

# Are you ready for **MLOps**?



Jeroen Overschie

PyCon SK — 16<sup>th</sup> of March 2024



**Jeroen Overschie**  
Machine Learning Engineer

What does  
it mean to  
be **ready**?

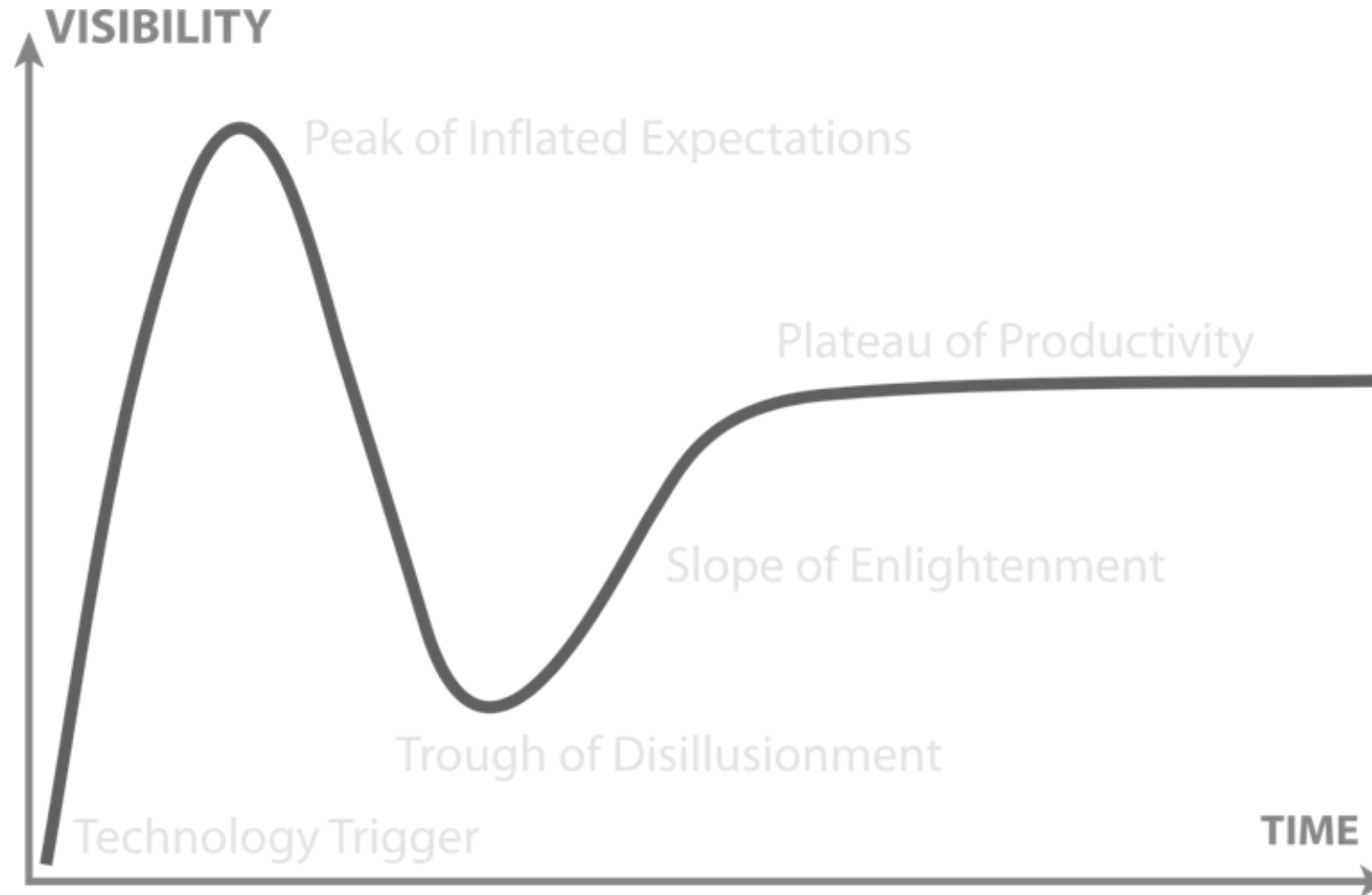
To find out,  
let's first look  
at what **MLOps**  
promised us.



# The promise of MLOps

# The promise of MLOps

## Hype cycle



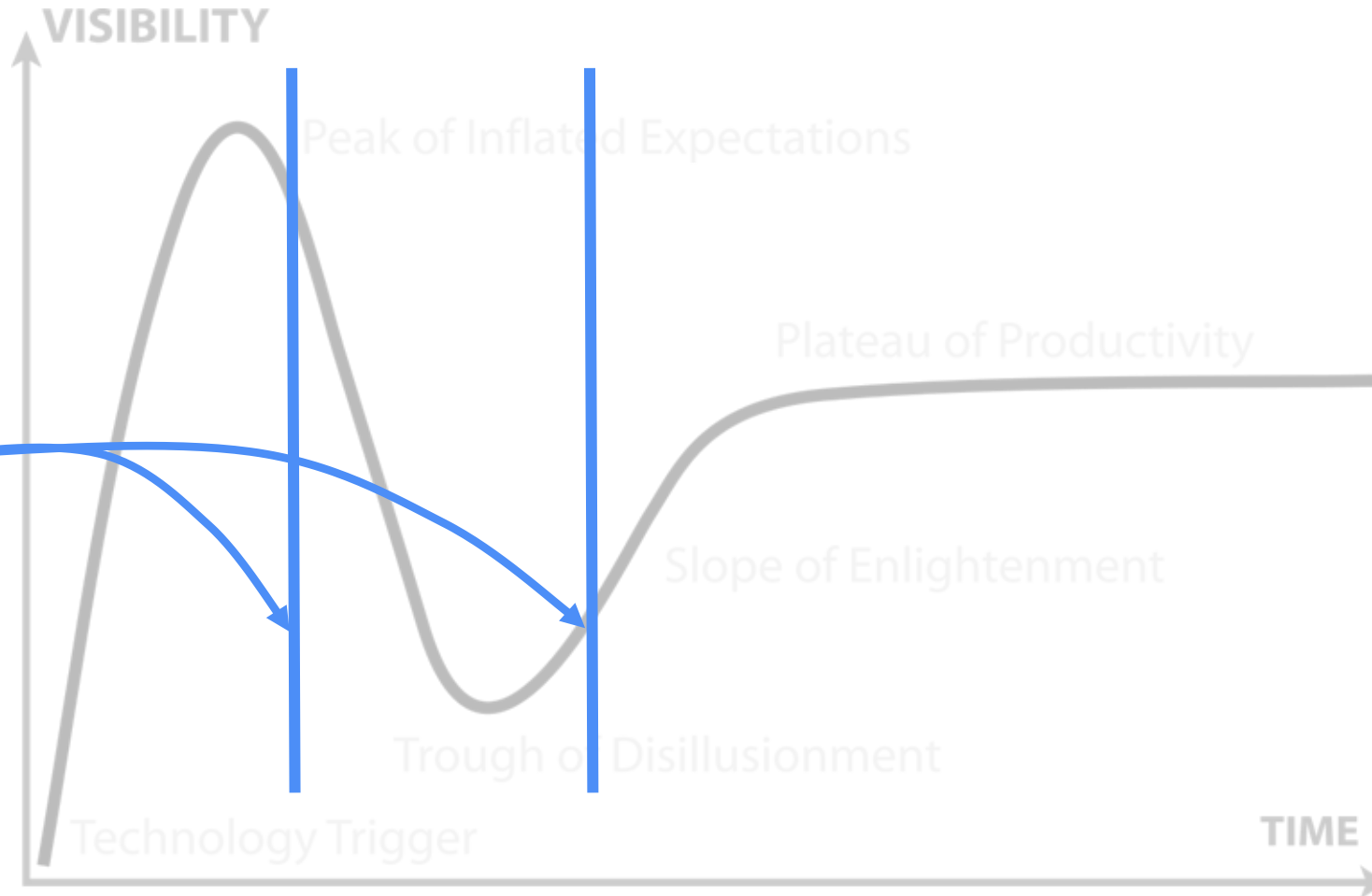
About the hype cycle  
The *Gartner* hype cycle is a graphical presentation developed, used and branded by the American research, advisory and information technology firm Gartner to represent **the maturity, adoption, and social application of specific technologies**. The hype cycle claims to provide a graphical and conceptual presentation of the maturity of emerging technologies through five phases. <sup>[1]</sup>

[1] [https://en.wikipedia.org/wiki/Gartner\\_hype\\_cycle](https://en.wikipedia.org/wiki/Gartner_hype_cycle)

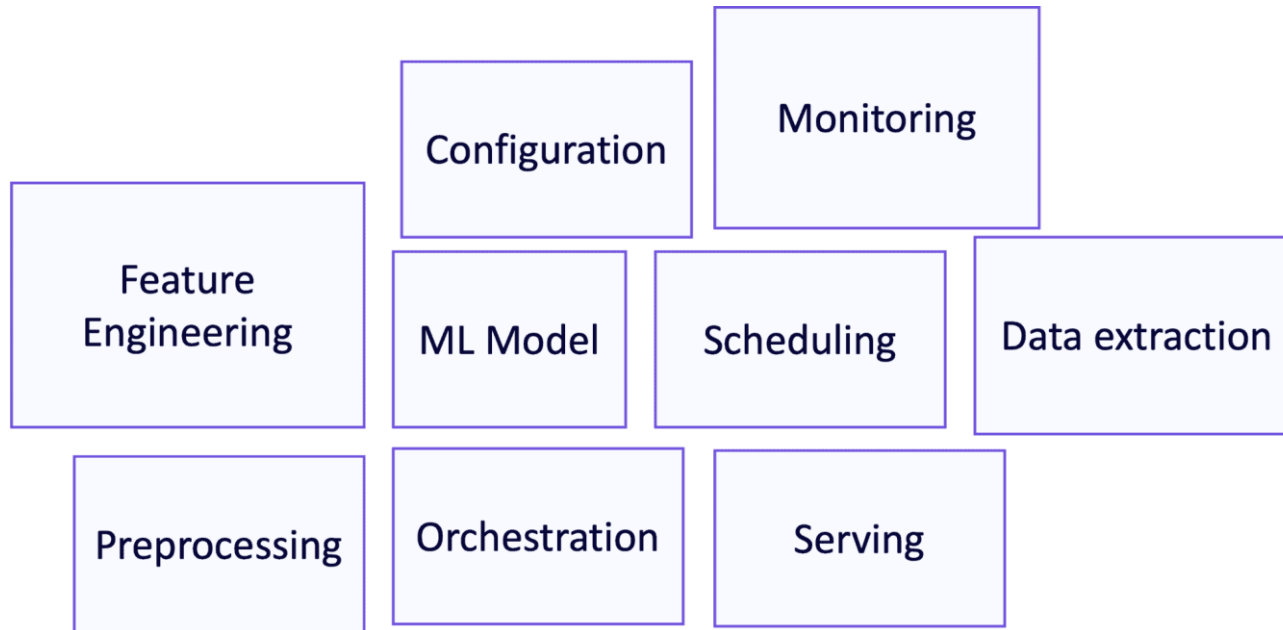
# The promise of MLOps

## Hype cycle

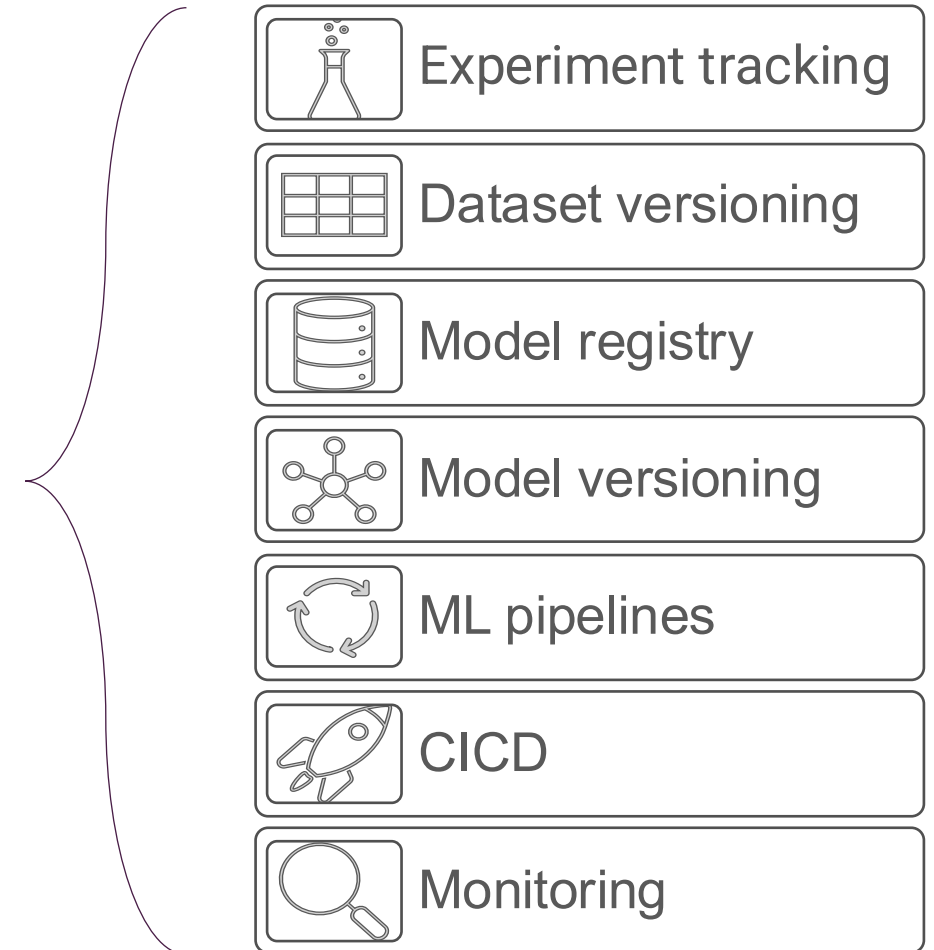
MLOps



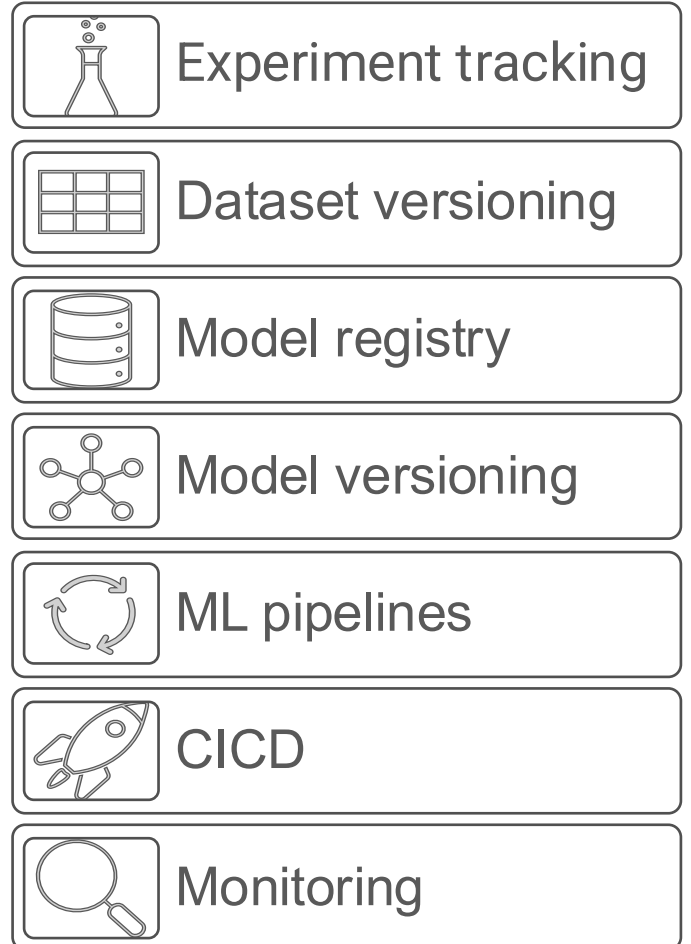
# The promise of MLOps



<https://xebia.com/blog/mlops-why-and-how-to-build-end-to-end-product-teams/>



# The promise of MLOps



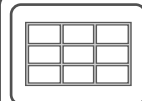
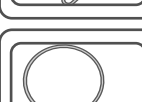
# The promise of MLOps

The screenshot displays the mlflow web interface. On the left, a sidebar shows 'Experiments' with a search bar and a list including 'Default' and 'mlflow-demo'. The main area is titled 'mlflow-demo' and includes a 'Share' button. A notification banner states: 'Track machine learning training runs in an experiment. [Learn more](#)'. Below this, the 'Experiment ID: 1' is shown. A 'Description' section with an 'Edit' link is present. Action buttons include 'Refresh', 'Compare', 'Delete', 'Download CSV', and a 'Start Time' dropdown set to 'All time'. A search bar contains the query 'metrics.rmse < 1 and params.model = "tree"'. A table titled 'Showing 5 matching runs' lists the following data:

|                          | Start Time    | Duration | Run Name | User   | Source     | Version | Models  | Metrics | Parameters |
|--------------------------|---------------|----------|----------|--------|------------|---------|---------|---------|------------|
| <input type="checkbox"/> | 2 minutes ago | 9.4s     | run_4    | KayJan | C:\Program | -       | sklearn | 1       | 20         |
| <input type="checkbox"/> | 2 minutes ago | 11.9s    | run_3    | KayJan | C:\Program | -       | sklearn | 1       | 10         |
| <input type="checkbox"/> | 2 minutes ago | 12.4s    | run_2    | KayJan | C:\Program | -       | sklearn | 0.967   | 5          |
| <input type="checkbox"/> | 3 minutes ago | 16.8s    | run_1    | KayJan | C:\Program | -       | sklearn | 0.967   | 2          |
| <input type="checkbox"/> | 3 minutes ago | 10.7s    | run_0    | KayJan | C:\Program | -       | sklearn | 0.633   | 1          |

A 'Load more' button is located at the bottom of the table.

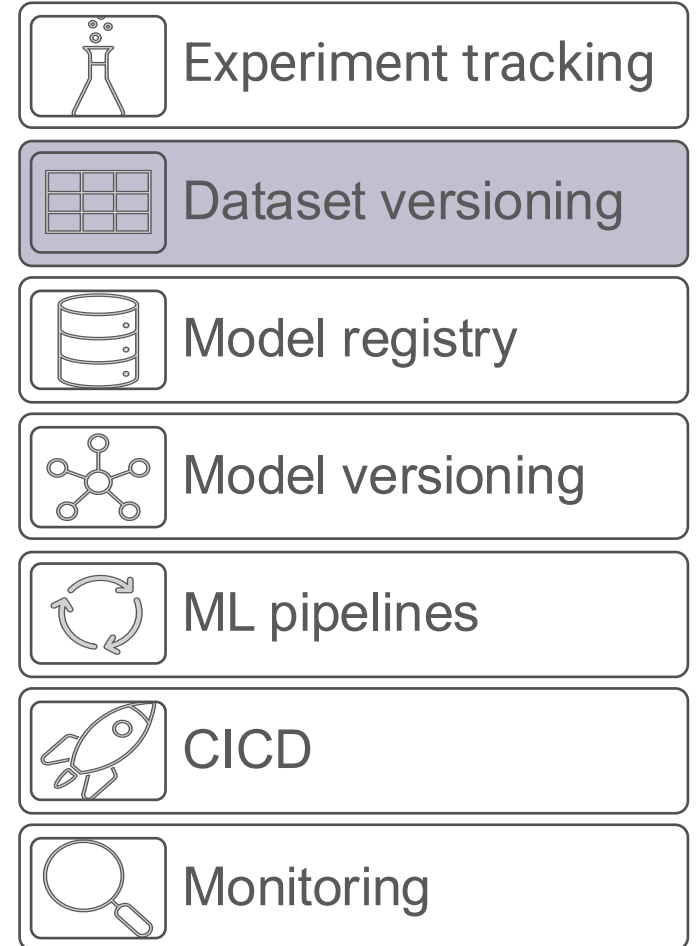
<https://towardsdatascience.com/experiment-tracking-with-mlflow-in-10-minutes-f7c2128b8f2c>

-  Experiment tracking
-  Dataset versioning
-  Model registry
-  Model versioning
-  ML pipelines
-  CICD
-  Monitoring

# The promise of MLOps

The screenshot displays the Azure Machine Learning workspace interface. The left sidebar contains navigation options: New, Home, Author (Notebooks, Automated ML, Designer), Assets (Datasets, Experiments, Pipelines, Models, Endpoints), and Manage (Compute, Environments). The main area shows the path: mayworkspace > Experiments > keras-mnist > keras-mnist\_1570739212\_92bc7afd. The selected run is 'Run 24'. Below the run name are tabs for Properties, Metrics, Images, Child runs, Outputs, Logs, Snapshot, and Raw JSON. The 'Properties' tab is active, showing details like Status (Completed), Created time (Oct 10, 2019 1:31 PM), Duration (1m 55.69s), Compute target (local), Run ID, Run number (24), Script name (keras\_mnist.py), and Input datasets (keras-mnist, which is highlighted with a red box). The 'Metrics' tab shows Accuracy (Vector) and Final test accuracy (0.9794999957084656).

<https://learn.microsoft.com/en-us/azure/machine-learning/how-to-version-track-datasets?view=azureml-api-1>



# The promise of MLOps

Vertex AI

TOOLS

Dashboard

Workbench

Pipelines

DATA

Feature Store

Datasets

Labeling tasks

MODEL DEVELOPMENT

Training

Experiments

Metadata

DEPLOY AND USE

Endpoints

Model Registry

Batch predictions

Matching Engine

Model Registry

CREATE

IMPORT

Models are built from your datasets or unmanaged data sources. There are many different types of machine learning models available on Vertex AI, depending on your use case and level of experience with machine learning. [Learn more](#)

Region

us-central1 (Iowa)

Filter

Deployment status: Deployed on Vertex AI

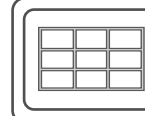
Enter a property name

| Name                                                                                     | Deployment status     | Description | Default version | Versions | Type                 |
|------------------------------------------------------------------------------------------|-----------------------|-------------|-----------------|----------|----------------------|
| <a href="#">abalone-model</a>                                                            | Deployed on Vertex AI | —           | 1               | 1        | Custom trained       |
| <a href="#">automl_object_detection_quickstart (2)_2020924155613</a>                     | Deployed on Vertex AI | —           | 1               | 1        | Object detection     |
| <a href="#">automl_untilted_15997825_20200910050743</a>                                  | Deployed on Vertex AI | —           | 1               | 1        | Tabular              |
| <a href="#">automl_with_weight_column_20200916_peris (7)</a>                             | Deployed on Vertex AI | —           | 1               | 1        | Tabular              |
| <a href="#">automl_ybo_427_automl_1</a>                                                  | Deployed on Vertex AI | —           | 1               | 1        | Object detection     |
| <a href="#">automl-tabular-model-upload-4866906856490008576-3750702443181113344</a>      | Deployed on Vertex AI | —           | 1               | 1        | Imported             |
| <a href="#">automl-tabular-model-upload-6026042800817045504-2775550528308903936</a>      | Deployed on Vertex AI | —           | 1               | 1        | Imported             |
| <a href="#">automl-tabular-model-upload-6099367032250171392-1464271861511618560</a>      | Deployed on Vertex AI | —           | 1               | 1        | Imported             |
| <a href="#">credit_card_default_1619536651363_2021524173021_limit_balance_regression</a> | Deployed on Vertex AI | —           | 1               | 1        | Tabular              |
| <a href="#">credit_card_default_1619536651363_limit_balance_regression</a>               | Deployed on Vertex AI | —           | 1               | 1        | Tabular              |
| <a href="#">custom_batch_prediction_test_model_20210303</a>                              | Deployed on Vertex AI | —           | 1               | 1        | Imported             |
| <a href="#">custom_job_with_gpus_0610</a>                                                | Deployed on Vertex AI | —           | 1               | 1        | Custom trained       |
| <a href="#">custom_model_tf_flowers</a>                                                  | Deployed on Vertex AI | —           | 1               | 1        | Imported             |
| <a href="#">custom_model_tf_gpu_flowers</a>                                              | Deployed on Vertex AI | —           | 1               | 1        | Imported             |
| <a href="#">flowers_2021119233932</a>                                                    | Deployed on Vertex AI | —           | 1               | 1        | Image classification |
| <a href="#">flowers_2021119234048_edge</a>                                               | Deployed on Vertex AI | —           | 1               | 1        | Image classification |

<https://cloud.google.com/blog/products/ai-machine-learning/vertex-ai-model-registry>



## Experiment tracking



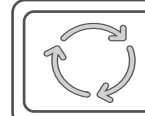
## Dataset versioning



## Model registry



## Model versioning



## ML pipelines



CICD



## Monitoring

# The promise of MLOps

Vertex AI

Churn classifier model [EDIT DETAILS](#)

Model description: A churn prediction model for real-time inference

Region: us-central1 (Iowa)

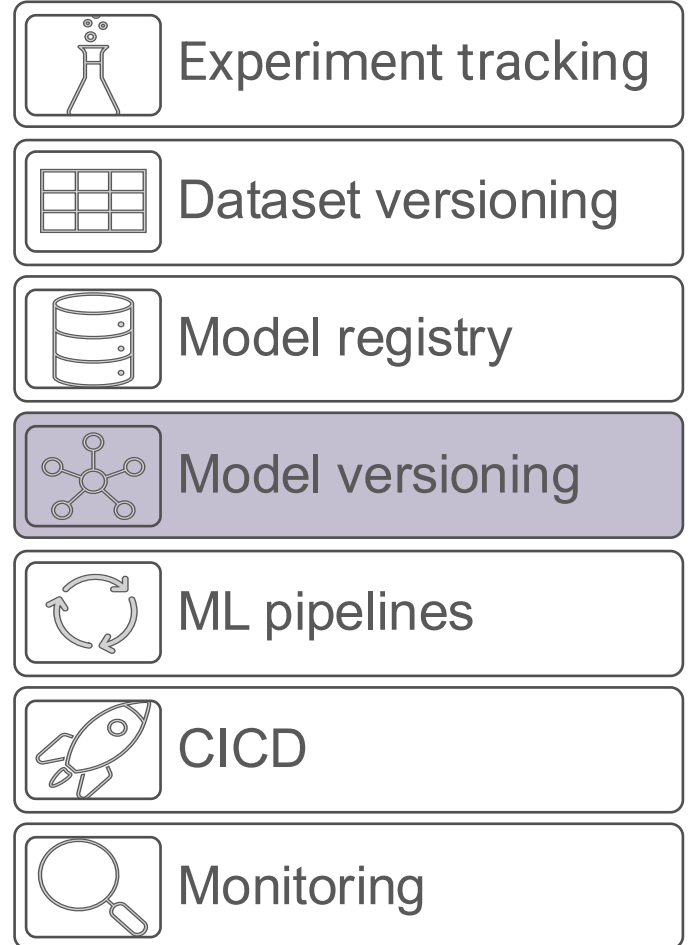
Model labels: —

Versions

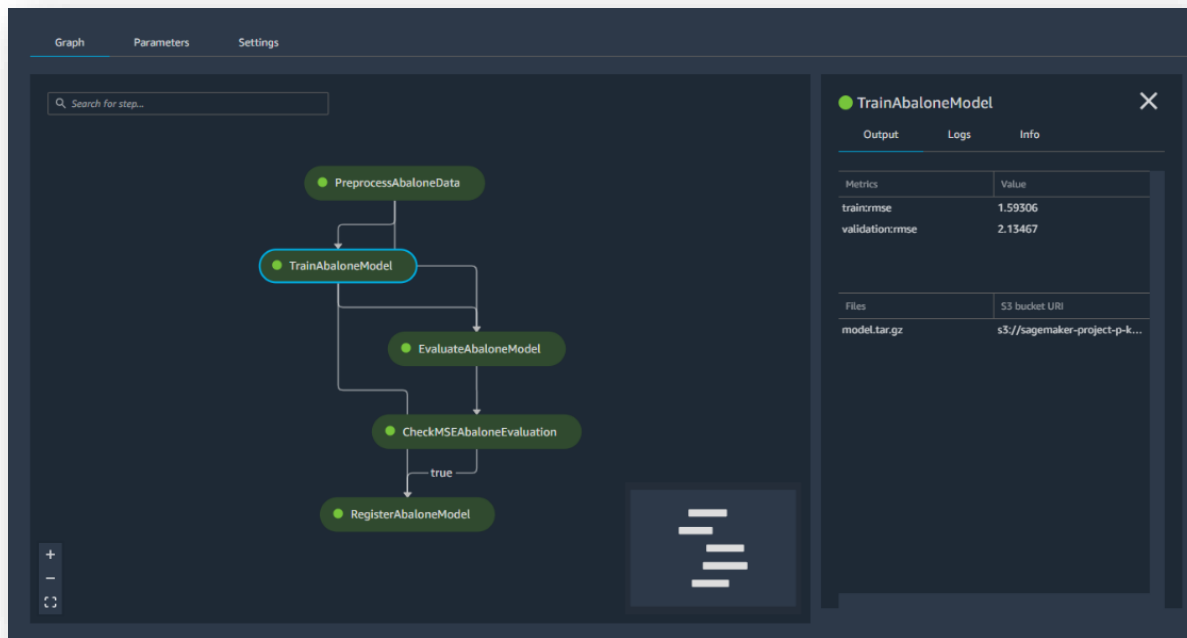
Filter: Enter a property name

| Version ID | Alias                           | Status | Description         | Endpoints | Created                 | Labels                                       |
|------------|---------------------------------|--------|---------------------|-----------|-------------------------|----------------------------------------------|
| 3          | rfor experimental               | Ready  | Random Forest       | —         | Oct 5, 2022, 5:45:10 PM | created_by: data_scienc... team: data_office |
| 2          | gbtree staging                  | Ready  | Gradient Boosting   | —         | Oct 5, 2022, 5:35:06 PM | created_by: data_scienc... team: data_office |
| 1          | default logistic_reg production | Ready  | Logistic Regression | —         | Oct 5, 2022, 5:33:58 PM | created_by: data_scienc... team: data_office |

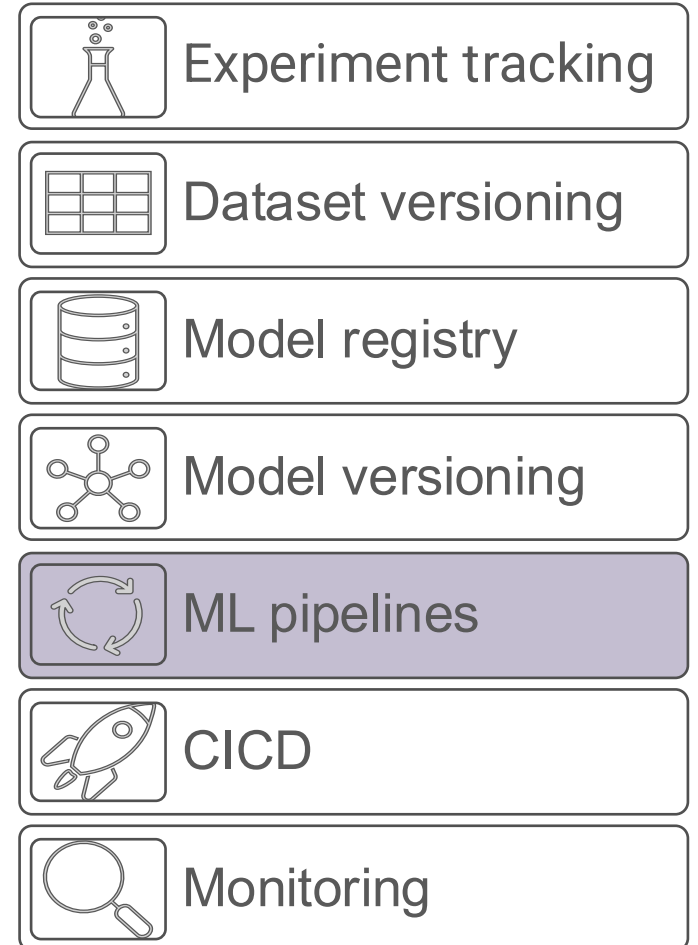
<https://cloud.google.com/blog/products/ai-machine-learning/vertex-ai-model-registry>



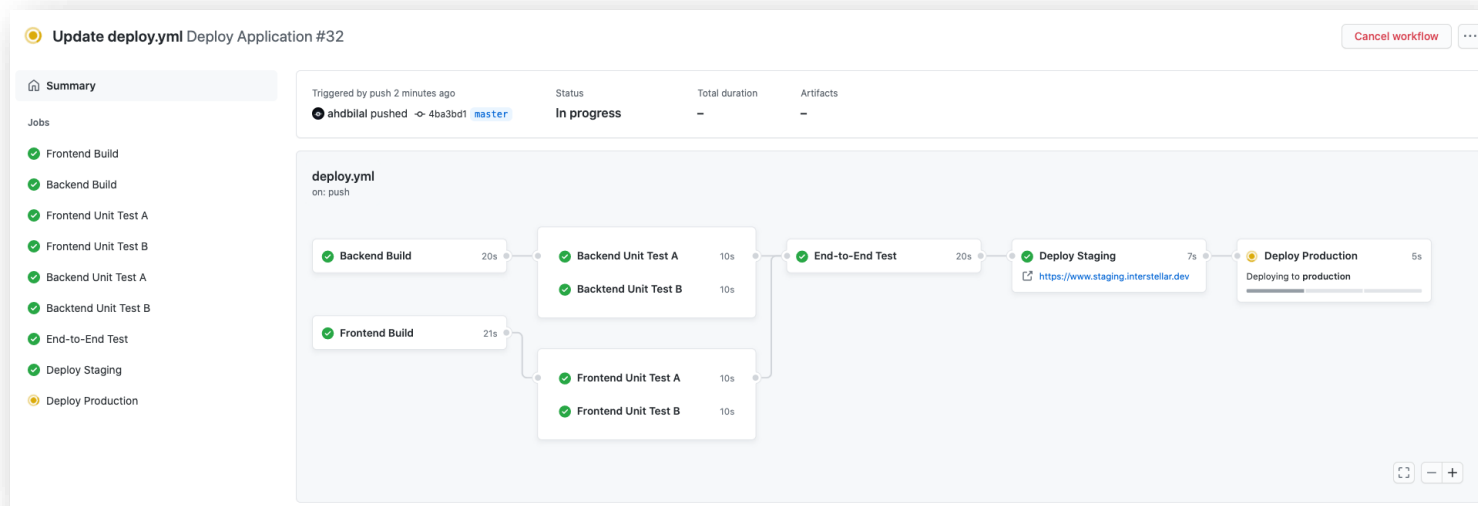
# The promise of MLOps



<https://www.amazonaws.cn/en/sagemaker/pipelines/>



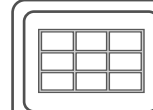
# The promise of MLOps



<https://github.blog/changelog/2020-12-08-github-actions-workflow-visualization/>



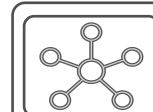
Experiment tracking



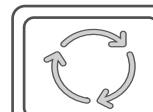
Dataset versioning



Model registry



Model versioning



ML pipelines

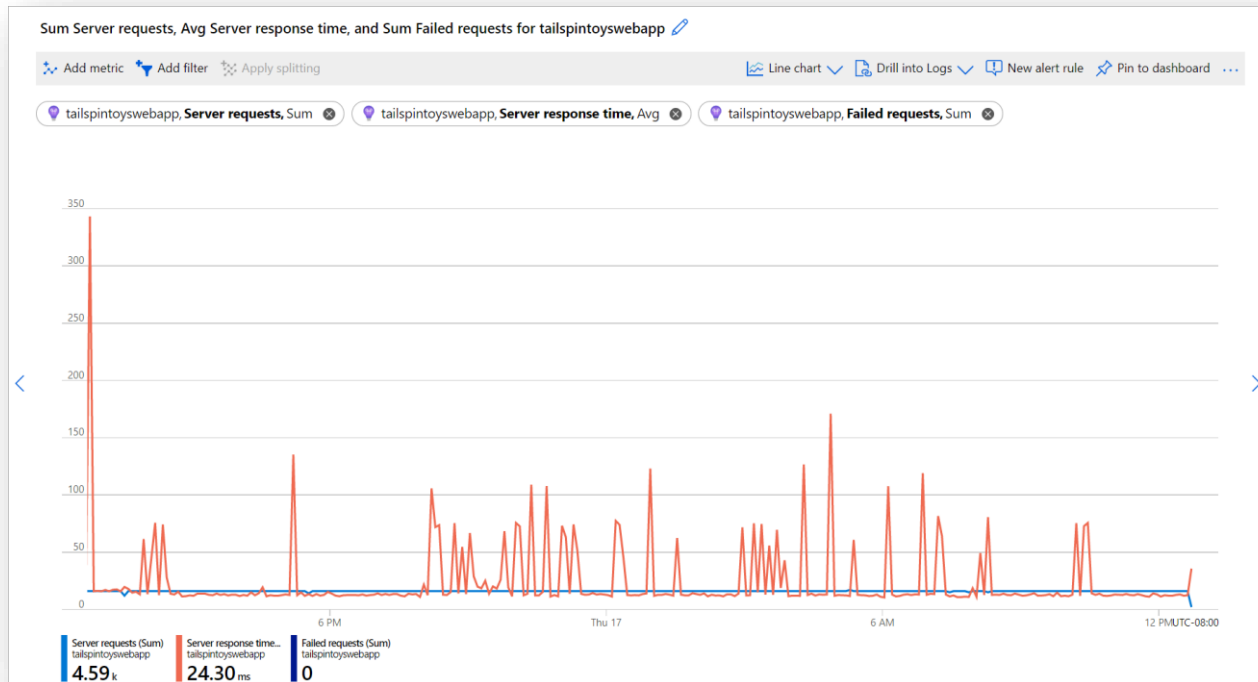


CI/CD

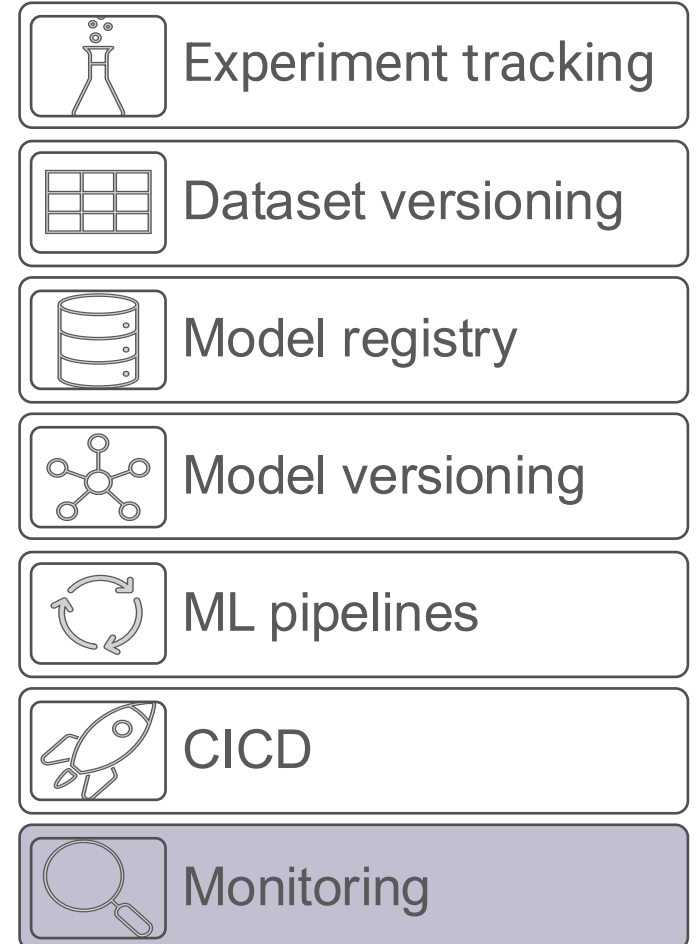


Monitoring

# The promise of MLOps



<https://learn.microsoft.com/en-us/azure/azure-monitor/essentials/data-platform-metrics>



# The promise of **MLOps**

Cloud providers offer  
solutions for **MLOps**.



Azure Machine Learning



Vertex AI



Amazon SageMaker



**databricks**

# The promise of **MLOps**

So what's  
that **promise**?

The **MLOps** promises.

- Productionisation
- Automated quality checks
- Faster development
- Automated releases
- Faster deployment
- Better monitoring
- Reliable (ML) software products

The promise  
of MLOps



So where  
did this all  
come  
from?

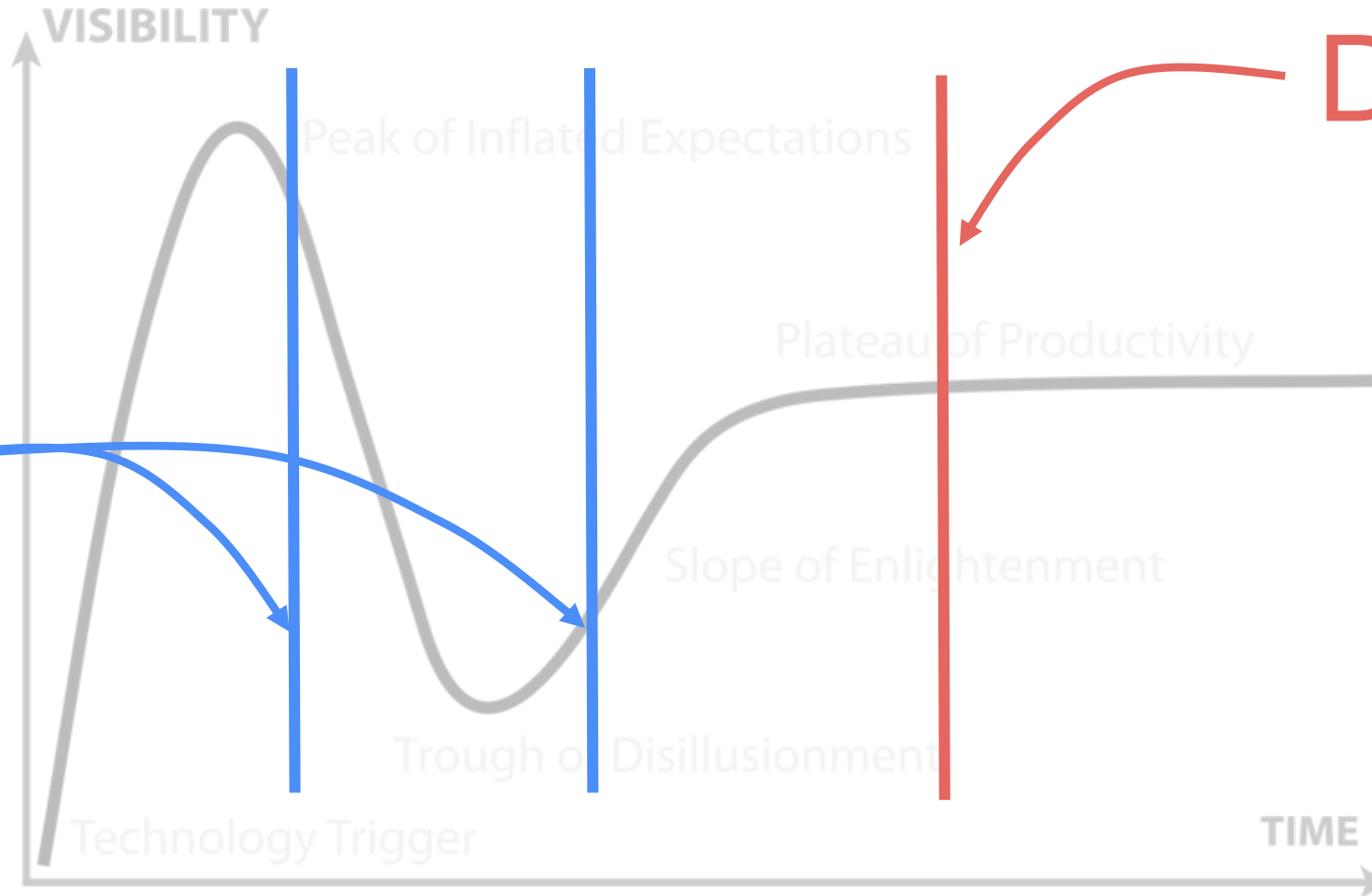
# Back to the hype cycle

Back to the  
hype cycle

# Hype cycle

DevOps

MLOps



DevOps

**MLOps?**

SecOps

...Ops hype

DevSecOps

LLM Ops

LegOps

DataOps

# DevOps



# MLOps

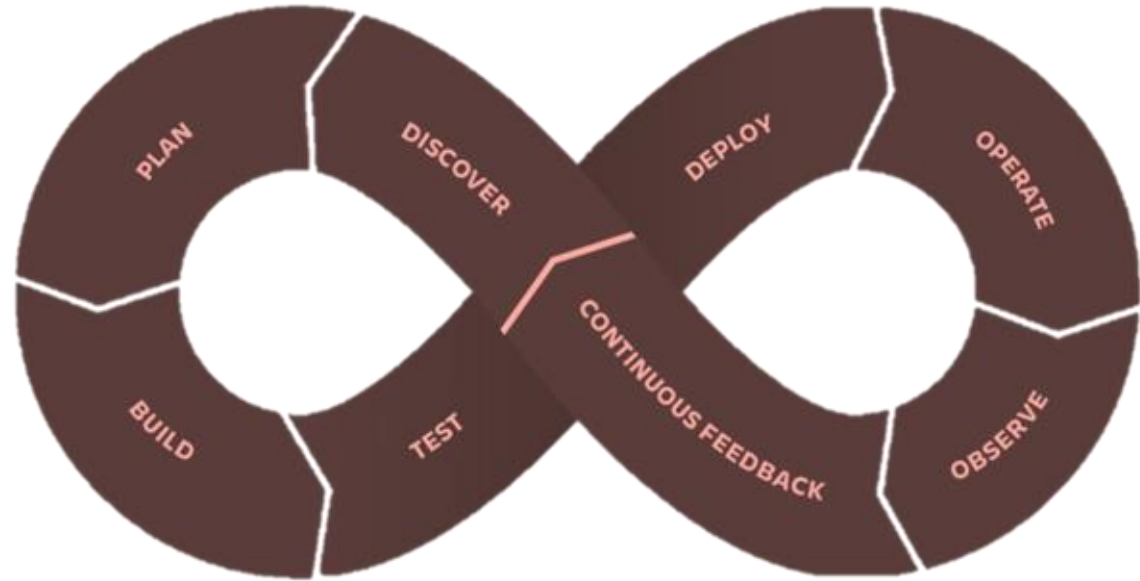


# DevOps

Since 2007.  
Bring together  
**Dev** and **Ops**.

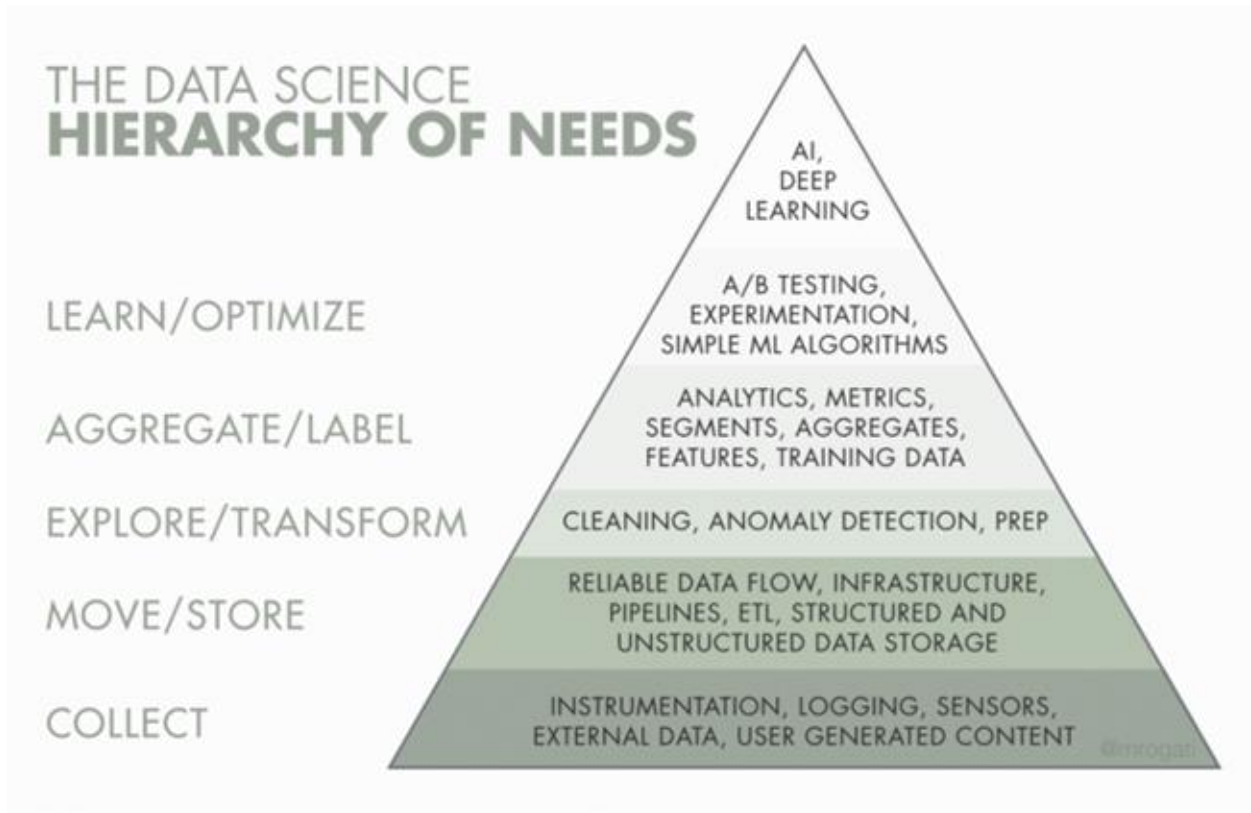
## Key principles

- Automation
- Collaboration & communication
- Continuously improving
- Focus on user needs

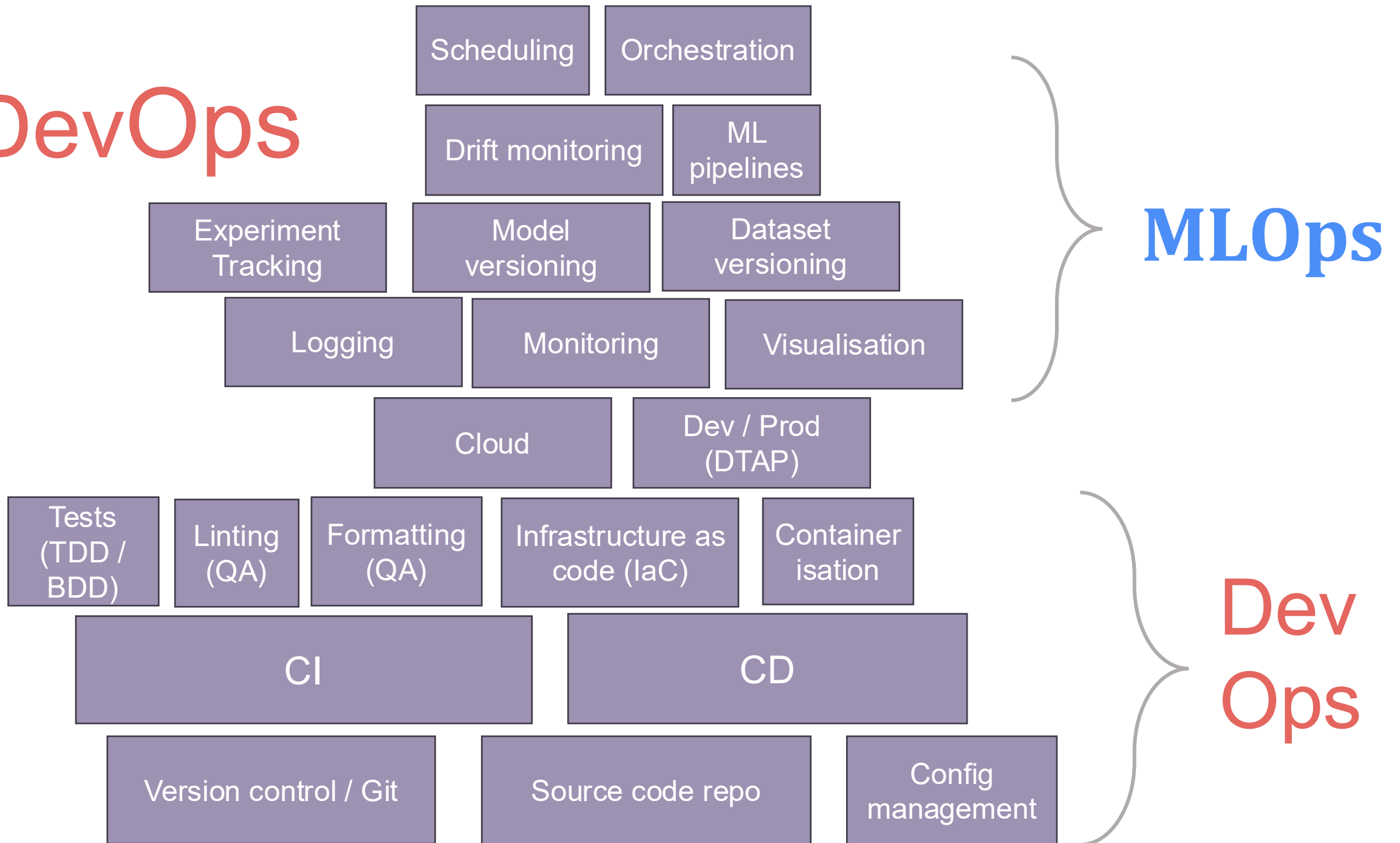


<https://www.atlassian.com/devops/what-is-devops>

# DevOps



# DevOps



# DevOps



**MLOps**

**Dev  
Ops**



**MLOps**

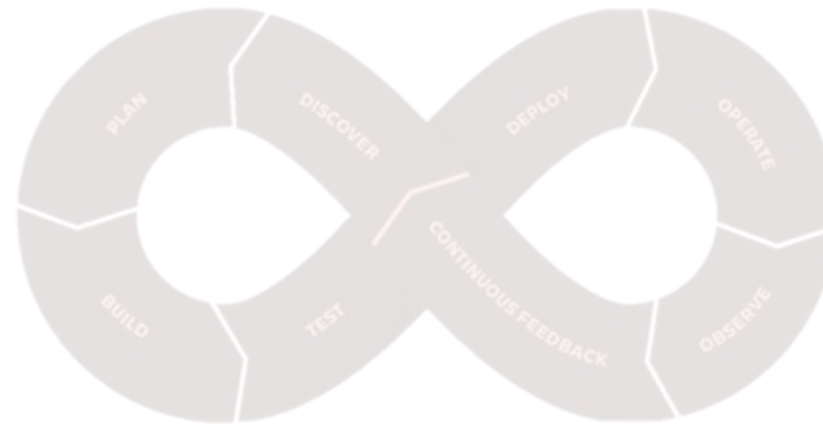
**Dev  
Ops**

# DevOps

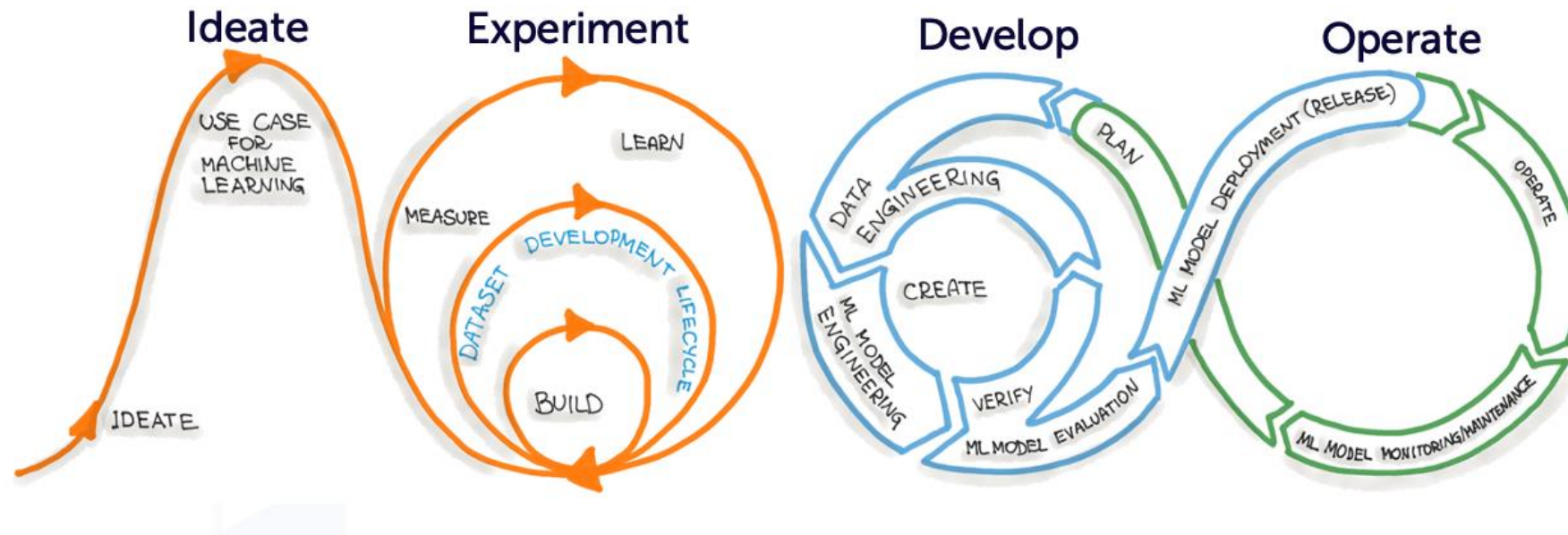
Alright so DevOps.

But then what's  
**the MLOps twist?**

# The MLOps twist

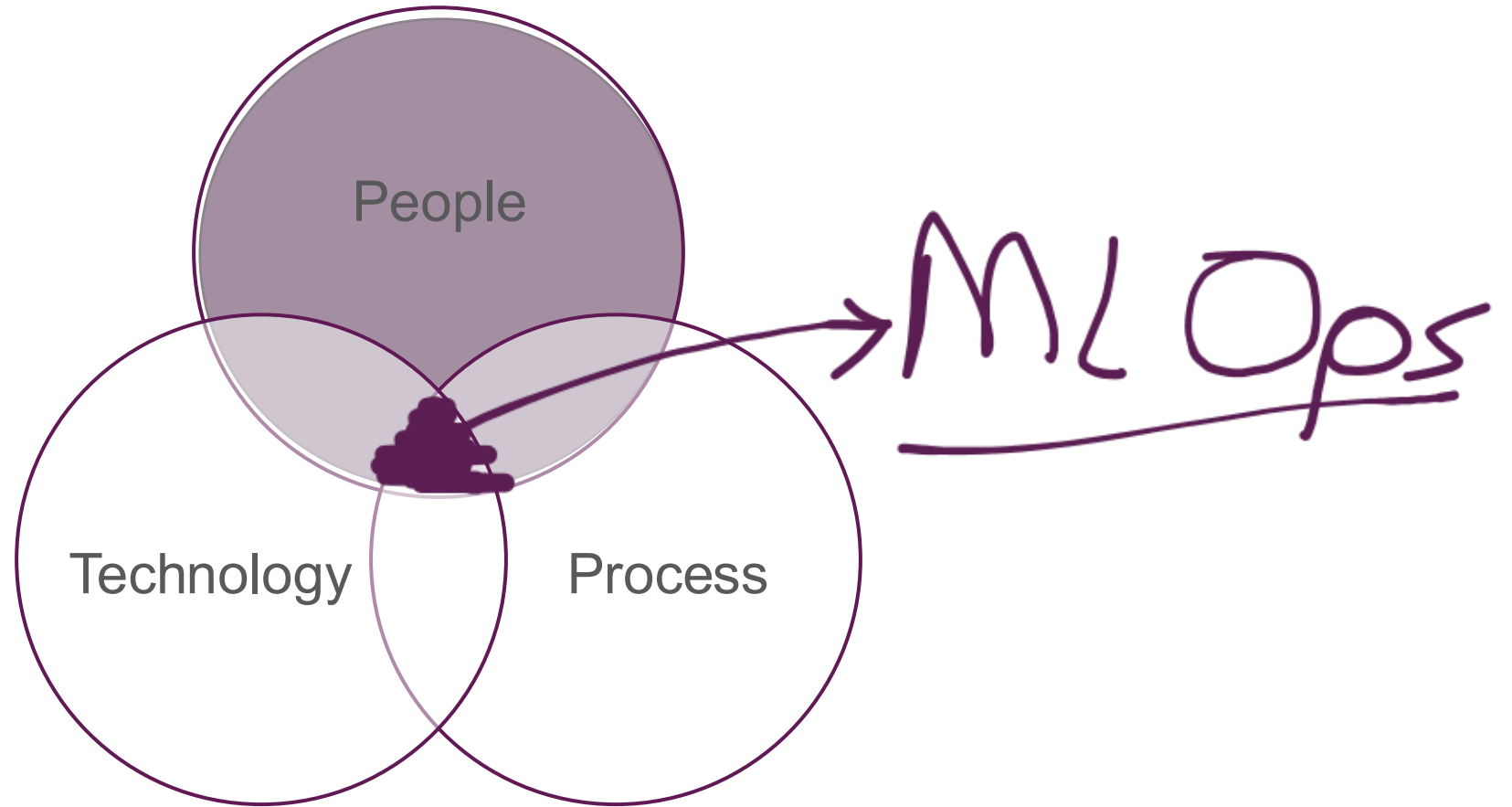


<https://www.atlassian.com/devops/what-is-devops>

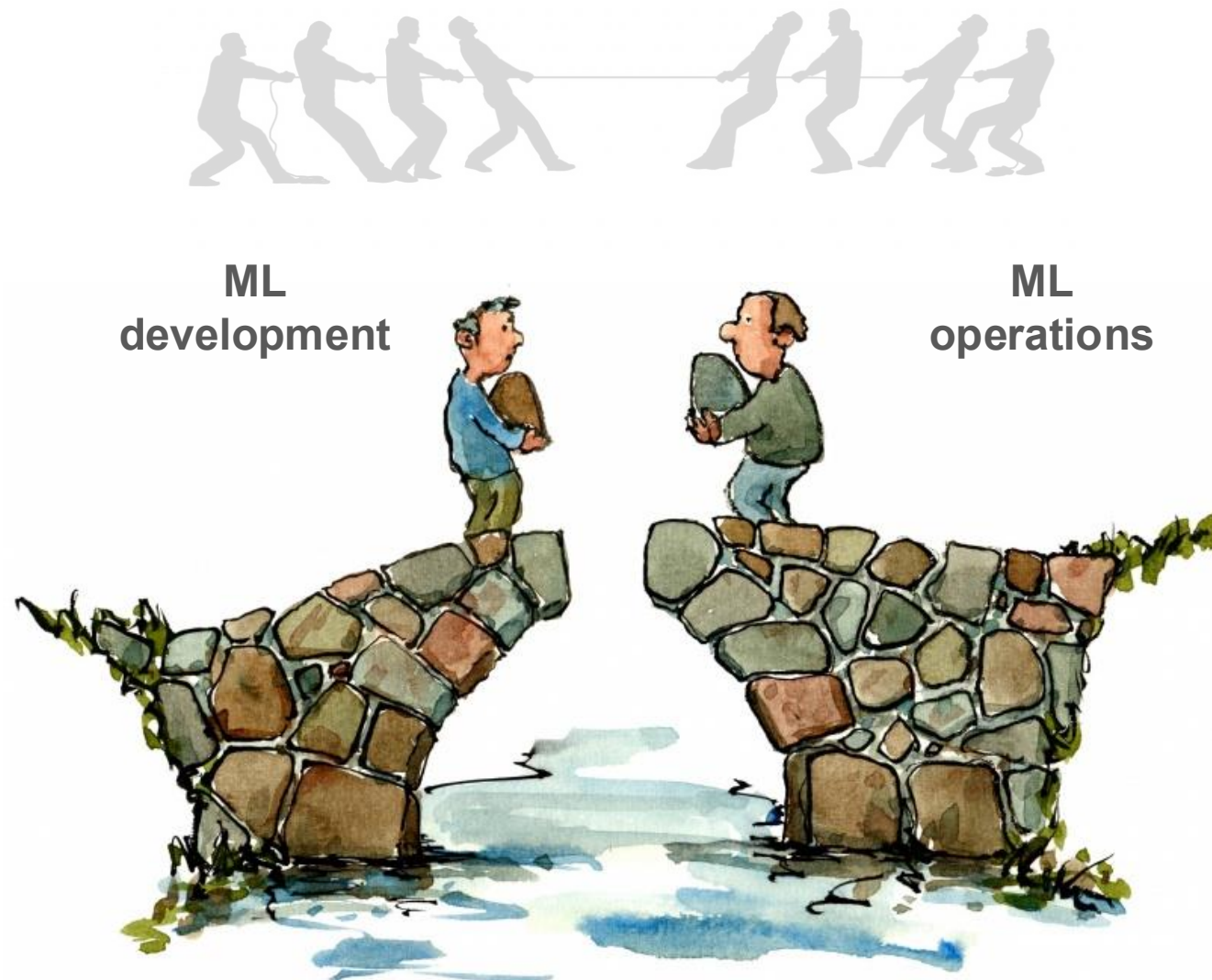


# The MLOps twist

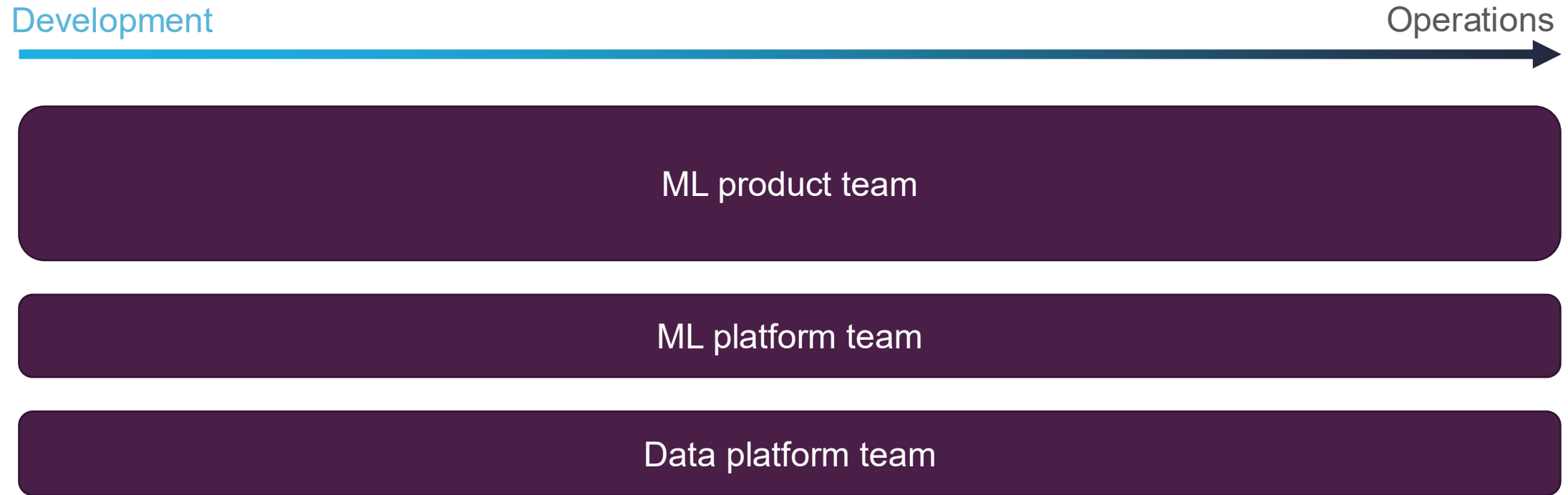
It was never just tech.



# The **ML**Ops twist



# The MLOps twist



# When to consider MLOps

| Data                                                            | Tools & Tech                                                    | People & Skills                                                 | Process & Ops                                                   |
|-----------------------------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------|
| <ul style="list-style-type: none"><li>• ✓</li><li>• ✓</li></ul> | <ul style="list-style-type: none"><li>• ✓</li><li>• ✓</li></ul> | <ul style="list-style-type: none"><li>• ✓</li><li>• ✓</li></ul> | <ul style="list-style-type: none"><li>• ✓</li><li>• ✓</li></ul> |



Curious about what checkmarks  
you should take into account?



Contact us about the MLOps  
maturity scan.

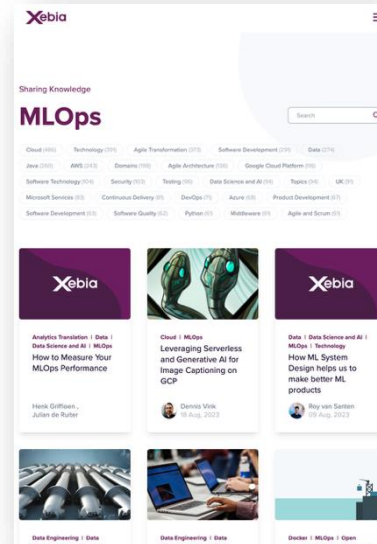
# Let's together make this a great community ☒



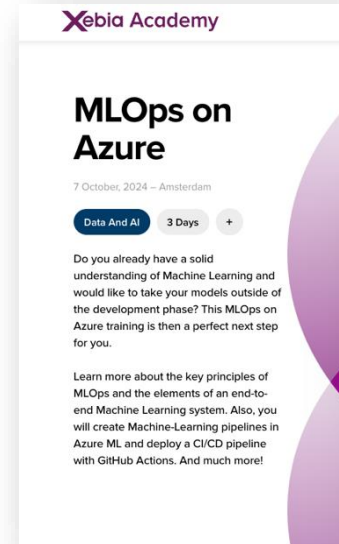
 Worldwide MLOps  
community



Meetup  
community



Xebia  
Blog



Xebia Academy  
MLOps Training



Xebia Base MLOps  
Platform



## | Room B

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10:00 - 13:00



Beginners

How to MLOps: Experiment tracking & deployment

Yke Rusticus a Jeroen Overschie



# Thank you!

— Jeroen Overschie

Jeroen Overschie  
Machine Learning Engineer @ Xebia Data

 <https://linkedin.com/in/jeroenoverschie>

[xebia.com](https://xebia.com)

