**Bike Rental Cloud Pipeline - Project Instructions**

This document serves as a step-by-step guide and reference for the entire project, including all tools and workflows used to process, train, deploy, and Dockerize a machine learning model for bike rental prediction.

**1. Project Setup**

mkdir bike-rental-cloud-pipeline && cd bike-rental-cloud-pipeline

python3 -m venv venv

source venv/bin/activate

pip install -r requirements.txt

**requirements.txt** contains dependencies like pandas, scikit-learn, joblib, boto3, fastapi, uvicorn etc.

**2. Preprocessing the Dataset**

* **Source**: s3://<your-bucket>/raw/bike\_rental.csv
* Run preprocessing script: python scripts/preprocessing.py
* Outputs:
  + data/bike\_rental.csv
  + processed/train\_test\_split.joblib

**3. Train the Model**

python scripts/train\_model.py

* Saves best\_model.joblib to models/
* Model: RandomForestRegressor (grid search on hyperparams)

**4. Inference & Predictions Upload**

python scripts/model\_inference.py

* Downloads model from S3
* Predicts on test data
* Saves predictions/predictions.csv
* Uploads predictions back to S3
* Prints RMSE

**5. FastAPI for Real-Time Prediction**

**Run locally**: python scripts/api\_server.py

**Test using curl**:

curl -X POST "http://localhost:8000/predict" \

-H "Content-Type: application/json" \

-d '{"season":1, "yr":0, "mnth":1, "holiday":0, "weekday":6, "workingday":0, "weathersit":2, "temp":14.1, "atemp":18.1, "hum":80.5, "windspeed":10.7}'

**6. Dockerize the App**

**Dockerfile**

FROM python:3.12-slim

WORKDIR /app

COPY . .

RUN pip install --no-cache-dir --upgrade pip && \

pip install --no-cache-dir -r requirements.txt

EXPOSE 8000

CMD ["uvicorn", "scripts.api\_server:app", "--host", "0.0.0.0", "--port", "8000"]

**Build & Run**

docker build -t bike-rental-api .

docker run -d -p 8000:8000 --name bike-rental-api-container bike-rental-api

**7. Docker Compose (Optional)**

**docker-compose.yml**

services:

bike-rental-api:

build: .

ports:

- "8000:8000"

container\_name: bike-rental-api-container

docker compose up –build

**8. Makefile (Helper Commands)**

setup:

python3 -m venv venv && source venv/bin/activate && pip install -r requirements.txt

preprocess:

python scripts/preprocessing.py

train:

python scripts/train\_model.py

infer:

python scripts/model\_inference.py

run-api:

uvicorn scripts.api\_server:app --reload

docker-build:

docker build -t bike-rental-api .

docker-run:

docker run -d -p 8000:8000 --name bike-rental-api-container

**9. AWS Setup**

**Configure CLI**

aws configure

# Enter Access Key, Secret, Region, Output format

**S3 Usage**

* Download bike\_rental.csv from S3
* Upload best\_model.joblib and predictions.csv

**MFA & IAM**

* Enabled MFA for root
* Created IAM user raghu-admin
* Created group raghu-admin-group with AdministratorAccess
* Attached IAM policy and access key

**10. GitHub**

* Initialized git repo
* Added .gitignore (ignored venv/, \_\_pycache\_\_/, .DS\_Store, etc.)
* Added all project files
* Committed and pushed to:

https://github.com/coolhead/bike-rental-cloud-pipeline

**11. CI/CD (Planned)**

* GitHub Actions workflow (.github/workflows/workflow.yml)
* Steps:
  + Linting (flake8, black)
  + Unit tests (pytest)
  + Docker build

**12. Extras**

* 📄 LICENSE → MIT License
* 📋 README.md → Project overview, structure, and API usage

**✅ DONE!**

You're ready to reuse or enhance this repo in the future!