

Orchestration in MLOps

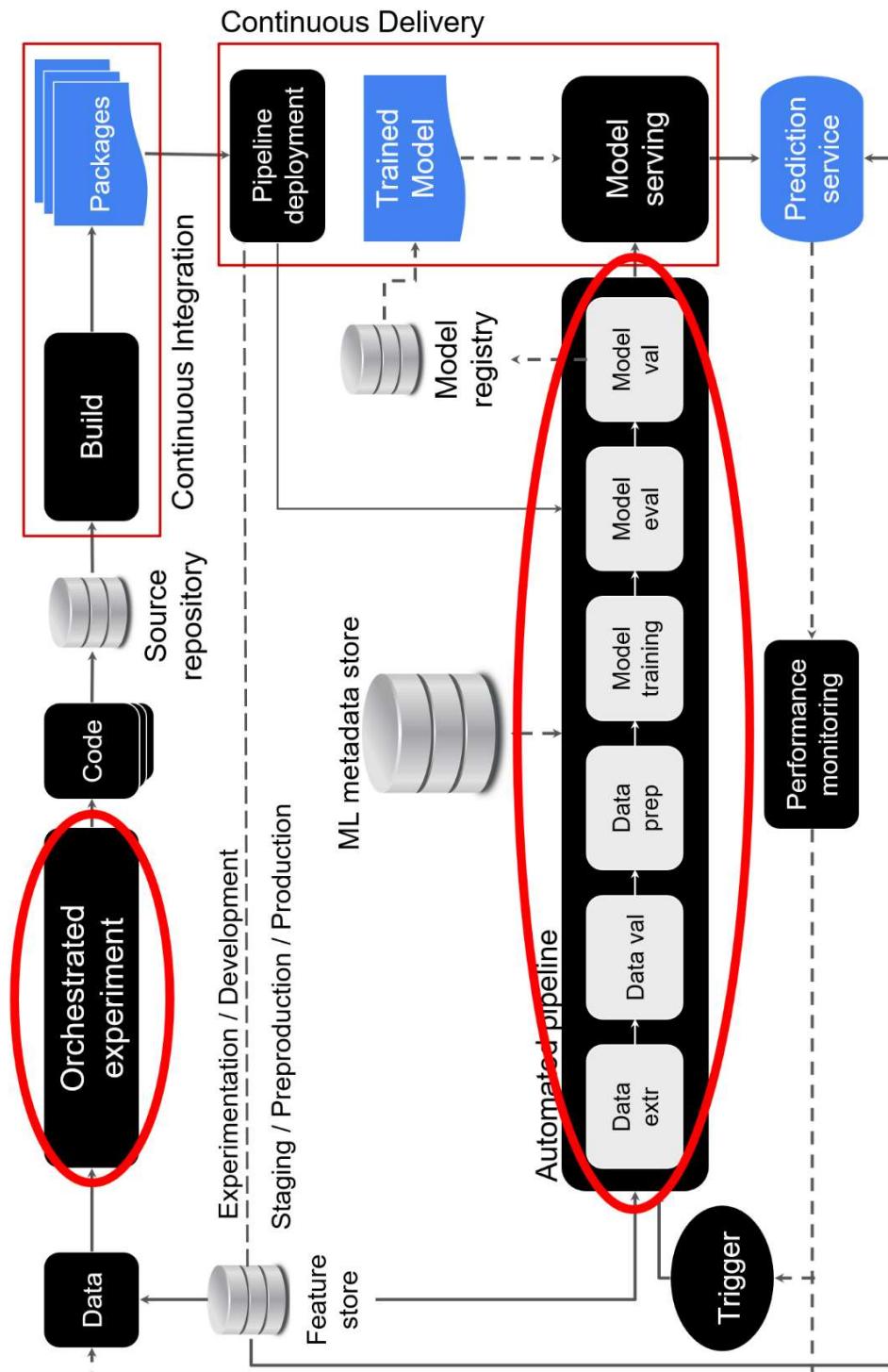
FULLY AUTOMATED MLOPS



Arturo Opsetmoen Amador
Senior Consultant - Machine Learning



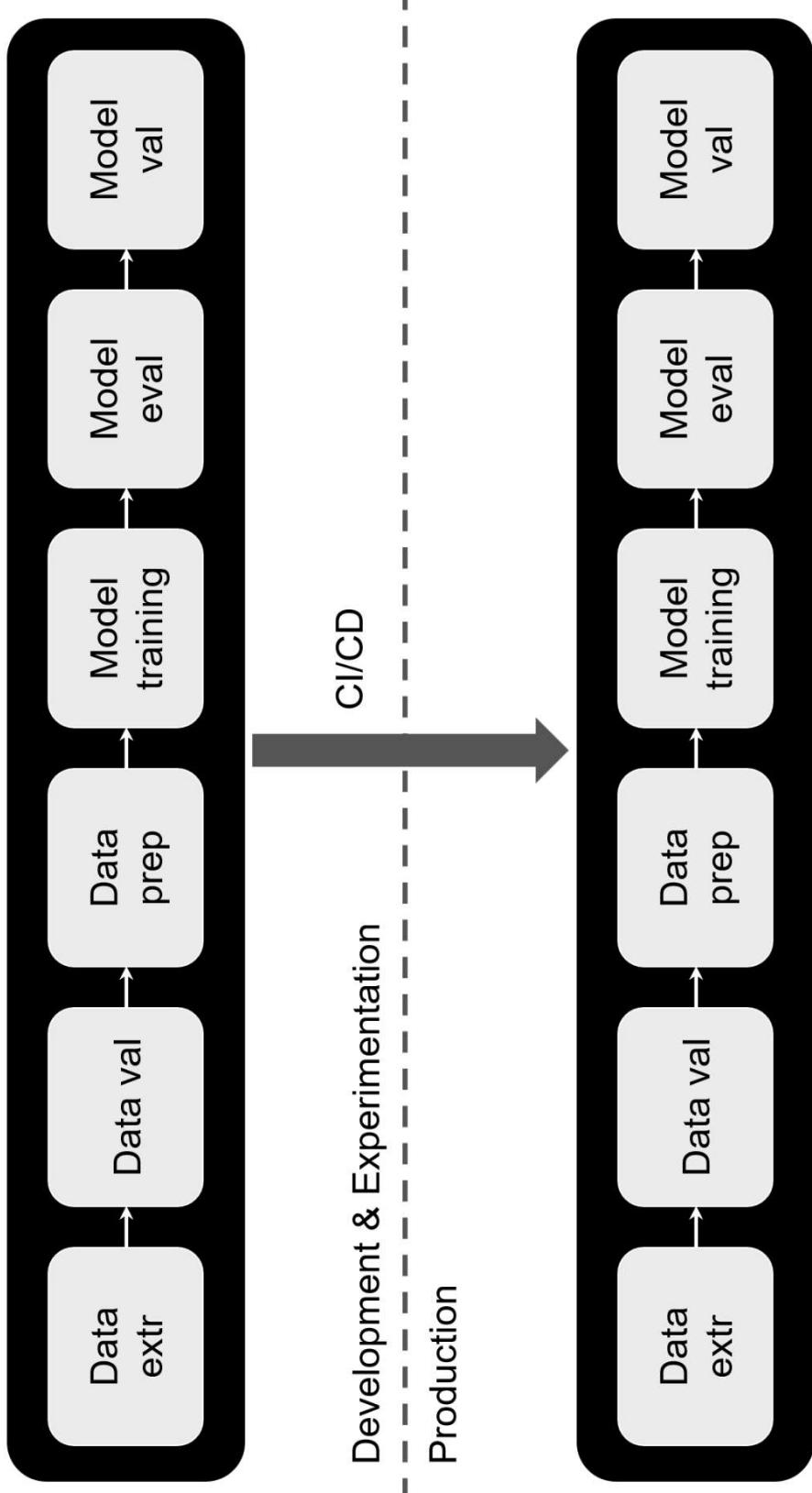
A core component in MLOps systems



datacamp

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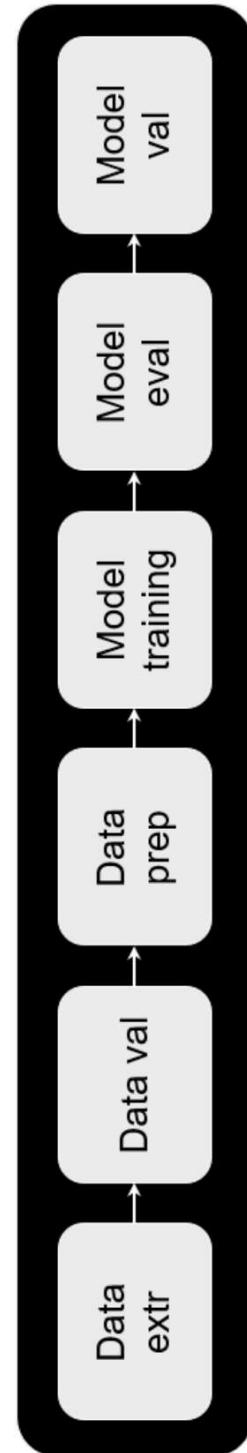
Modularity & reusability



Orchestration & automation

ML pipelines are used in:

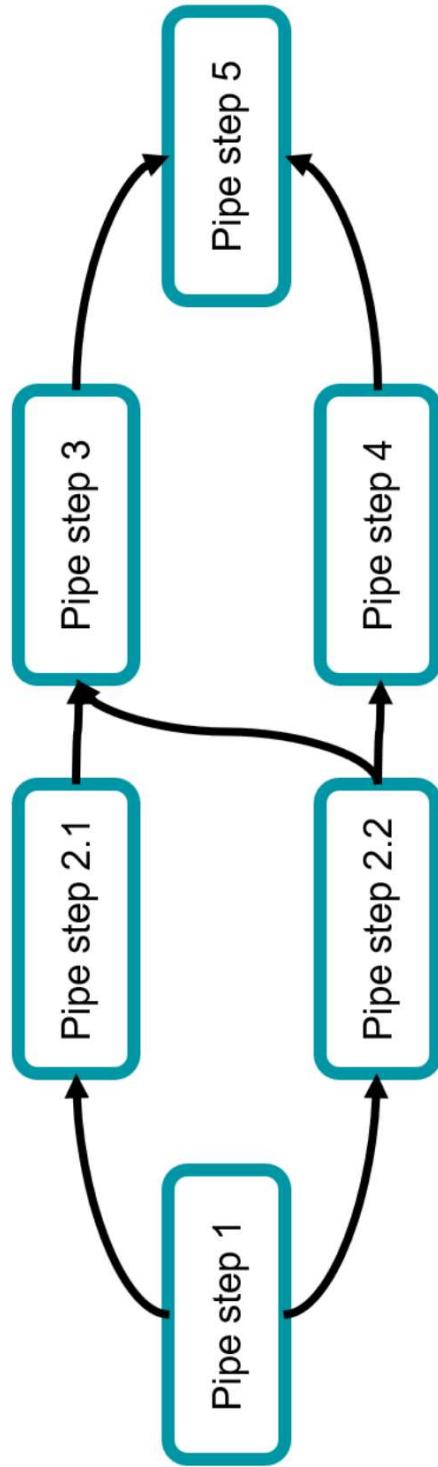
- Development & experimentation



- Production

Direct Acyclic Graphs in MLOps

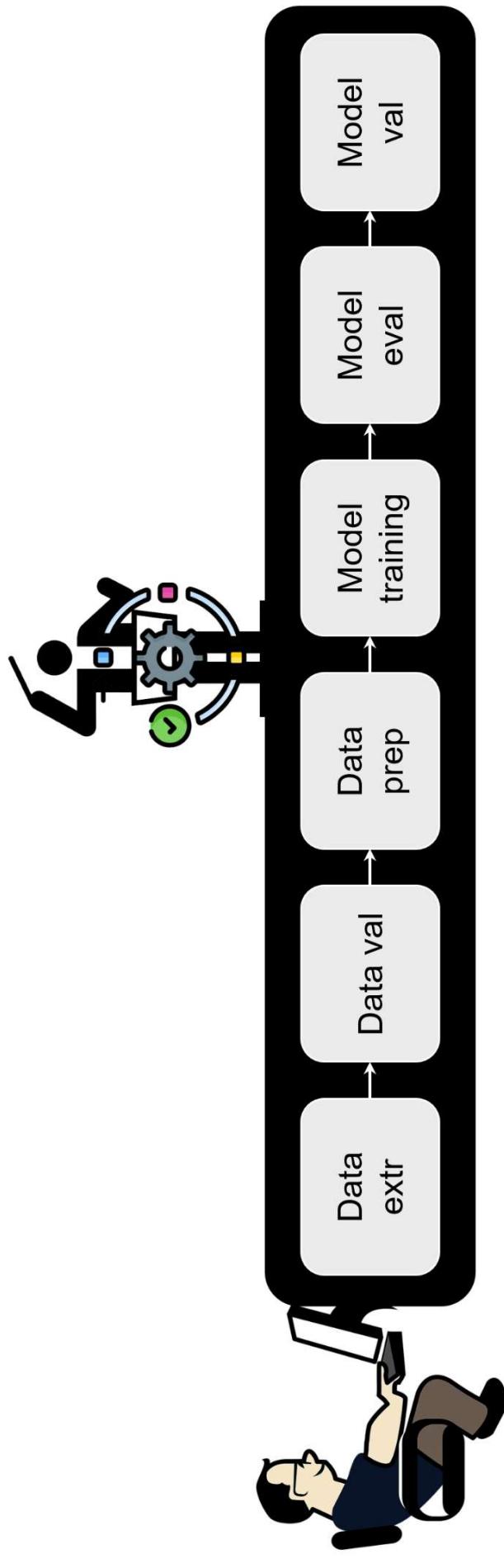
- Graphical pipeline representations
- Pipeline steps represented as nodes
- Steps dependencies are edges



What is orchestration in MLOps?

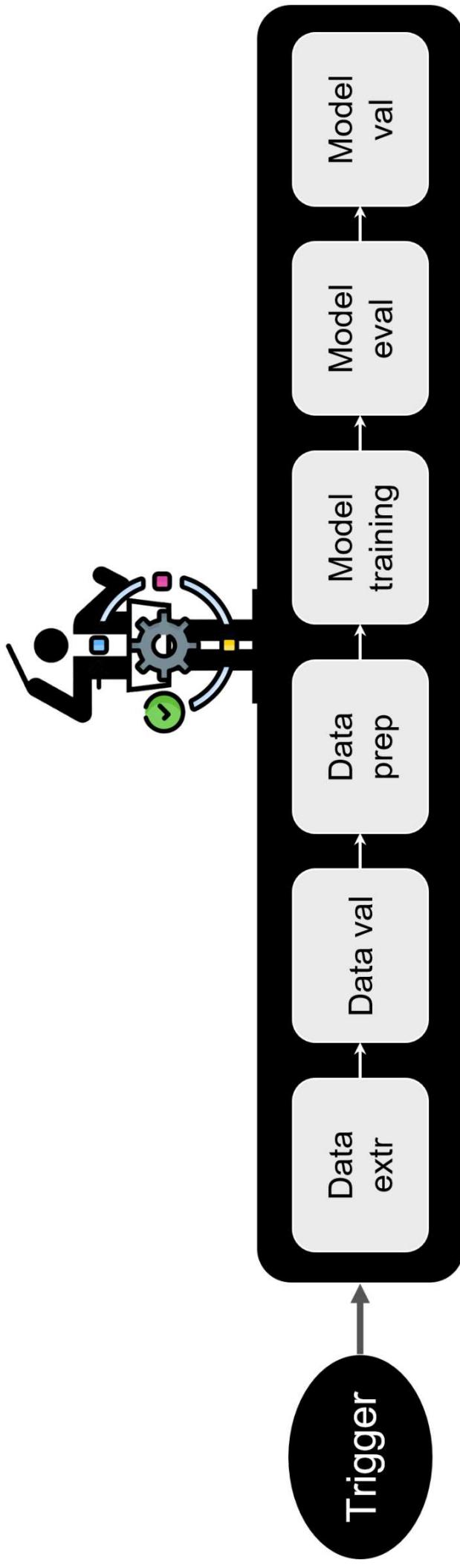
- Managing & automating task flows
- Scheduling, monitoring of tasks
- Managing data dependencies and flows

ML pipelines - development & experimentation



- Manage end-to-end tasks in model training
- Correct flow, record and logging
- Parallel experimentation

ML pipelines - production



- Helps automating model deployment
- Manages and execute pipeline steps
- Consistent and reliable deployments

Let's practice!

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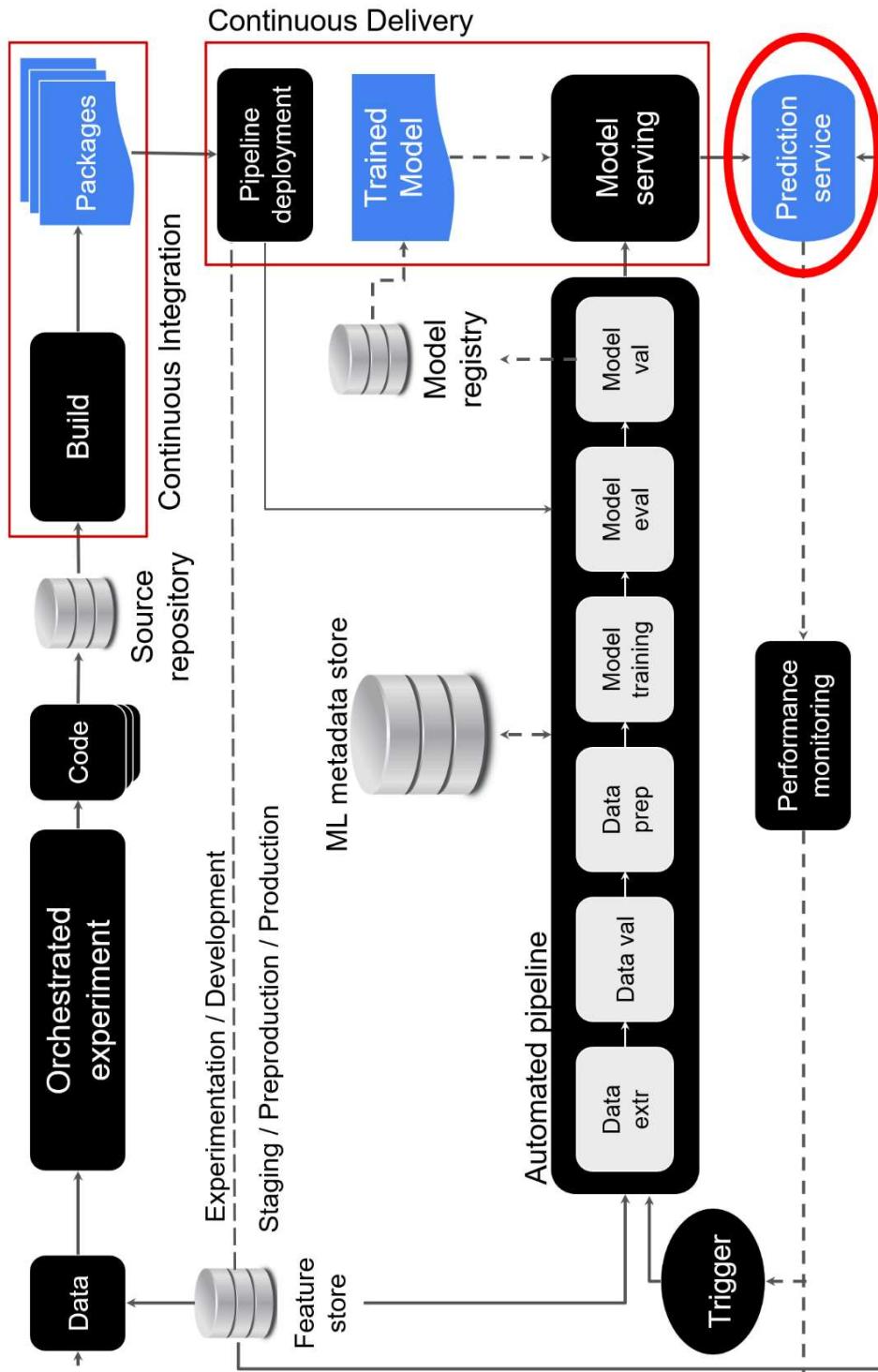
Automation in MLOps deployment strategies

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Model deployment - prediction service



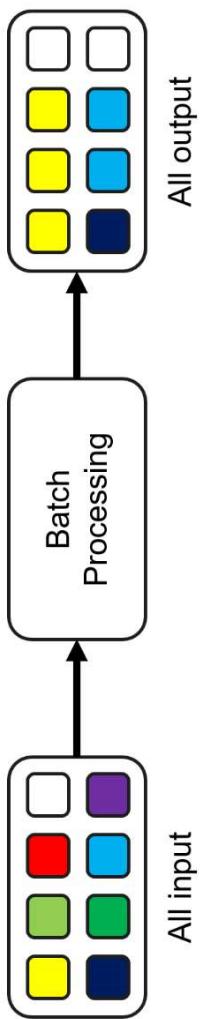
Prediction services - modes recap

Predictions can be served in:

- Batch
- Streams
- Real-time
- On-the-edge

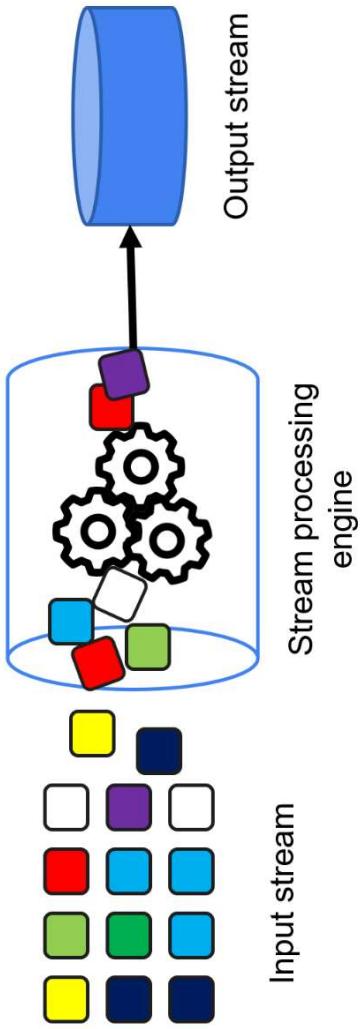
Prediction service - batch serving

- Large number of predictions
- Periodic schedules
- Event triggered



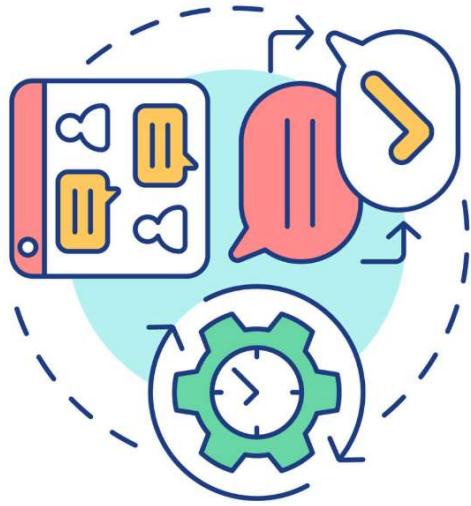
Prediction service - streaming serving

- Continuously incoming data
- Continuously delivered predictions



Prediction service - real time

- Single record
- Instant predictions



Prediction service - on the edge

- Mobile devices
- IoT devices
- Reduced latency



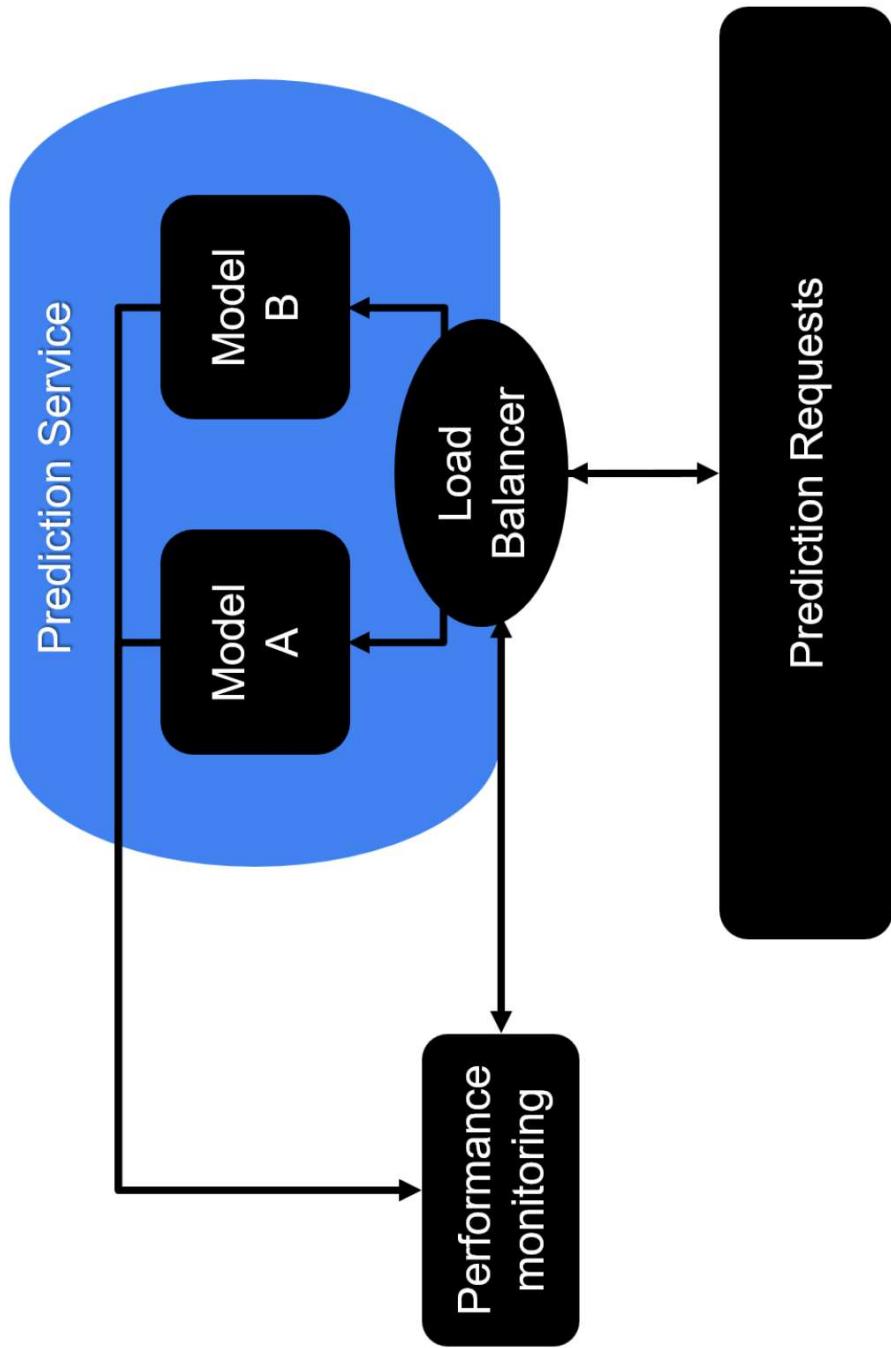
Deployment strategies

ML serving types determines how we should deploy and update our prediction services

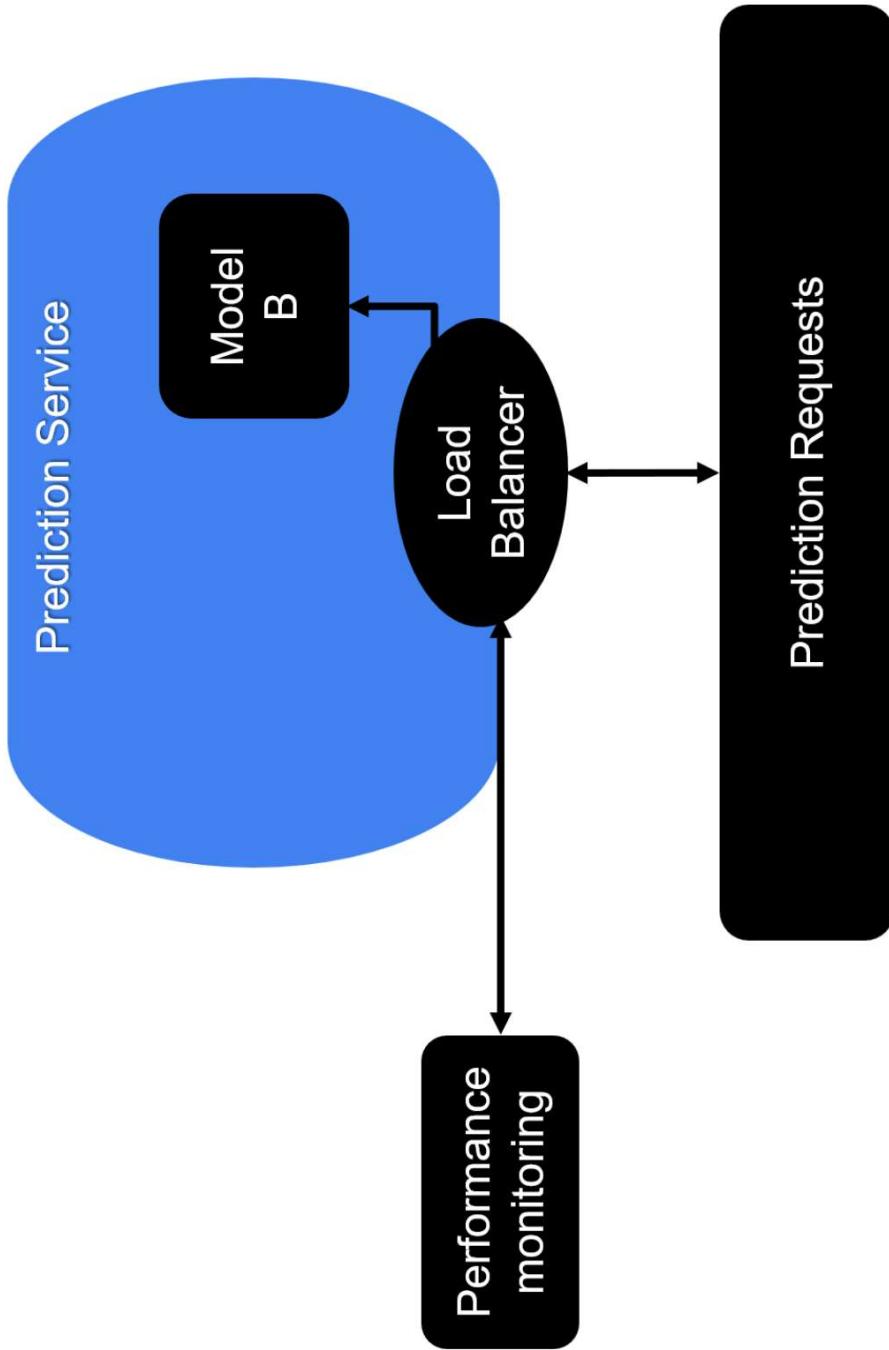
Model deployment strategies include:

- Shadow deployment
- Canary deployment
- A/B testing
- Blue/Green

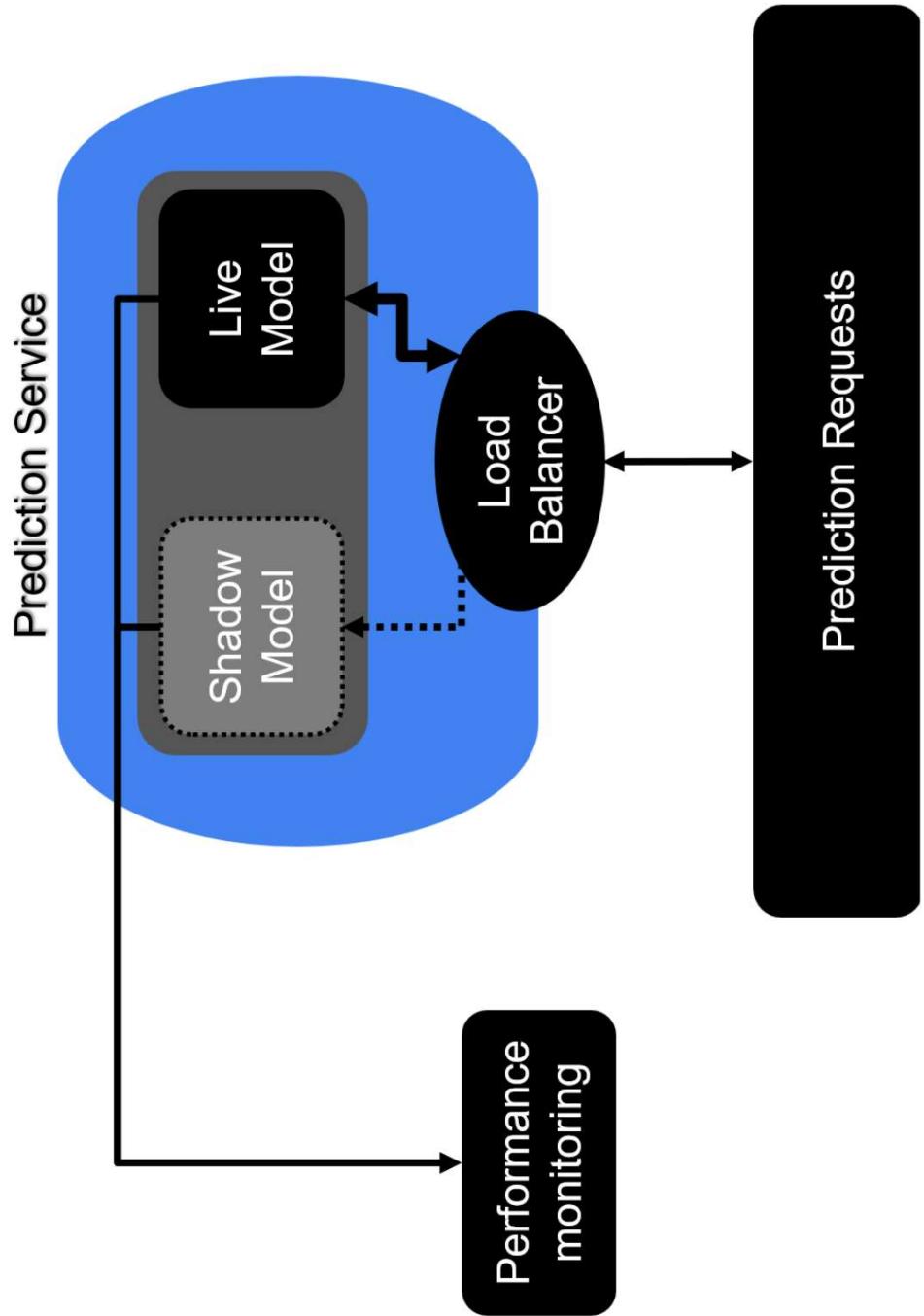
A/B testing



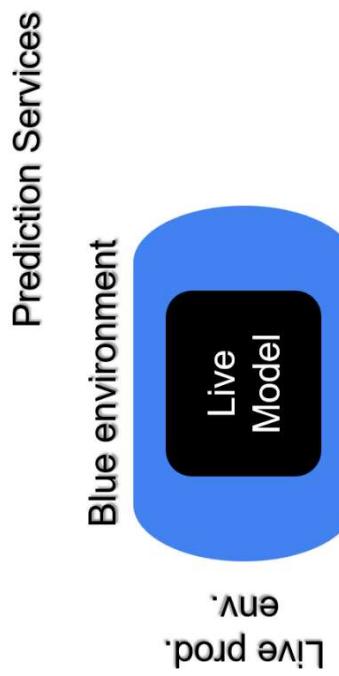
A/B testing



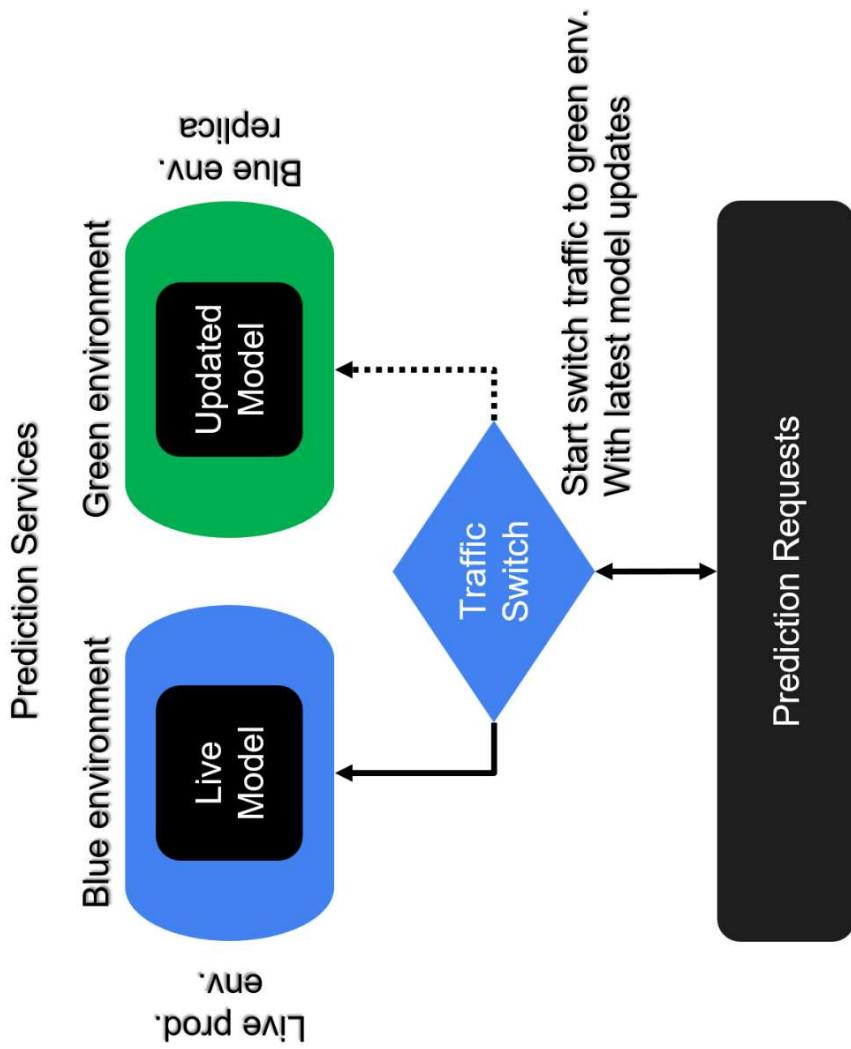
Shadow deployment



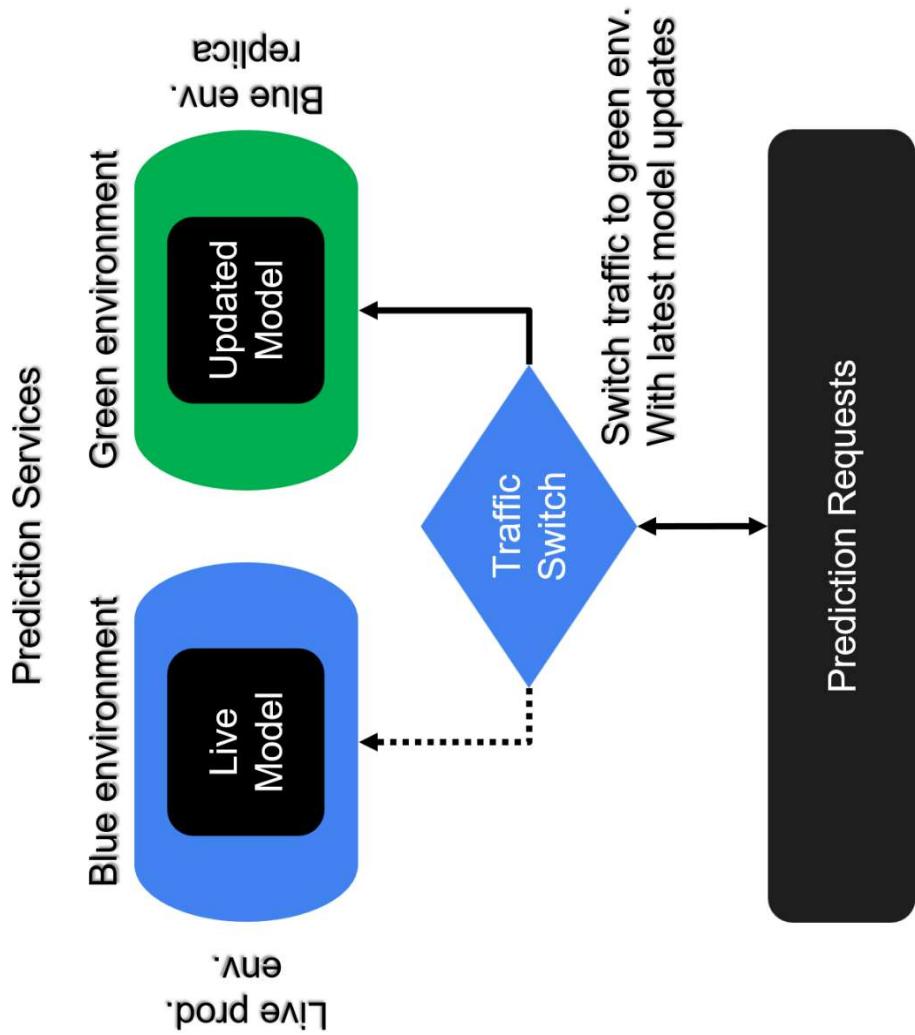
Blue/Green deployment



Blue/Green deployment

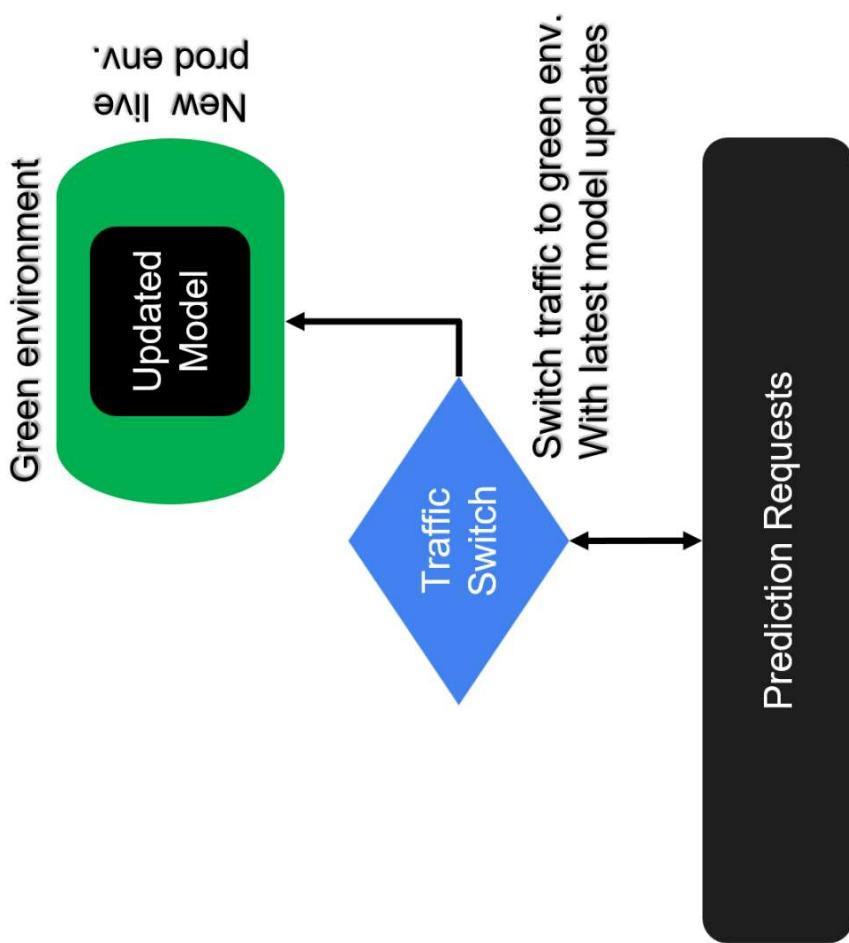


Blue/Green deployment



Blue/Green deployment

Prediction Services



Switch traffic to green env.
With latest model updates

Prediction Requests

Deploying and updating prediction services

Model type determines deployment strategy

Deployment strategy	No downtime	Condition-based	Rollback time	Additional costs
Shadow	➤	✗	NA	Medium
Canary	➤	✗	Fast	Low
A/B testing	➤	➤	Fast	Low
Blue/Green	➤	✗	Instant	High

Let's practice!

FULLY AUTOMATED MLOPS

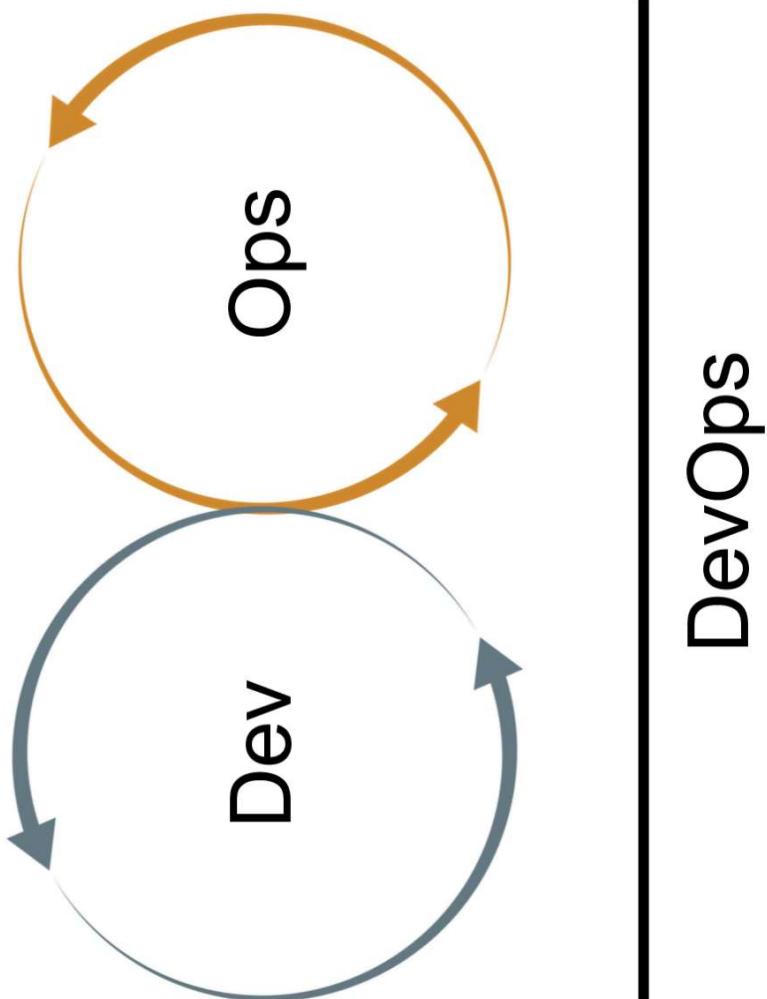
CI/CD/CT/CM in Fully Automated MLOps

FULLY AUTOMATED MLOPS

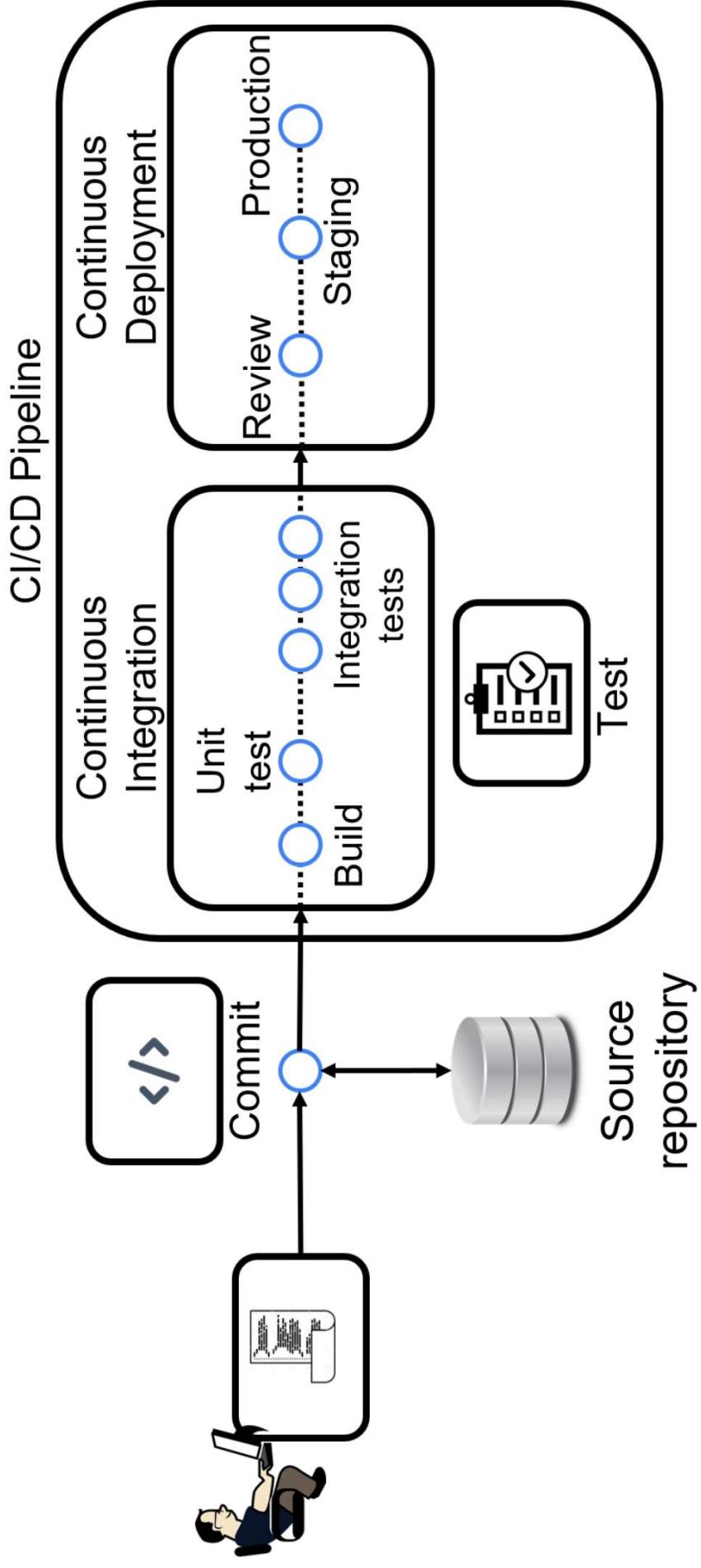


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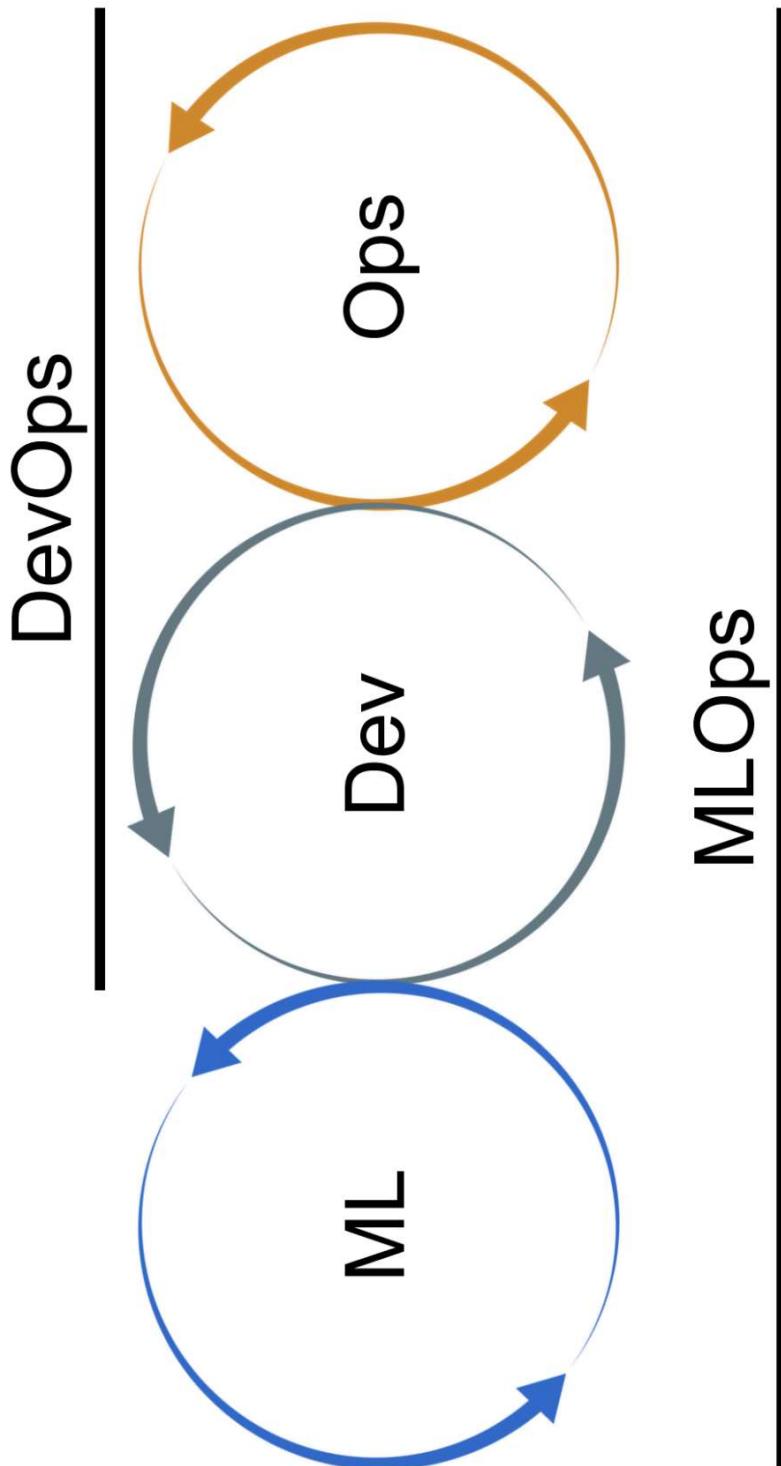
DevOps



CI/CD in DevOps

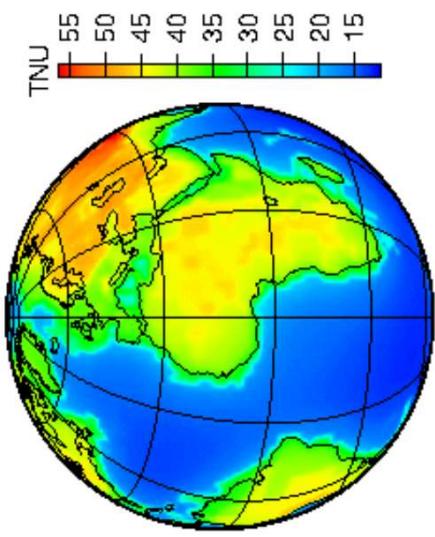


Fully automated MLOps

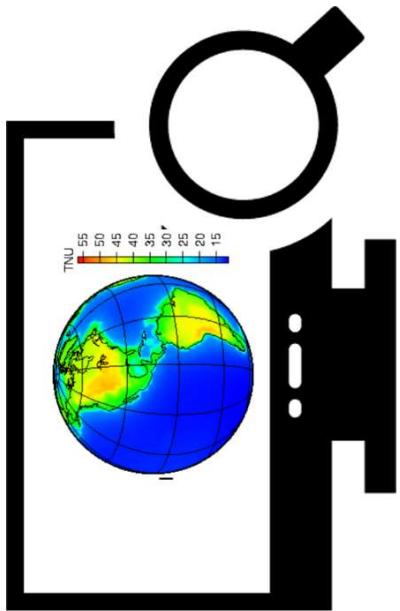


Considerations about ML - Changing world

Continuously changing world



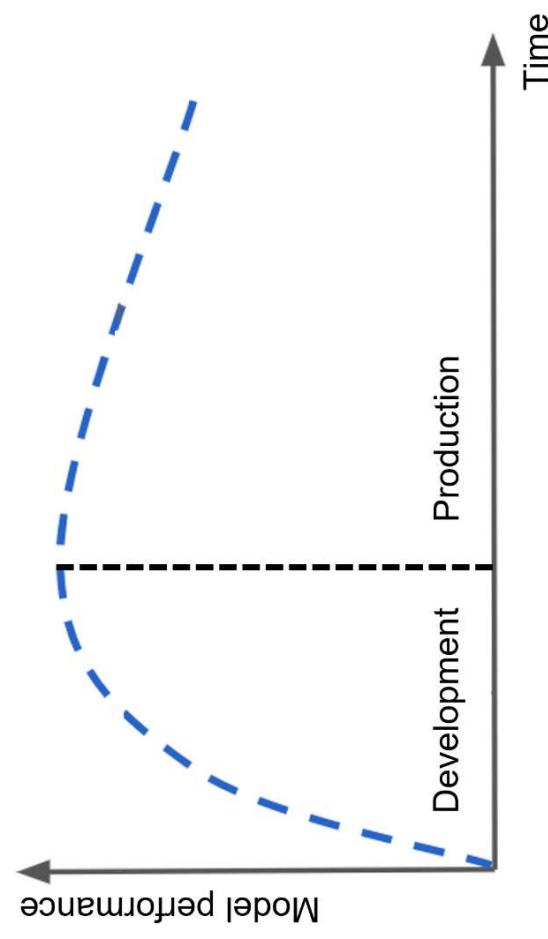
Continuous monitoring (CM)



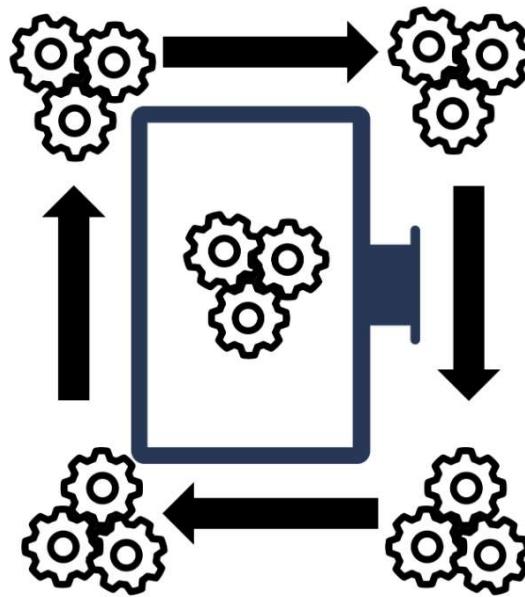
Considerations about ML - Decaying performance

Continuously decaying models

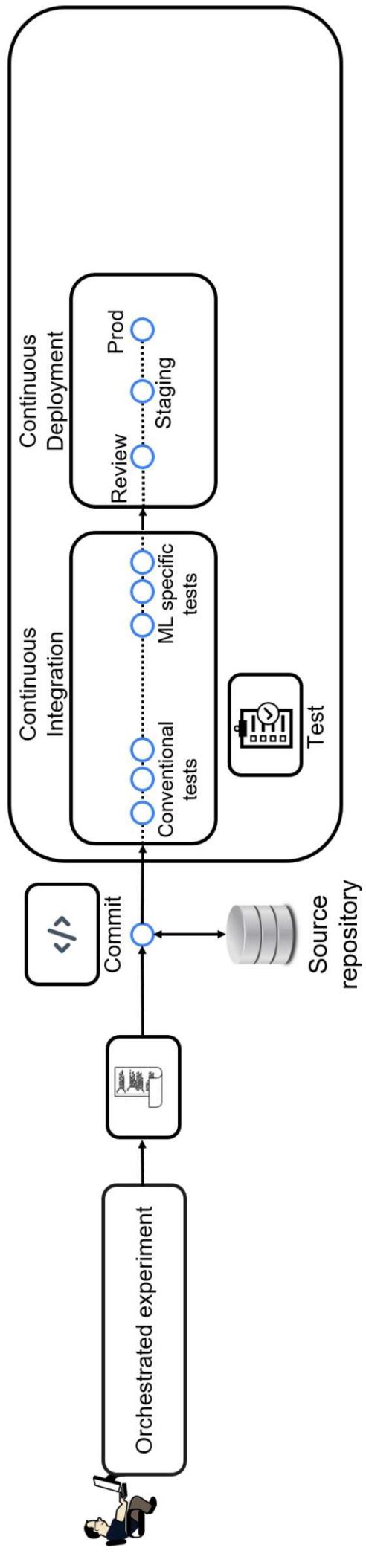
Model performance decays over time



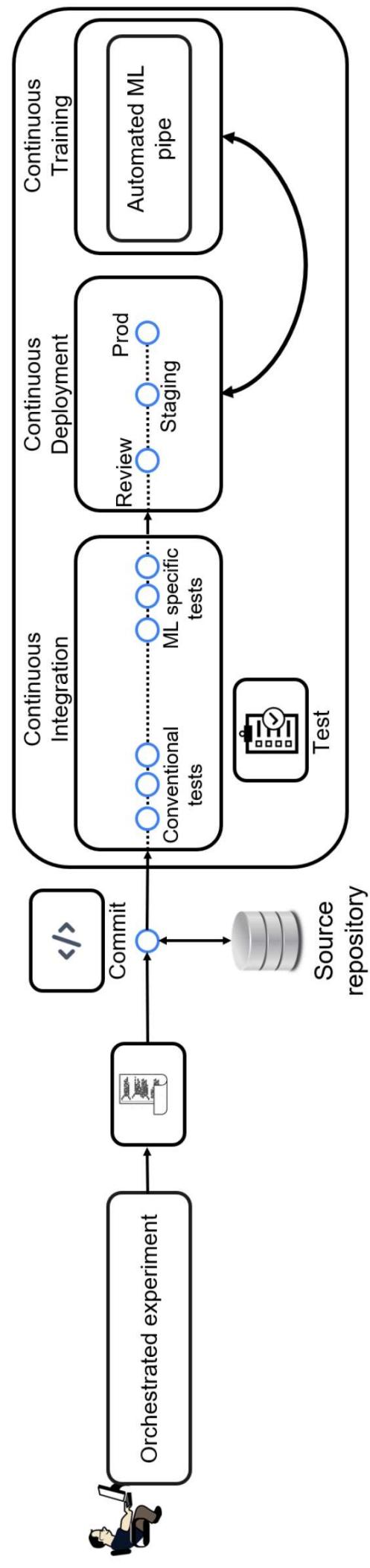
Continuous training (CT)



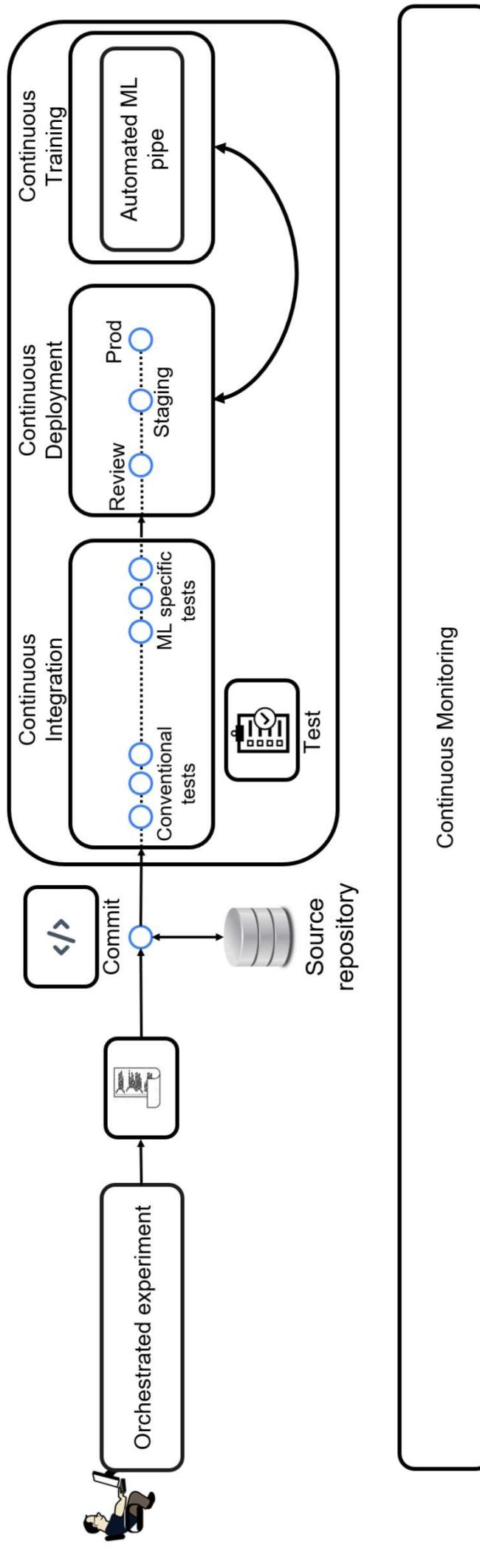
CI/CD/CT/CM in MLOps



CI/CD/CT/CM in MLOps



CI/CD/CT/CM in MLOps



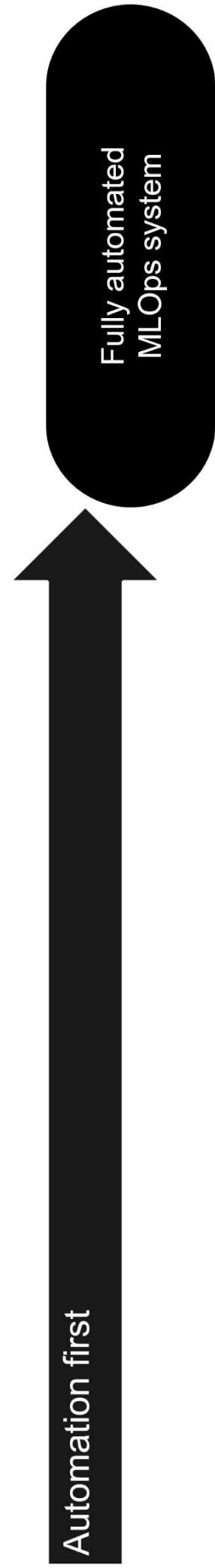
Fully automated MLOps

Fully automated
MLOps system

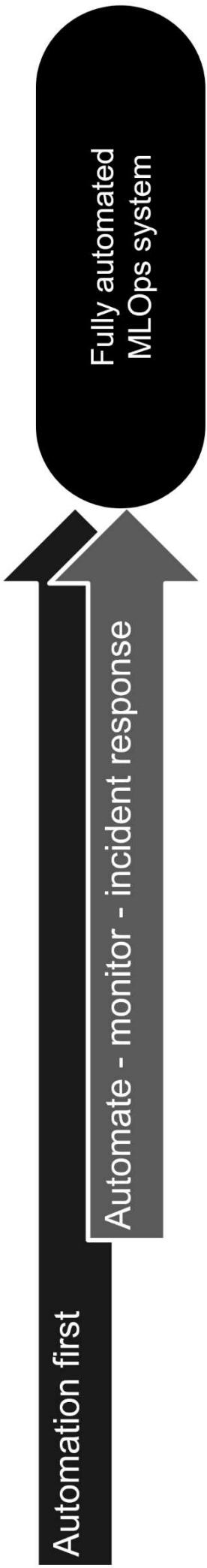


FULLY AUTOMATED MLOPS

Fully automated MLOps - Automation first



Fully automated MLOps - Automated response pattern



Fully automated MLOps - CI/CD/CT/CM



Fully automated MLOps



Let's practice!

FULLY AUTOMATED MLOPS

Summary

FULLY AUTOMATED MLOPS



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Congratulations!!!



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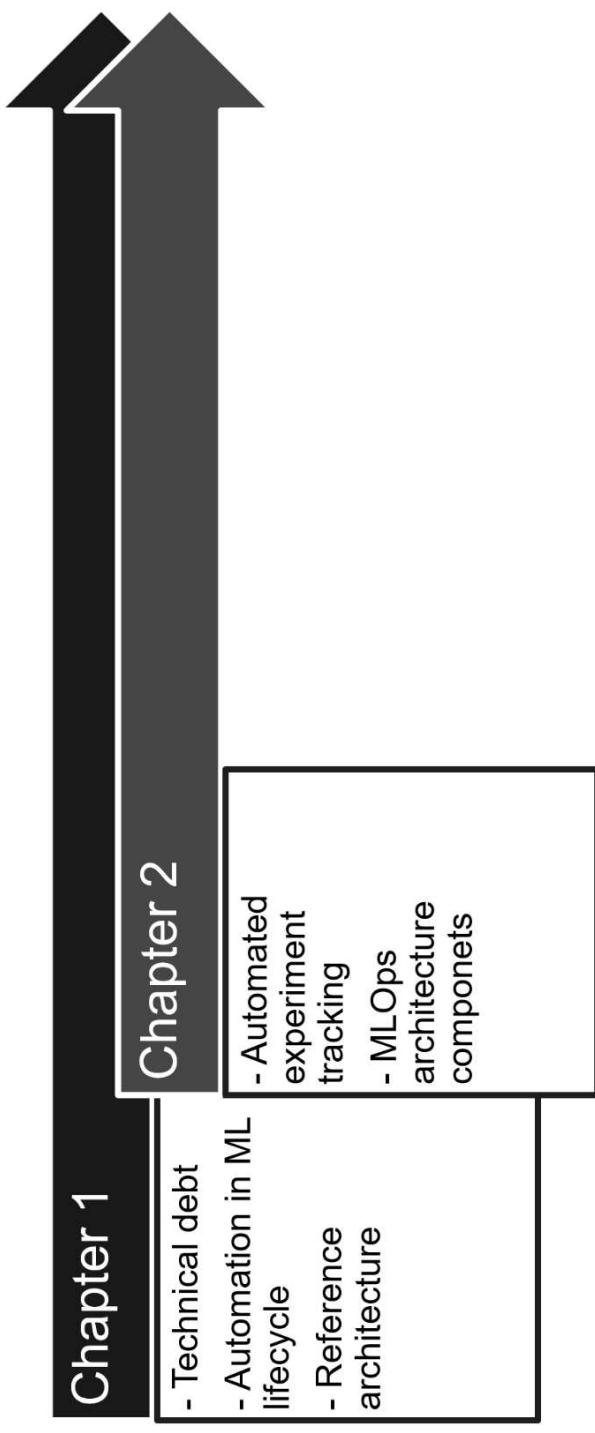
Chapter 1 - Introduction to fully automated MLOps



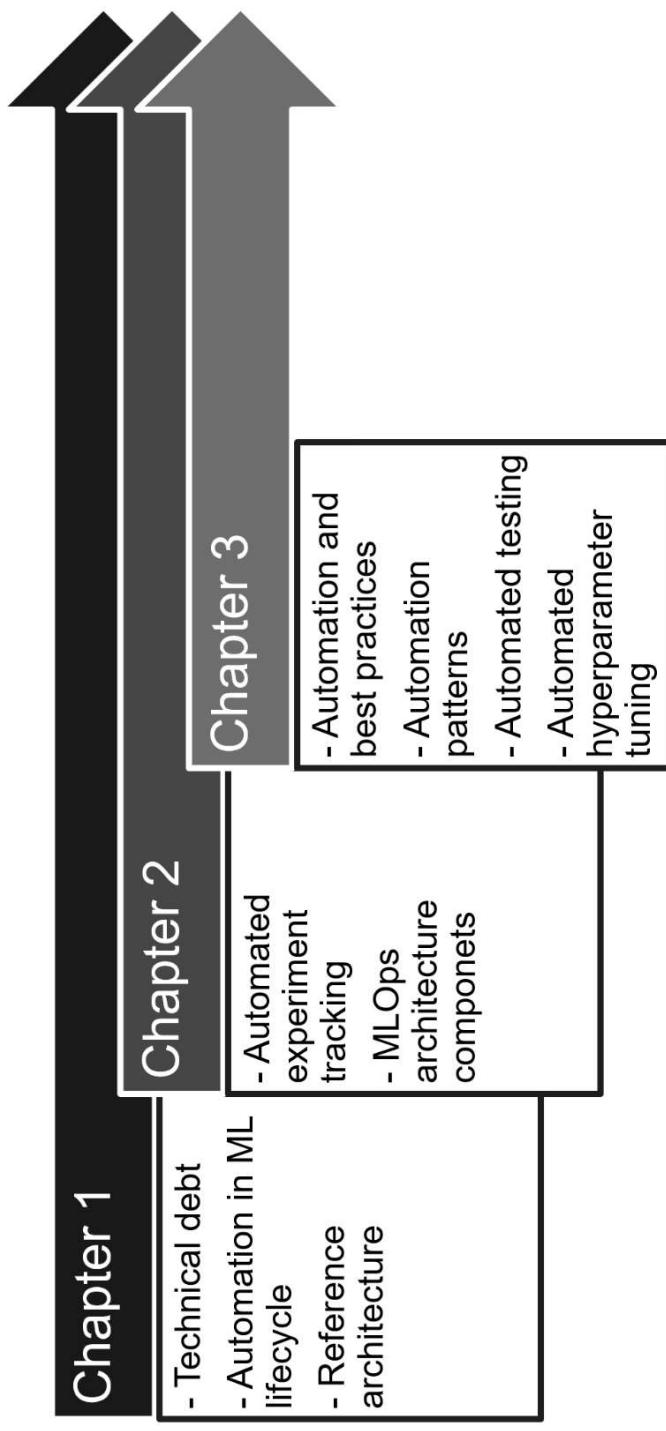
Chapter 1

- Technical debt
- Automation in ML lifecycle
- Reference architecture

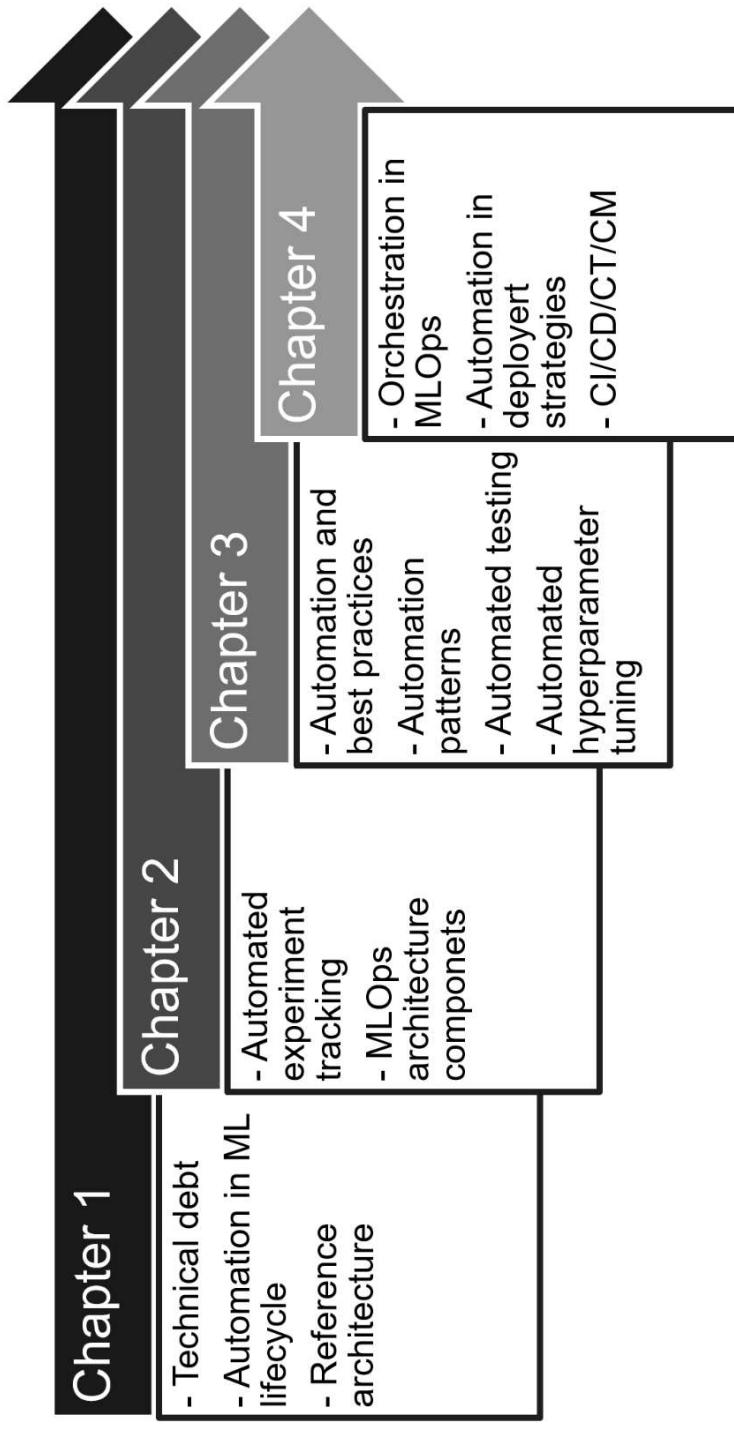
Chapter 2 - Fully automated MLOps architecture



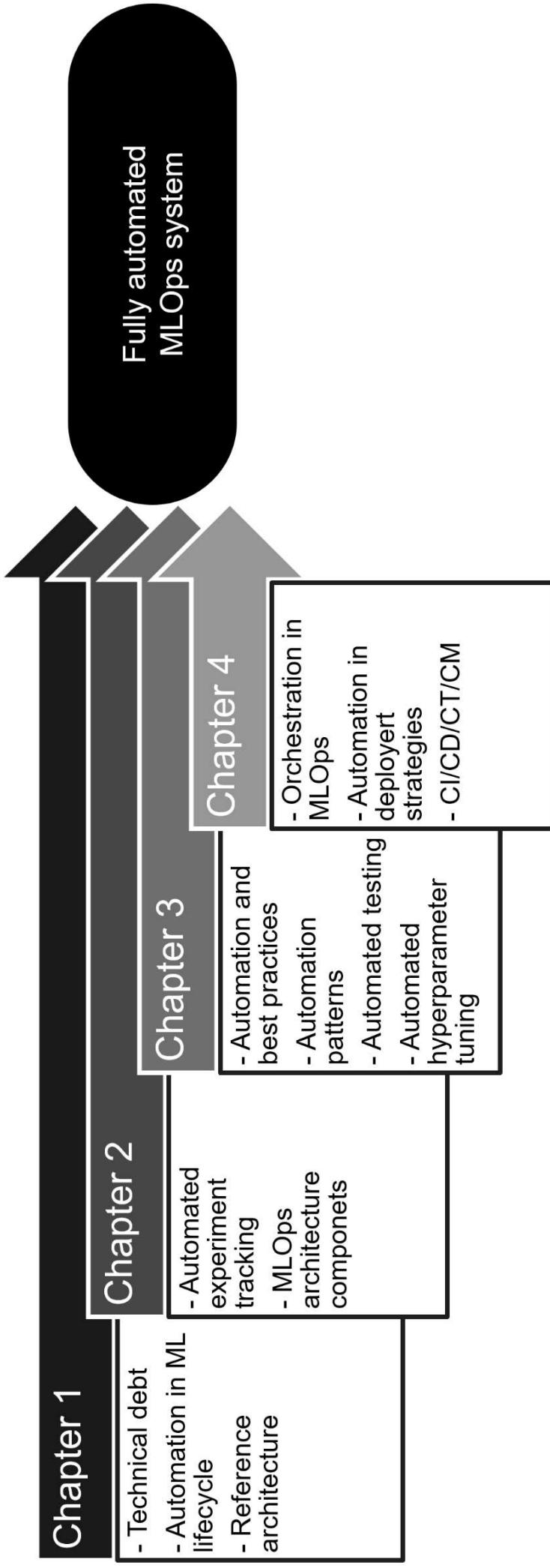
Chapter 3 - Automation patterns



Chapter 4 - Automation in MLOps deployments



Congratulations!



Let's practice!

FULLY AUTOMATED MLOPS