■ Deep Dive into MLOps + MLflow

MLOps (Machine Learning + Operations) is the backbone of taking ML models from experimentation to production. It enables seamless collaboration between Data Scientists, ML Engineers, and DevOps. Below are detailed notes along with practical MLflow screenshots for better understanding – perfect for interview prep ■.

■ What is MLOps?

MLOps is the combination of Machine Learning (ML) and Operations (Ops). It's a practice to streamline the deployment, monitoring, and maintenance of ML models in production. It ensures that models are not just trained but also deployed, monitored, and continuously improved.

■ Why MLOps?

- Faster deployment of ML models ■ - Continuous monitoring of performance ■ - Collaboration between Data Science + Ops teams ■ - Retraining models with new data ■ - Handling Model Versioning (v1 → v2 → v3 …) ■ - Preventing Model Degradation by rolling back if needed ■

■ Key Components of MLOps

1■■ Continuous Integration (CI) 2■■ Model Integration & Testing 3■■ Model Deployment (App Server / Production Server) 4■■ Continuous Monitoring & Logging 5■■ Model Updating with new data

■ MLOps Workflow

1. Data Collection ■ 2. Model Training ■ 3. Model Deployment ■ 4. Model Monitoring ■ 5. Continuous Updates ■

■ CI/CD Pipeline in MLOps

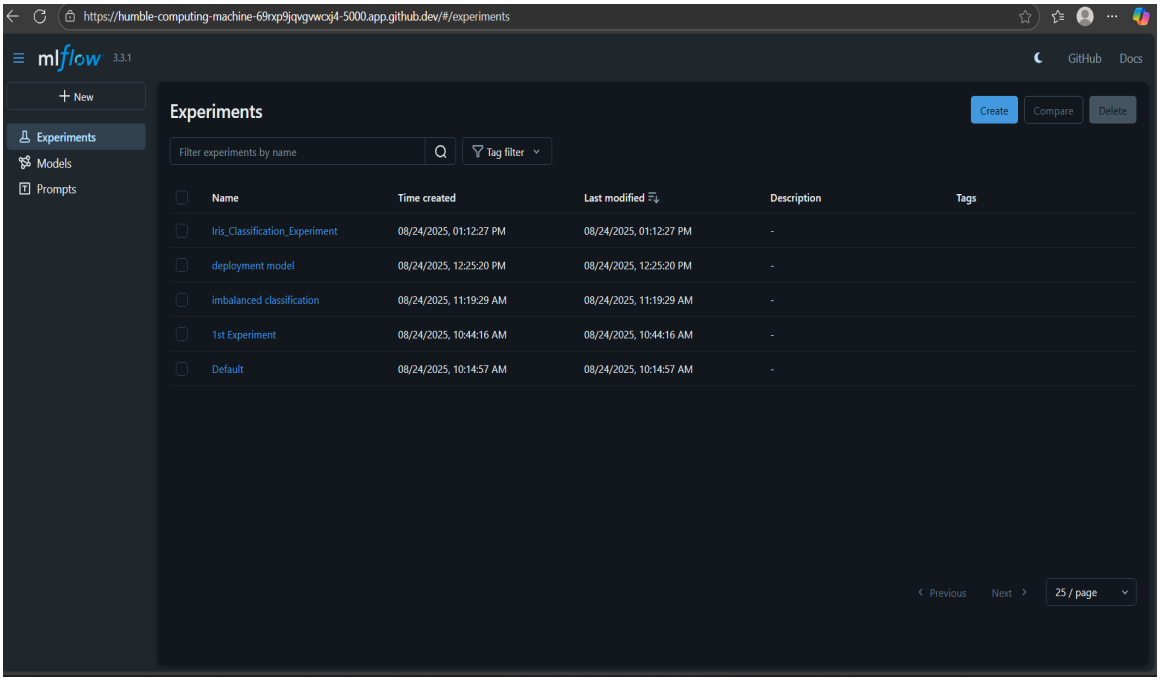
- **CI (Continuous Integration):** Code changes (data preprocessing, feature engineering, training pipeline) are automatically tested & versioned. - **CD (Continuous Deployment/Delivery):** Models are automatically deployed to production servers after validation. This ensures quick rollouts, rollback on failure, and minimal downtime (like Amazon, PhonePe, GPay – 24/7 uptime).

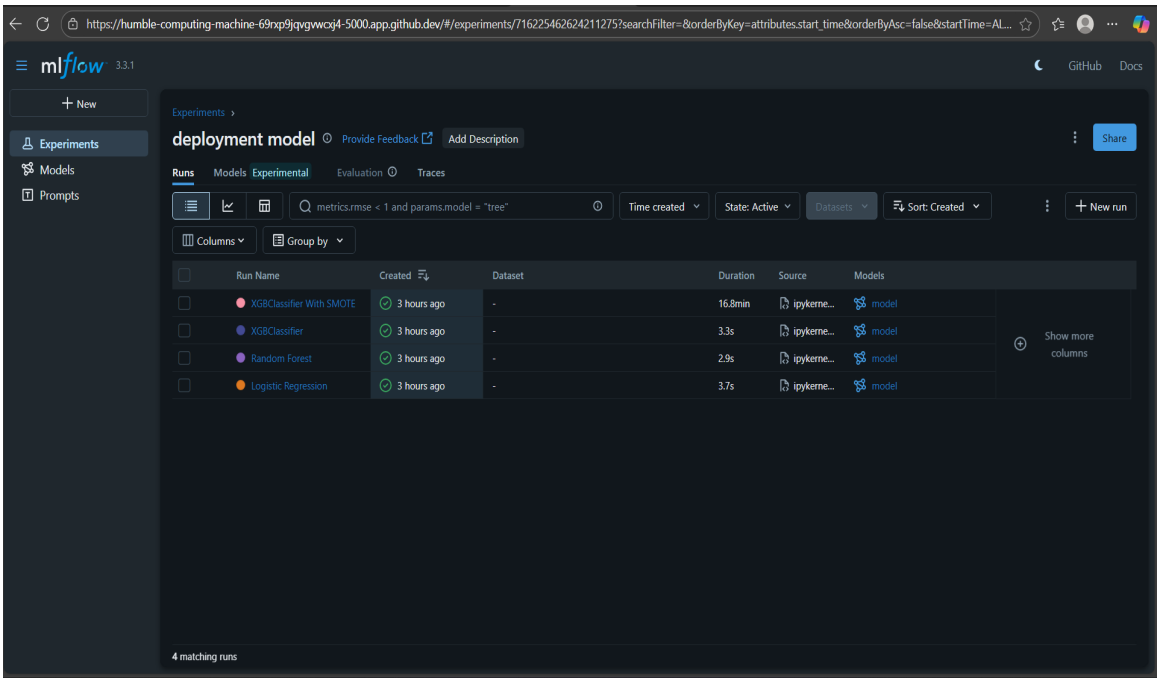
■ Tools in MLOps

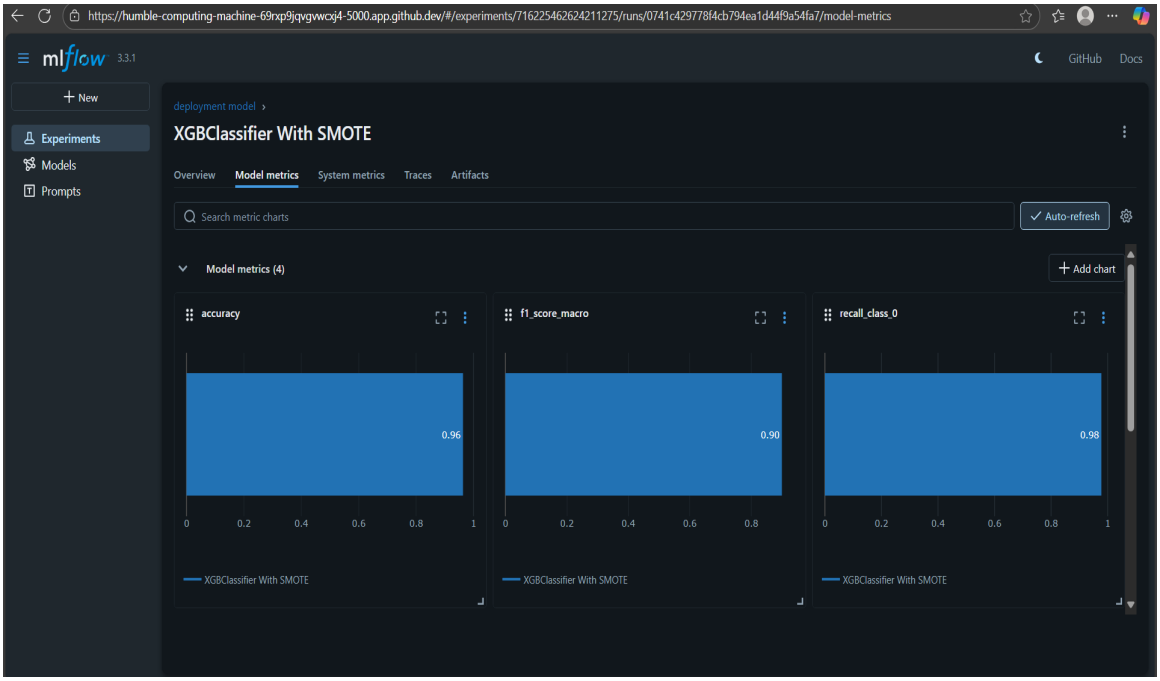
- MLflow (Tracking, Experimentation, Deployment) - Kubeflow (Orchestration) - Docker (Containerization) - Cloud Platforms (AWS, Azure, GCP) - Databricks (Data + ML pipelines) - ZenML (Pipeline automation)

■ MLflow in Action

Here are the MLflow experiment tracking and model registry screenshots showcasing: - Running multiple experiments (Logistic Regression, Random Forest, XGBoost) - Comparing metrics (accuracy, F1-score, recall) - Versioned models stored in MLflow registry - Production-ready model deployment ■



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deployment model
XGBClassifier With SMOTE
Overview
Model metrics
System metrics
Traces
Artifacts
Search metric charts
Auto-refresh
Model metrics (4)
Add chart
accuracy
f1_score_macro
recall_class_0
0.96
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0
0.2
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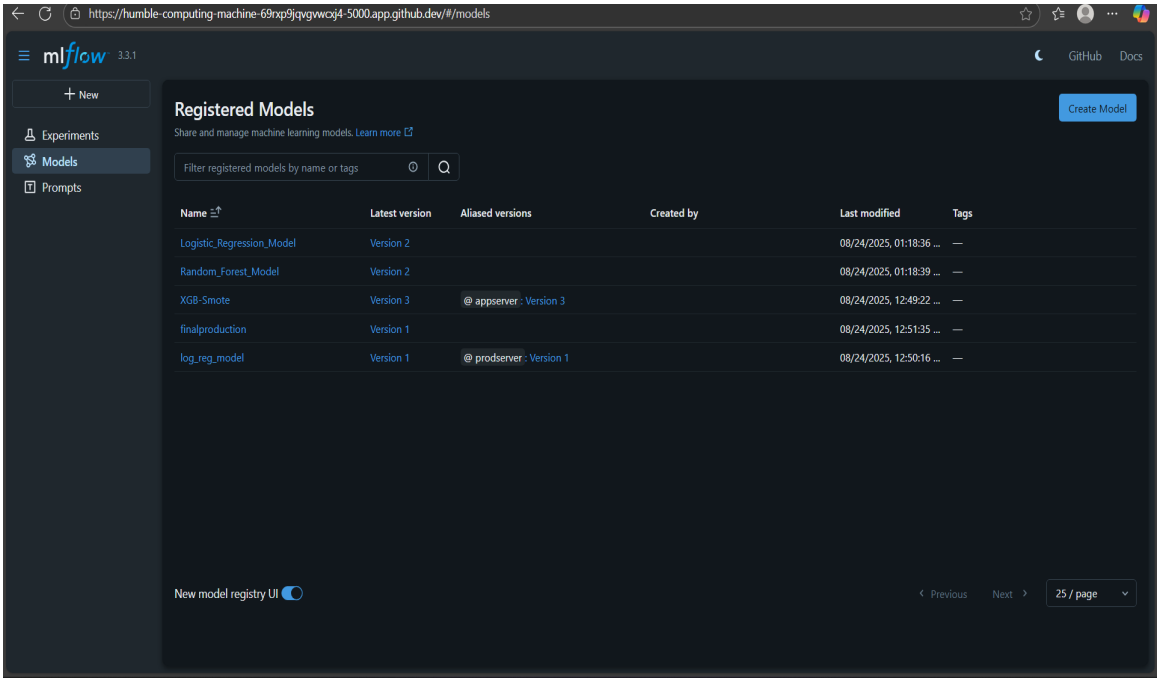
1
XGBClassifier With SMOTE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Registered Models
Share and manage machine learning models. Learn more
Create Model
Filter registered models by name or tags
Name
Latest version
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Last modified
Tags
Logistic_Regression_Model
Version 2
08/24/2025, 01:18:36 ...
Random_Forest_Model
Version 2
08/24/2025, 01:18:39 ...
XGB-Smote
Version 3
@ appserver : Version 3
08/24/2025, 12:49:22 ...
finalproduction
Version 1
08/24/2025, 12:51:35 ...
log_reg_model
Version 1
@ prodserver : Version 1
08/24/2025, 12:50:16 ...
New model registry UI
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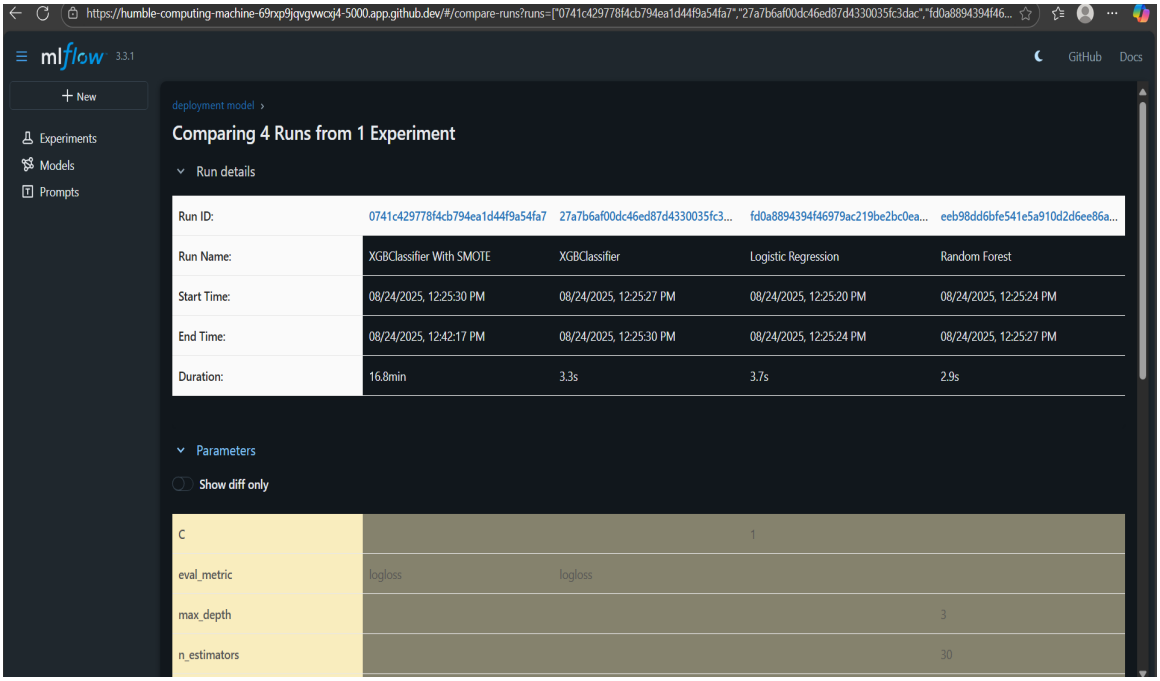
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deployment model ›
Comparing 4 Runs from 1 Experiment
Run details
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End Time: 08/24/2025, 12:42:17 PM 08/24/2025, 12:25:30 PM 08/24/2025, 12:25:24 PM 08/24/2025, 12:25:27 PM
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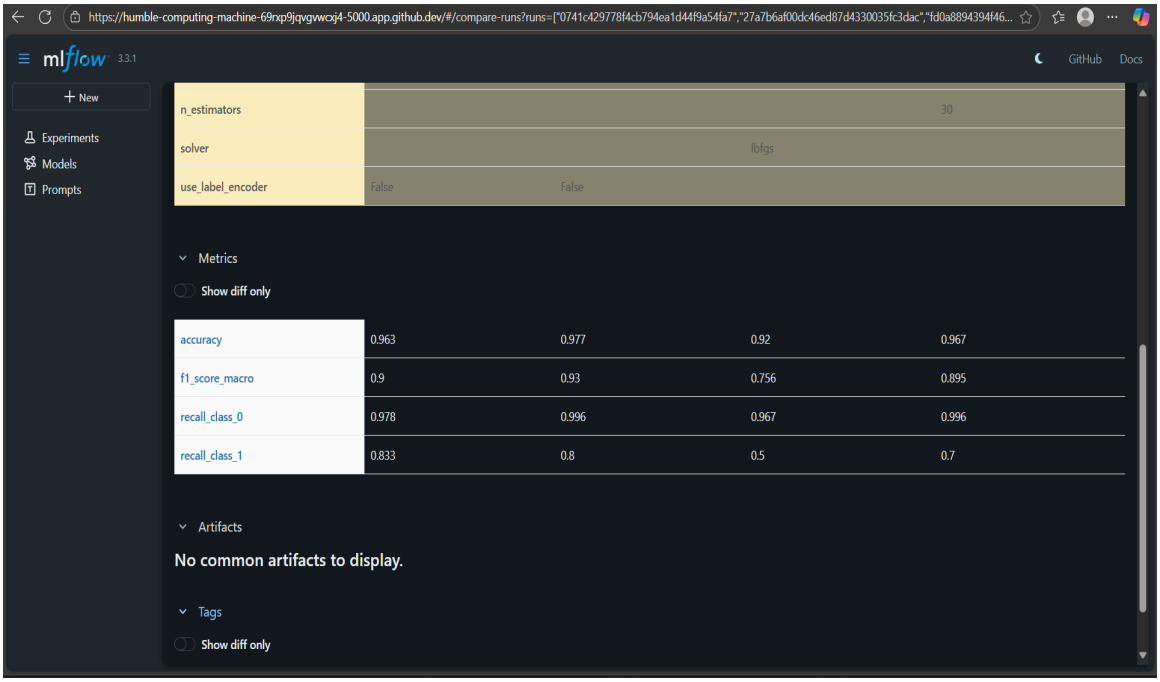
max_depth 3
n_estimators 30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mlflow 3.3.1
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n_estimators 30
solver lbfgs
use_label_encoder False False
Metrics
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accuracy 0.963 0.977 0.92 0.967
f1_score_macro 0.9 0.93 0.756 0.895
recall_class_0 0.978 0.996 0.967 0.996
recall_class_1 0.833 0.8 0.5 0.7
Artifacts
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Tags
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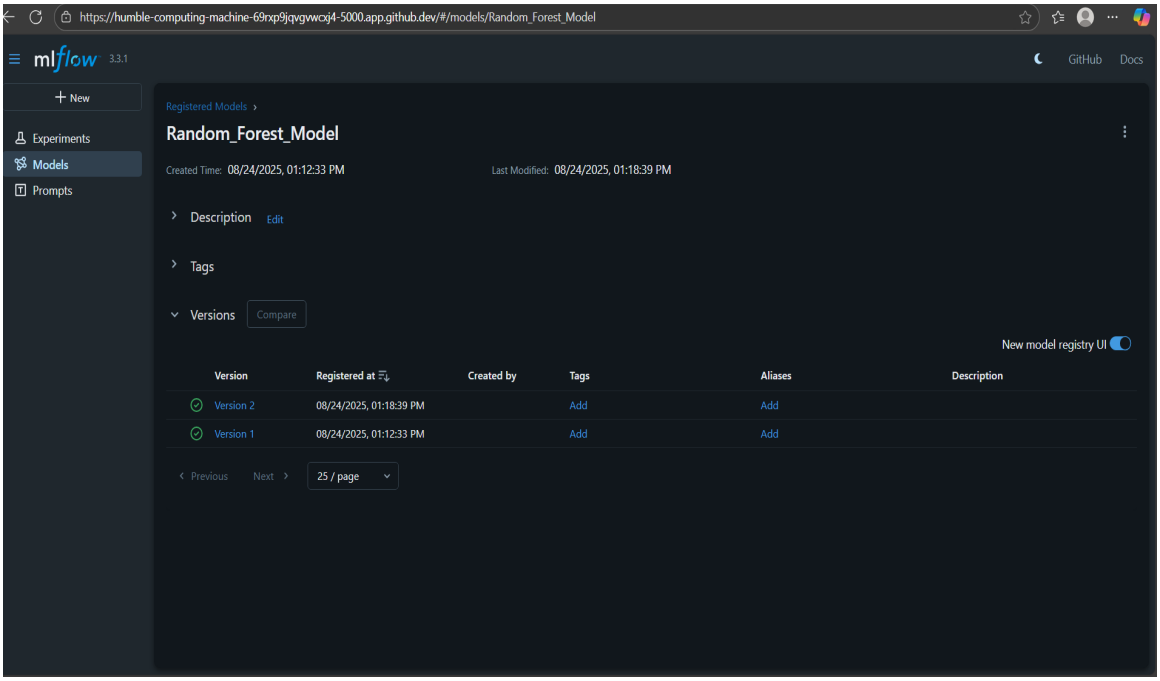
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Registered Models ›
Random_Forest_Model
Created Time: 08/24/2025, 01:12:33 PM
Last Modified: 08/24/2025, 01:18:39 PM
Description Edit
Tags
Versions Compare
New model registry UI
Version
Registered at
Created by
Tags
Aliases
Description
Version 2
08/24/2025, 01:18:39 PM
Add
Add
Version 1
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■ With MLOps + MLflow, you can confidently take models from experimentation → deployment → monitoring → continuous improvement. This is exactly what companies expect when they say **“We need production-ready ML systems.” ■ Mastering this workflow makes you stand out in interviews!**