link:** https://drive.google.com/file/d/1WXSlw_qqexVvShbrRsWuiAA-MoOgkXDY/view?usp=sharing

👥 Contributors

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Table of Contents

M1 — Source Code

Component	GitHub Link
Repository (main)	https://github.com/vishalvishal099/BinaryImageClassification_For_A_Pet_Adoption_Platform
Model Training	https://github.com/vishalvishal099/BinaryImageClassification_For_A_Pet_Adoption_Platform/blob/main/src/training/train.py
FastAPI Inference App	https://github.com/vishalvishal099/BinaryImageClassification_For_A_Pet_Adoption_Platform/blob/main/src/api/main.py
Preprocessing	https://github.com/vishalvishal099/BinaryImageClassification_For_A_Pet_Adoption_Platform/blob/main/src/data/preprocess.py
DVC Pipeline Config	https://github.com/vishalvishal099/BinaryImageClassification_For_A_Pet_Adoption_Platform/blob/main/dvc.yaml
DVC Remote Config	https://github.com/vishalvishal099/BinaryImageClassification_For_A_Pet_Adoption_Platform/blob/main/.dvc/config
Kubernetes Manifests	https://github.com/vishalvishal099/BinaryImageClassification_For_A_Pet_Adoption_Platform/tree/main/k8s/local
ArgoCD Application	https://github.com/vishalvishal099/BinaryImageClassification_For_A_Pet_Adoption_Platform/blob/main/k8s/argocd-application.yaml
Prometheus Config	https://github.com/vishalvishal099/BinaryImageClassification_For_A_Pet_Adoption_Platform/blob/main/monitoring/prometheus.yml
Metrics Server	https://github.com/vishalvishal099/BinaryImageClassification_For_A_Pet_Adoption_Platform/blob/main/scripts/push_metrics.py
start_all.sh	https://github.com/vishalvishal099/BinaryImageClassification_For_A_Pet_Adoption_Platform/blob/main/start_all.sh
Unit Tests	https://github.com/vishalvishal099/BinaryImageClassification_For_A_Pet_Adoption_Platform/tree/main/tests

M2 — CI/CD Pipelines

GitHub Actions — CI Pipeline

Item	Link
CI Workflow File	https://github.com/vishalvishal099/BinaryImageClassification_For_A_Pet_Adoption_Platform/blob/main/.github/workflows/ci.yml
CI Pipeline Runs	https://github.com/vishalvishal099/BinaryImageClassification_For_A_Pet_Adoption_Platform/actions/workflows/ci.yml

CI Jobs:

1. **Lint & Code Quality** — black, isort, flake8, mypy

2. **Unit Tests** — pytest (35 tests, coverage report → Codecov)
3. **Build Docker Image** — multi-stage build, push to GHCR
4. **Integration Tests** — spin up container, test all endpoints
5. **Security Scan** — Trivy vulnerability scan → GitHub Security tab

GitHub Actions — CD Pipeline (GitOps)

Item	Link
CD Workflow File	https://github.com/vishalvishal099/BinaryImageClassification_For_A_Pet_Adoption_Platform/blob/main/.github/workflows/cd.yml
CD Pipeline Runs	https://github.com/vishalvishal099/BinaryImageClassification_For_A_Pet_Adoption_Platform/actions/workflows/cd.yml

CD GitOps Flow:

```
git push → CI Pipeline passes
    └──▶ CD: update k8s/local/deployment.yaml with new image SHA
         └──▶ git commit [skip ci] → push to main
              └──▶ ArgoCD detects change → auto-syncs to Minikube cluster
```

CD Jobs:

1. **update-manifest** — updates image tag in `k8s/local/deployment.yaml`, commits & pushes `[skip ci]`
2. **smoke-tests** — health check, predict endpoint, metrics endpoint
3. **notify** — reports pipeline success/failure

M3 — Container Registry

Item	Link
GHCR Package	https://github.com/vishalvishal099/BinaryImageClassification_For_A_Pet_Adoption_Platform/pkgs/container/binaryimageclassification_for_a_pet_adopti
Docker Pull Command	`docker pull ghcr.io/vishalvishal099/binaryimageclassification_for_a_pet_adoption_platform:latest`
Dockerfile	https://github.com/vishalvishal099/BinaryImageClassification_For_A_Pet_Adoption_Platform/blob/main/Dockerfile

M4 — Experiment Tracking & Data Versioning (Dagshub)

Item	Link
Dagshub Repository	https://dagshub.com/vishalvishal099/BinaryImageClassification_For_A_Pet_Adoption_Platform
MLflow Experiment Tracking (Dagshub)	https://dagshub.com/vishalvishal099/BinaryImageClassification_For_A_Pet_Adoption_Platform.mlflow
DVC Data Remote (Dagshub)	https://dagshub.com/vishalvishal099/BinaryImageClassification_For_A_Pet_Adoption_Platform.dvc

MLflow Details:

- Model registered as: `CatsDogsClassifier` → **Production** stage
- Artifacts logged: `best_model.pt`, `loss_curves.png`, `confusion_matrix.npy`
- Local tracking server: `http://localhost:5001`

DVC Details:

- Pull data: `dvc pull`
- Run pipeline: `dvc repro`
- Pipeline stages: `preprocess → train → evaluate`

M5 — Local Services

All services are started with `./start_all.sh`

Service	Local URL	Description
MLflow UI	http://localhost:5001	Experiment tracking & model registry
FastAPI (Inference)	http://localhost:8000	REST API — `/predict`, `/health`, `/metrics`
FastAPI Docs (Swagger)	http://localhost:8000/docs	Interactive API documentation
FastAPI Health	http://localhost:8000/health	Health check endpoint

Service	Local URL	Description
FastAPI Metrics	http://localhost:8000/metrics	Prometheus scrape endpoint
Prometheus	http://localhost:9090/graph	Metrics collection & querying
Grafana Dashboard	http://localhost:3000/d/pet-adoption-ml-v2	ML observability dashboard
Grafana Home	http://localhost:3000	(admin / admin)
Metrics Server	http://localhost:8081/metrics	31 metric families, 60+ time series
ArgoCD UI	https://localhost:9443	GitOps CD controller (admin / see `start_all.sh` output)

Documentation Links

Document	GitHub Link	Des
README	https://github.com/vishalvishal099/BinaryImageClassification_For_A_Pet_Adoption_Platform/blob/main/README.md	Pro ove qui Git
Architecture Diagram	https://github.com/vishalvishal099/BinaryImageClassification_For_A_Pet_Adoption_Platform/blob/main/docs/ARCHITECTURE_DIAGRAM.md	Full ML arc witl diag
Setup Guide	https://github.com/vishalvishal099/BinaryImageClassification_For_A_Pet_Adoption_Platform/blob/main/docs/SETUP_GUIDE.md	Ste loca K8s mo
Documentation	https://github.com/vishalvishal099/BinaryImageClassification_For_A_Pet_Adoption_Platform/blob/main/docs/DOCUMENTATION.md	Det tec doc
start_all.sh	https://github.com/vishalvishal099/BinaryImageClassification_For_A_Pet_Adoption_Platform/blob/main/start_all.sh	Sin stai ser

🗂️ Repository Structure Summary

```
BinaryImageClassification_For_A_Pet_Adoption_Platform/
├── .github/workflows/
│   ├── ci.yml                    ← CI Pipeline (lint → test → build → push → scan)
│   └── cd.yml                    ← CD Pipeline (GitOps manifest update → ArgoCD sync)
├── src/
│   ├── training/train.py          ← Model training (SimpleCNN, PyTorch)
│   ├── api/main.py                ← FastAPI inference service
│   └── data/preprocess.py         ← Data preprocessing
├── k8s/local/
│   ├── deployment.yaml            ← K8s deployment (image tag auto-updated by CD)
│   ├── service.yaml
│   ├── configmap.yaml
│   └── namespace.yaml
├── k8s/argocd-application.yaml   ← ArgoCD GitOps app (watches k8s/local/)
├── monitoring/prometheus.yml     ← Prometheus scrape config
├── scripts/push_metrics.py       ← Metrics server (31 families, port 8081)
├── dvc.yaml                      ← DVC pipeline stages
├── .dvc/config                   ← DVC remote → Dagshub
├── start_all.sh                  ← Start all services (MLflow, FastAPI, Prometheus, Grafana, ArgoCD)
├── Dockerfile                    ← Multi-stage Docker build
├── docs/
│   ├── ARCHITECTURE_DIAGRAM.md
│   ├── SETUP_GUIDE.md
│   └── DOCUMENTATION.md
└── MLOps_Assignment_2_Group_81.md
```

Generated: February 21, 2026 | Group 81