# MLOps

**Machine learning operations**

Machine learning operations (MLOps) are a set of practices that automate and simplify machine learning (ML) workflows and deployments.

Machine learning and artificial intelligence (AI) are core capabilities that you can implement to solve complex real-world problems

MLOps is an ML culture and practice that unifies ML application development (Dev) with ML system deployment and operations (Ops).

Machine learning operation

1. model development
2. testing
3. integration
4. release
5. Infrastructure management.

MLOps is critical to systematically and simultaneously manage the release of new ML models with application code and data changes. An optimal MLOps implementation treats the ML assets similarly to other continuous integration and delivery (CI/CD) environment software assets. You deploy ML models alongside the applications and services they use and those that consume them as part of a unified release process.

## What are the principles of MLOps?

### Version control

This process involves tracking changes in the machine learning assets so you can reproduce results and roll back to previous versions if necessary. Every ML training code or model specification goes through a code review phase.

## Automation

Automate various stages in the machine learning pipeline to ensure repeatability, consistency, and scalability. This includes stages from data ingestion, preprocessing, model training, and validation to deployment.

Messaging
Monitoring or calendar events
Data changes
Model training code changes
Application code changes.

Benefits of machine

Faster time to market

Improved productivity

Efficient model deployment

difference between MLOps **and DevOps**

MLOps and DevOps are both practices that aim to improve processes

Where you develop

Deploy

Monitor software applications.

DevOps aims to bridge the gap between development and operations teams.

DevOps helps ensure that code changes are automatically tested, integrated, and deployed to production efficiently and reliably. اختبار تلقائي ودمج ونشر

It promotes a culture of collaboration to achieve faster release cycles, improved application quality, and more efficient use of resources. اتعاون ف اصدار اسرع

MLOps, on the other hand, is a set of best practices specifically designed for machine learning projects. While it can be relatively straightforward to deploy and integrate traditional software, ML models present unique challenges. They involve data collection

model training

validation

deployment

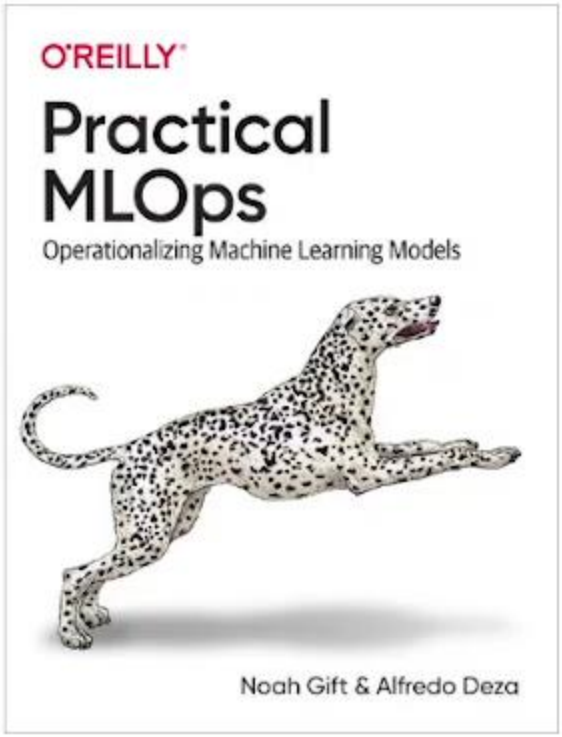
continuous monitoring and retraining.

MLOps faster in employment of ML models استخدام نماذج التعلم الآلي

better accuracy over time دقة

Stronger assurance that they provide real business ضمان أقوى

https://aws.amazon.com/what-is/mlops/#:~:text=Machine%20learning%20operations%20%28MLOps%29%20are%20a%20set%20of,real-world%20problems%20and%20deliver%20value%20to%20your%20customers.



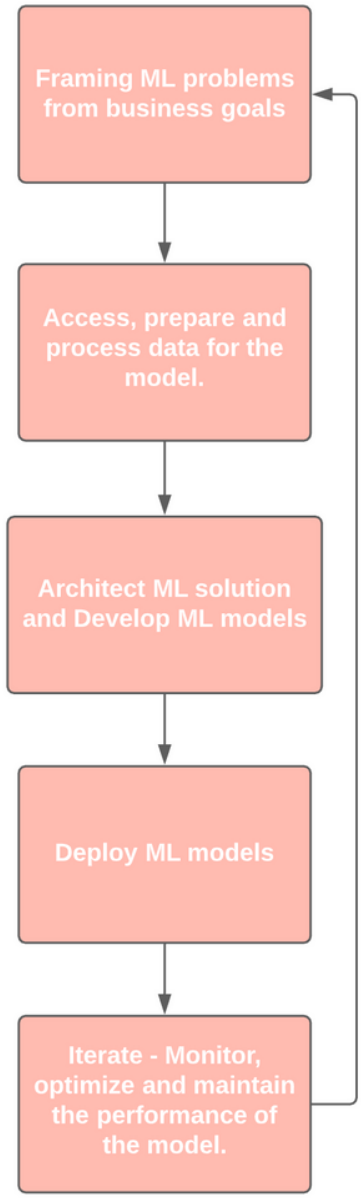

### Another website

MLOps is a relatively new discipline. it has come to be because more organizations are trying to integrate ML systems into their products and platforms.

# MLOps Leads

- **Business development or Product team** — defining business objective(s) with KPIs
- **Data Engineering** — data acquisition and preparation.
- **Data Science** — architecting ML solutions and developing models.
- **IT or DevOps** — complete deployment setup, monitoring alongside scientists.

# Machine Learning life cycle




https://www.freecodecamp.org/news/what-is-mlops-machine-learning-operations-explained/

## MLOps tools

Qdrant

https://github.com/qdrant/qdrant

LangChain

https://www.langchain.com/

### Experiment Tracking and Model Metadata Management Tools

MLFlow

https://mlflow.org/

Comet ML

https://www.comet.com/site/

Weights & Biases

https://wandb.ai/site

### Orchestration and Workflow Pipelines MLOps Tools

Perfect

https://www.prefect.io/

Metaflow

https://metaflow.org/

Kedro

https://kedro.org/

## Data and Pipeline Versioning Tools

Pachyderm

https://www.pachyderm.com/

Data Version Control (DVC)

https://dvc.org/

LakeFS

## Feature Stores

Feast

https://github.com/feast-dev/feast

Featureform

https://github.com/featureform/featureform

## Model Testing

Deepchecks ML Models Testing

https://deepchecks.com/open-source/

TruEra

https://truera.com/

## Model Deployment and Serving Tools

Kubeflow

https://www.kubeflow.org/docs/

BentoML

https://www.bentoml.com/

Hugging Face Inference Endpoints

https://huggingface.co/docs/inference-endpoints/guides/access

## Model Monitoring in Production ML Ops Tools

Evidently

https://www.evidentlyai.com/

Fiddler

https://www.fiddler.ai/

## Runtime Engines

Ray

https://www.ray.io/

Nuclio

https://github.com/nuclio/nuclio

## End-to-End MLOps Platforms

AWS SageMaker

https://aws.amazon.com/sagemaker/mlops/?sagemaker-data-wrangler-whats-new.sort-by=item.additionalFields.postDateTime&sagemaker-data-wrangler-whats-new.sort-order=desc

DagsHub

https://dagshub.com/

Iguazio MLOps Platform

https://www.iguazio.com/platform/

the link of website https://www.datacamp.com/blog/top-mlops-tools

https://youtu.be/vtjFSGeKKSI?si=1s6TAV_mrp_1AsDn مفهمتش منه حاجه بس عرفت اسم كتاب

# how to convert categorical to numerical data

it like if I am interested in one value so I can convert it to