

MLOPs Zoomcamp

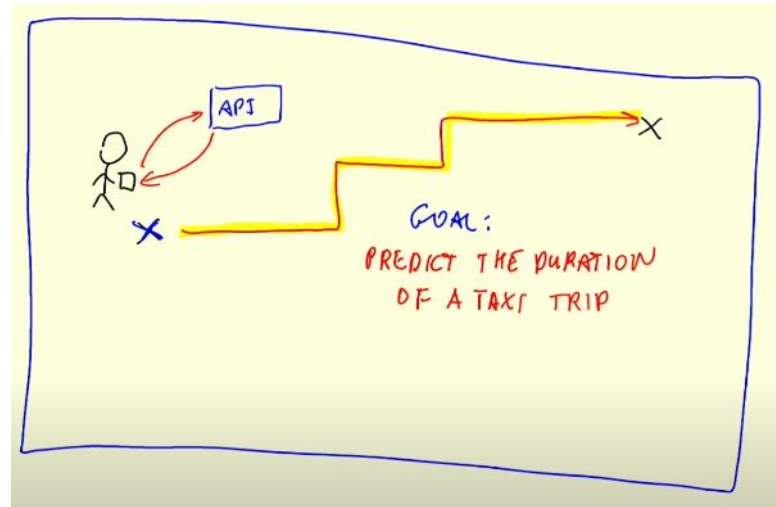
Week 1

Gabriel



1-1 introduction

- putting ML to production
- Hiring taxi dataset (duration estimation)
- 3 stages of ml project process:
 - Design: experiments,
 - training,
 - operate: deploy





1-2 environment setup

1-3 taxi ride duration prediction

1-4 Course Overview: Module 2 Experiment Tracking

- Experiment tracker
- Model registry
- Use together to log (MLflow)
- Help us remember things

```
In [126]: lr = Lasso(0.1)
          lr.fit(X_train, y_train)

          y_pred = lr.predict(X_val)

          mean_squared_error(y_val, y_pred, squared=False)
```

Out[126]: 11.167275941179728

log →

```
val_dicts = df_val[categorical + numerical]
X_val = dv.transform(val_dicts)

In [95]: target = 'duration'
         y_train = df_train[target].values
         y_val = df_val[target].values

In [127]: lr = LinearRegression()
          lr.fit(X_train, y_train)

          y_pred = lr.predict(X_val)

          mean_squared_error(y_val, y_pred, squared=

Out[127]: 7.479547365621185

In [128]: with open('models\\lin_reg.bin', 'wb') as f_out:
          pickle.dump((dv, lr), f_out)

In [126]: lr = Lasso(0.1)
          lr.fit(X_train, y_train)
```



1-4 Course Overview:

Module 3 Orchestration

- Decompose notebook and modularized → ML pipeline
 - Load & prepare data → Vectorize → train → model
 - Ex:
 - Train_data = Jan_2021
 - Val_data = feb_2021
 - Model = LR
 - \$python pipeline.py -train_data=xxx -val_data=xxx
- Perfect, Kubeflow Pipelines



1-4 Course Overview:

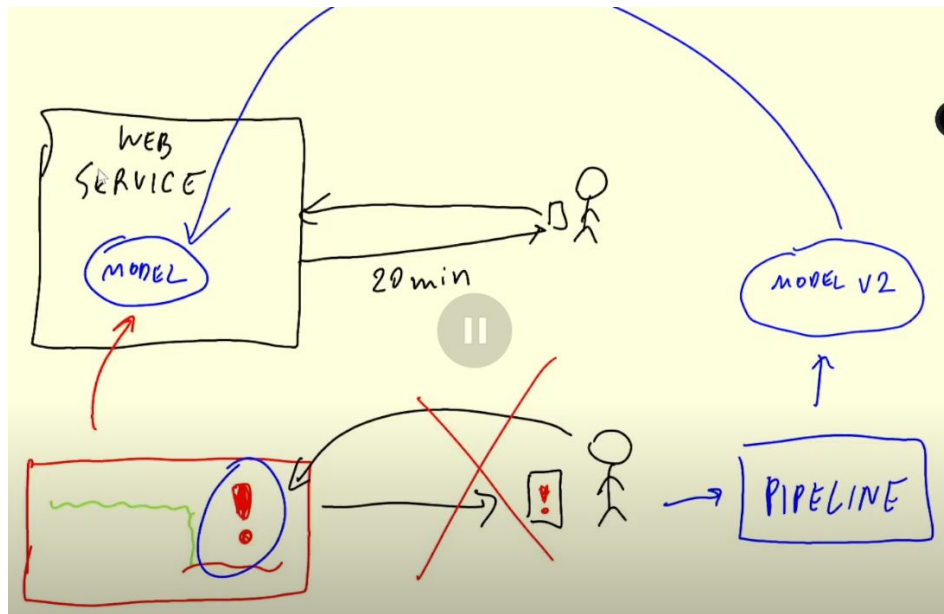
Module 4 Deployment:

- Three ways of model deployment: Online (web and streaming) and offline (batch)
- Web service: model deployment with Flask
- Streaming: consuming events with AWS Kinesis and Lambda
- Batch: scoring data offline

1-4 Course Overview:

Module 5 Model Monitoring

- Monitoring web services with Prometheus, Evidently, and Grafana
- Monitoring batch jobs with Prefect, MongoDB, and Evidently





1-4 Course Overview:

Module 6 Best Practices

- Package “pipeline” and “monitoring service” in the Docker
- Testing: unit, integration
- Python: linting and formatting
- Pre-commit hooks and makefiles
- CI/CD (GitHub Actions)
- Infrastructure as code (Terraform)



1-4 Course Overview:

Week 7-9 Final project

- end-to-end project
- choose the dataset by your own interest
- Week 7&8: are for developing
- week 9 for peer reviewing:
 - you'll need to review 3 of your peers else you'll fail to complete the final project



1-5 MLOps maturity model

- 0. No MLOPs:
 - No automation
 - All code in notebook (Data scientist works alone)
 - For POC level only
- 1. Devops, no MLOPs (Not specifically for ML)
 - Releases are automated (CI/CD, with web service)
 - Unit & integration tests
 - OPs metrics (network situation)
 - No experiment tracking, no reproducibility, DS work separately from engineers

<https://learn.microsoft.com/en-us/azure/architecture/ai-ml/guide/mlops-maturity-model>



1-5 MLOps maturity model

- 2. Automated training (multiple ML use cases, models)
 - ML training pipeline (with python scripts)
 - Experiment tracking
 - Model registry
 - Low friction deployment (fast switch models)
 - DS work with engineers
- 3. Automated Deployment (This course)
 - Easy to deploy model (API call for using model)
 - A/B test (v1 vs v2) (Not covered in this course)
 - Model monitoring might be in level 3 or 4

<https://learn.microsoft.com/en-us/azure/architecture/ai-ml/guide/mlops-maturity-model>



1-5 MLOps maturity model

- 4. Full MLOPs Automation
 - Automatic training, retraining, deployment
 - Approaching a zero-downtime system
 - Not all services need to be at this level

<https://learn.microsoft.com/en-us/azure/architecture/ai-ml/guide/mlops-maturity-model>



Other information:

Minutes of youtube video per week

1: 49

2: 160

3: 84

4: 88

5: 119

6: 321



Other Information: Assignment deadline

MLOps Zoomcamp 2024

<https://github.com/DataTalksClub/mlops-zoomcamp>

[Course leaderboard](#)

[Edit course profile](#)

Total score: 0

Homework

Homework 1: Introduction	23 May 2024 19:00	Scored
Homework 2: Experiment Tracking	29 May 2024 19:00	Open
Homework 3: Training Pipelines	6 June 2024 19:00	Open
Homework 4: Deployment	10 June 2024 19:00	Closed
Homework 5: Monitoring	17 June 2024 19:00	Closed
Homework 6: Best Practices	24 June 2024 19:00	Closed

Projects

Project attempt 1	15 July 2024 19:00	Closed
Project attempt 2	29 July 2024 19:00	Closed



Other Information: Homework submission format

[Courses](#) > [MLOps Zoomcamp 2024](#)

[Login](#)

Homework 2: Experiment Tracking for [MLOps Zoomcamp 2024](#)

<https://github.com/DataTalksClub/mlops-zoomcamp/blob/main/cohorts/2024/02-experiment-tracking/homework.md>

Due date: 29 May 2024 19:00 (local time)

Please [log in](#) to submit your answers.

Questions

Question 1. Install MLflow (1 point)

Question 2. Download and preprocess the data (1 point)

- ☐ 1
- ☐ 3
- ☐ 4
- ☐ 7

Question 3. Train a model with autolog (1 point)

- ☐ 2
- ☐ 4
- ☐ 8
- ☐ 10

Question 6. Promote the best model to the model registry (1 point)

- ☐ 5.060
- ☐ 5.567
- ☐ 6.061
- ☐ 6.568

Homework URL [?](#)

Learning in public links (optional) [?](#)

Time spent on lectures (hours) (optional) [?](#)

Time spent on homework (hours) (optional) [?](#)

Problems or comments (optional)

FAQ contribution (FAQ document, optional) [?](#)



Other Information:

Github & course: <https://github.com/DataTalksClub/mlops-zoomcamp>

website with introduction: <https://datatalks.club/blog/mlops-zoomcamp.html>