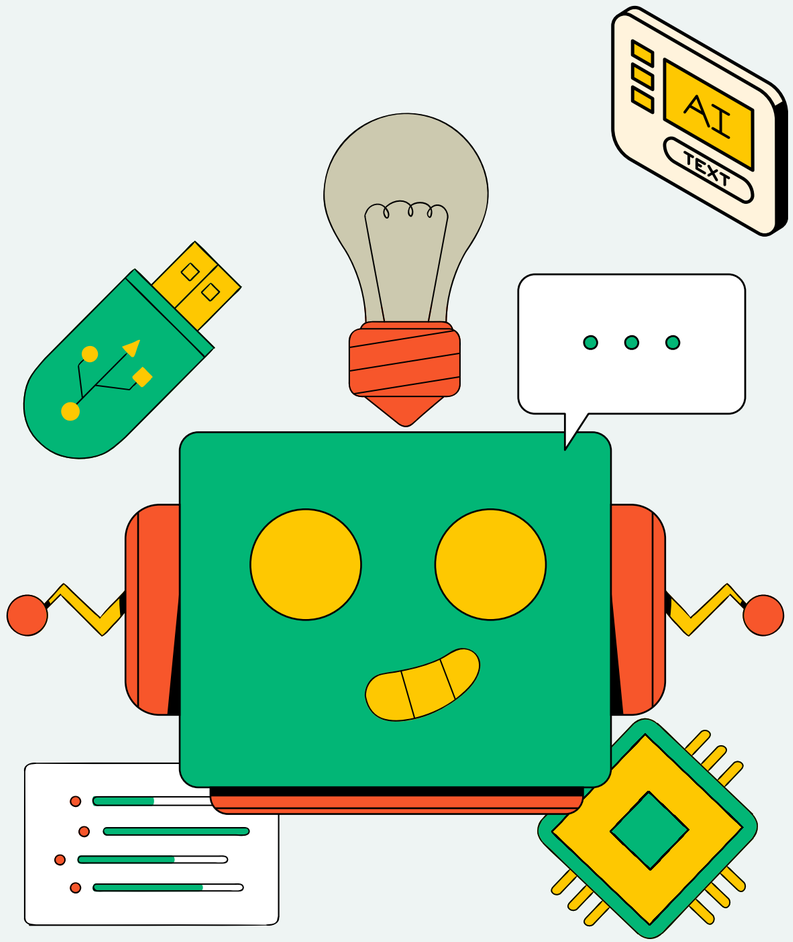
VNU-HCM UNIVERSITY OF SCIENCE
FACULTY OF INFORMATION TECHNOLOGY



DP06
KUBEFLOW

21KHMT2

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Âu Dương Khang - 21127621
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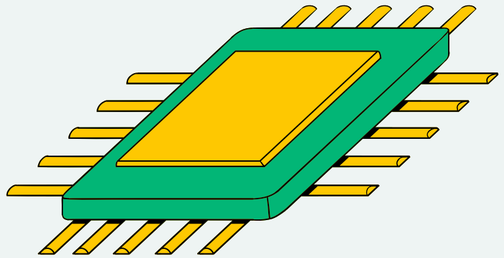


PRESENTATION OUTLINE

- Machine Learning Landscape
- Kubeflow
- Advantages
- Components
- Comparison with similar solutions
- Demo

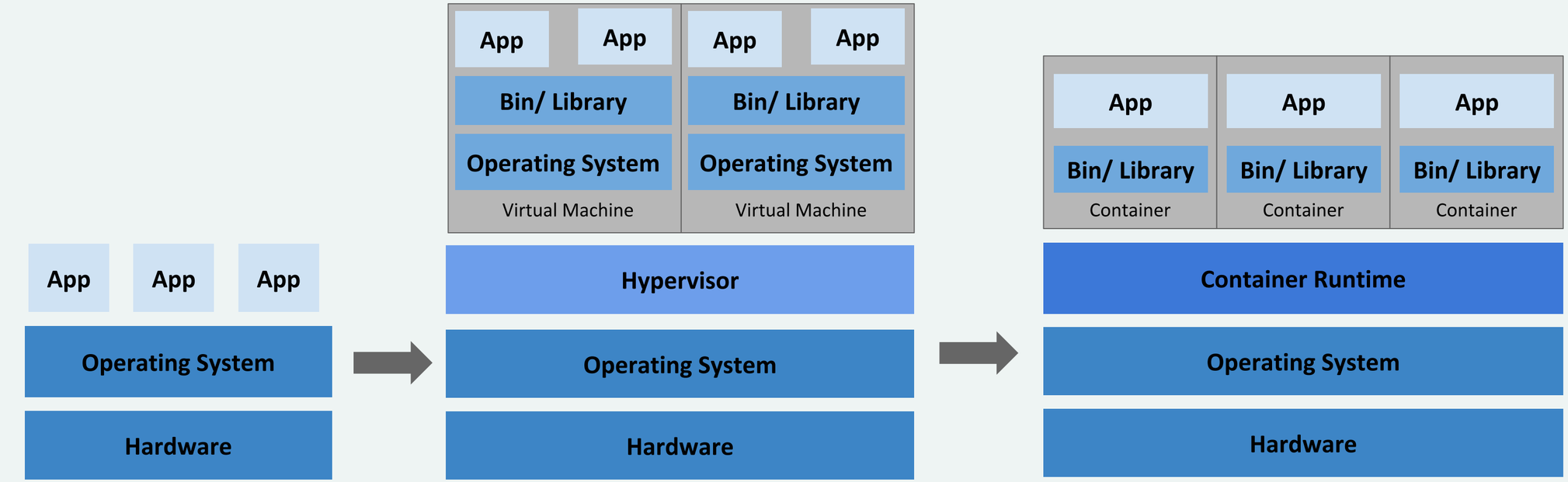
MACHINE LEARNING LANDSCAPE 2013 - 2017

- **Challenges:**
  - **Lack** of **great notebooks** for data exploration.
  - **Difficulty embedding** libraries in notebook frameworks.
  - Python version **compatibility issues.**
  - Complex installation of ML frameworks like TensorFlow, Torch, etc.
- **Transition**:
  - Google's donation of **TensorFlow** to the community.
  - Experimentation limited due to **installation complexities.**

WHERE ARE WE NOW? AND WHAT IS ABOUT TO CHANGE?

- Containers ubiquitous.
- **Kubernetes** powerful orchestration engine.
- Spark natively supports Kubernetes.
- Kubeflow **simplifies ML environment** deployment on Kubernetes.
- Overall, **significant improvement** for IT departments supporting data scientists.

KUBERNETES

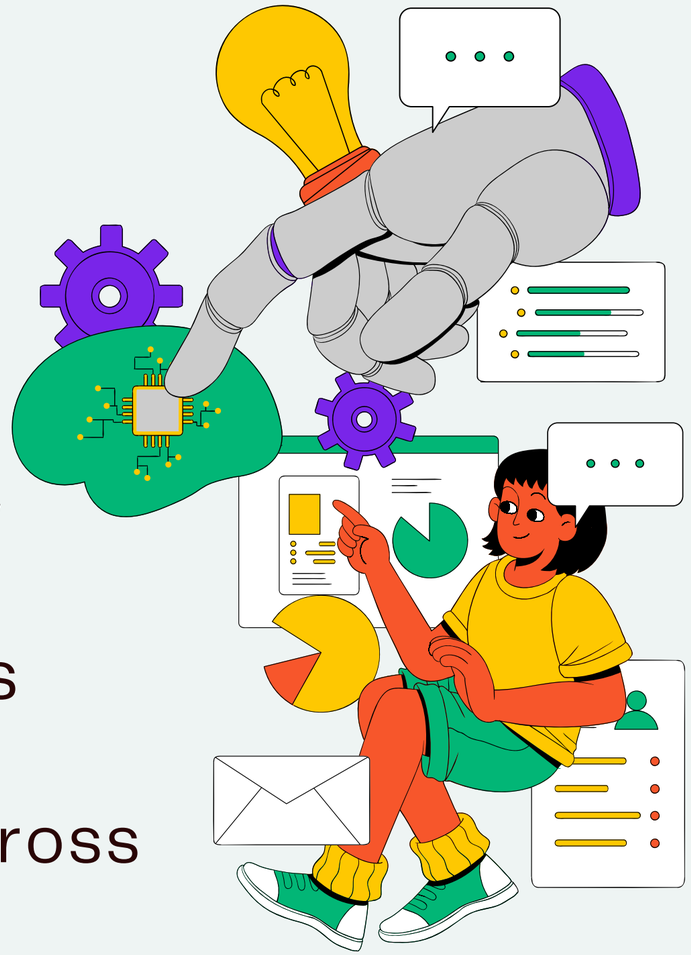


Traditional Deployment

Virtualized Deployment

Container Deployment

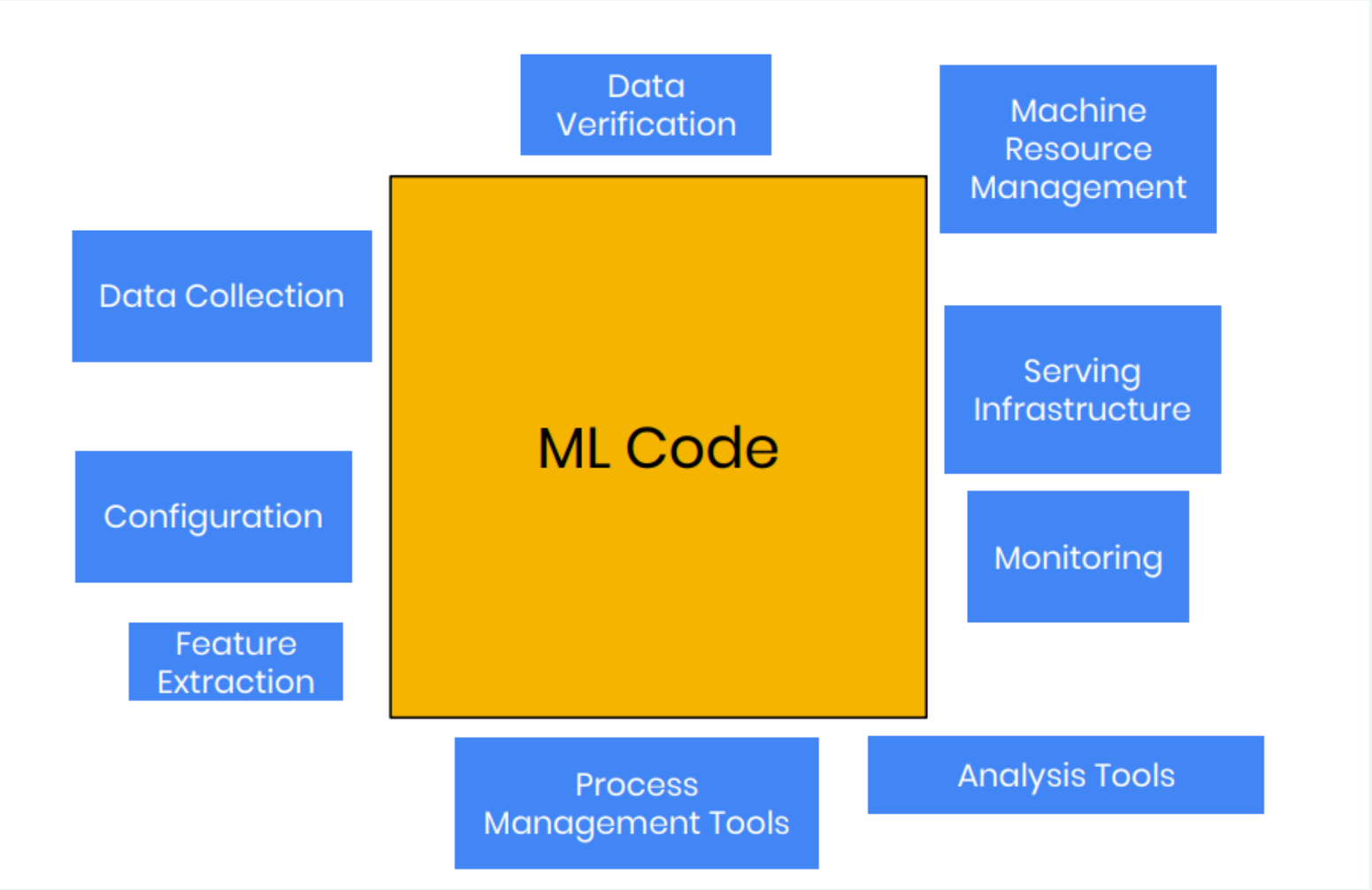
WHAT MAKES ML/AI STILL SO CHALLENGING?



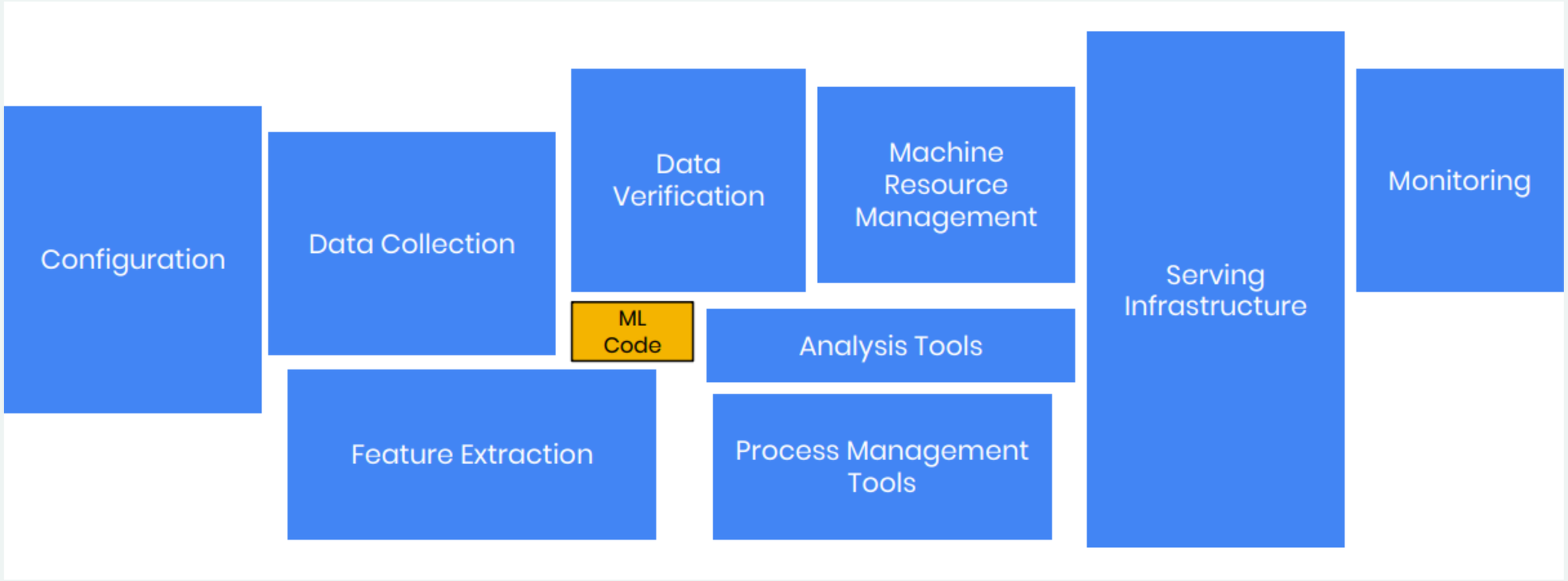
Data Scientists are the **worst IT customers**.

- Setting up an **ML stack/pipeline** is **incredibly hard**
- Setting up a production ML stack/pipeline is **even harder**
- Setting up an ML stack/pipeline that works across the 81% of enterprises that use multi-cloud* environments is **EVEN HARDER**

PERCEPTION: ML PRODUCTS ARE MOSTLY ABOUT ML



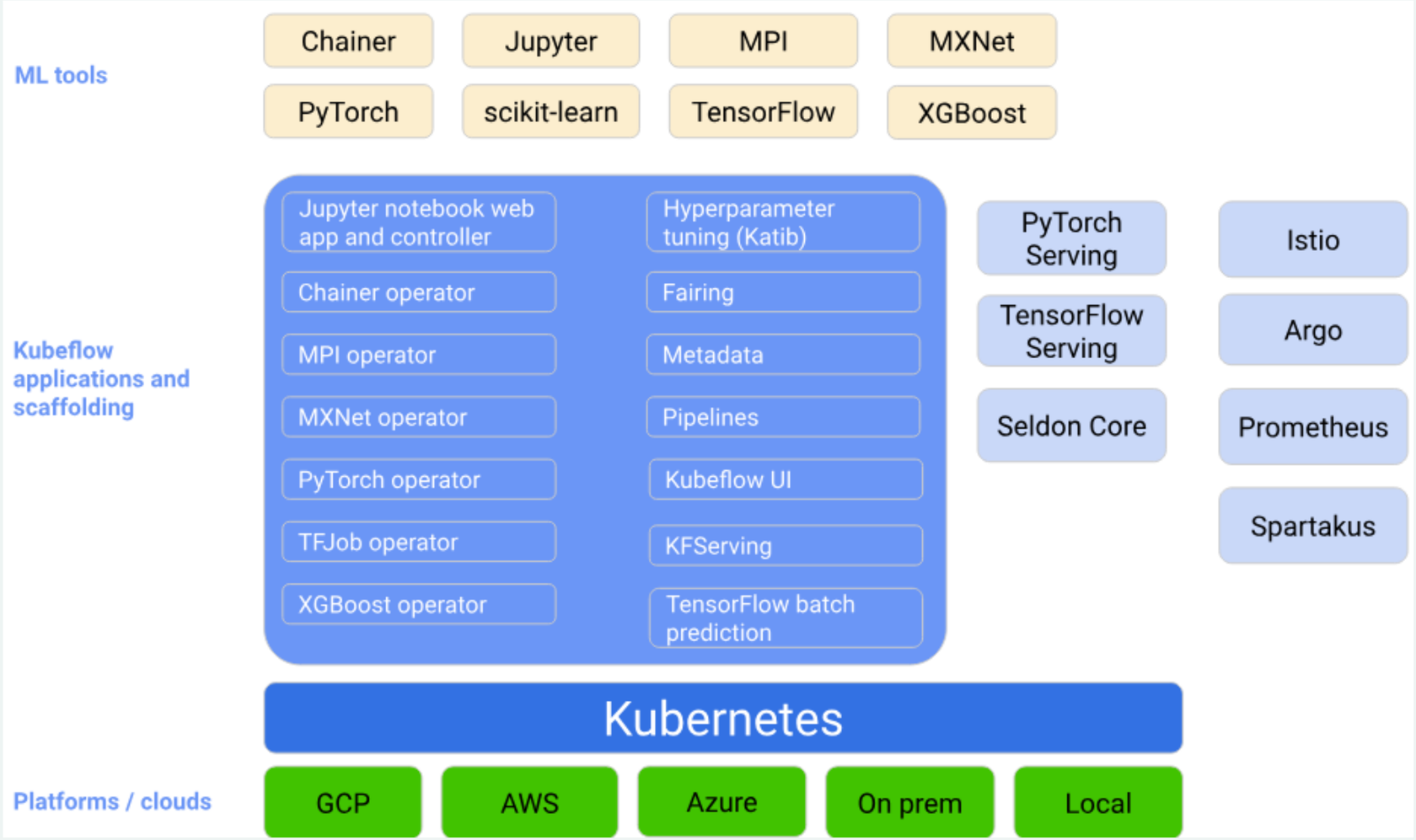
REALITY: ML REQUIRES DEVOPS; LOTS OF IT



WHY Kubeflow ?

- **End-to-end solution** for ML on Kubernetes
- **Containerized workload**
- **Experiment exploration** with **state-of-art AI** technologies
- Easy **on-boarding**
- Outstanding community and industry suppor**t**

KUBEFLOW IS THE ML TOOLKIT FOR KUBERNETES.

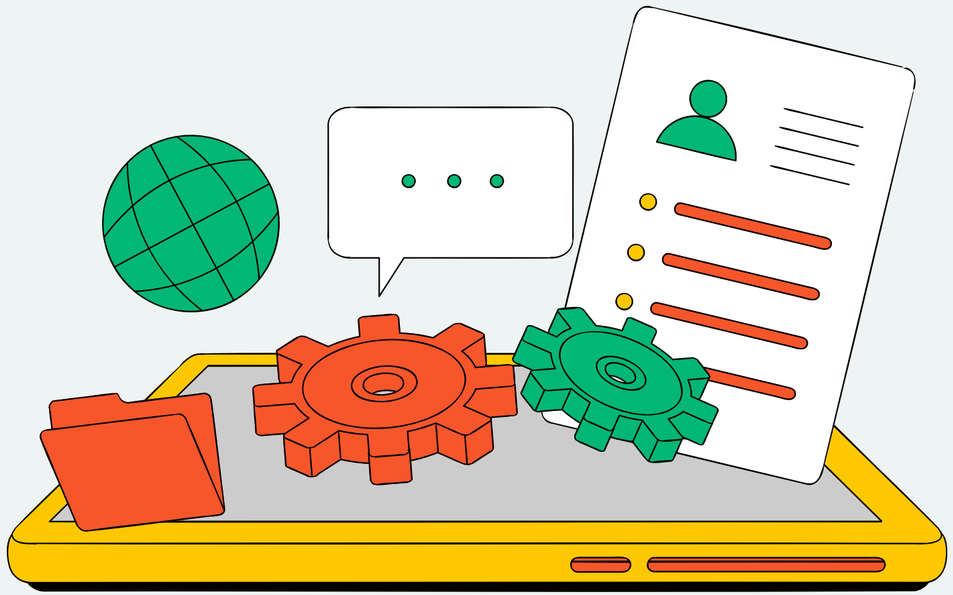


DEPLOYMENT ON CLOUD

Google Cloud Platform (GCP)

Amazon Web Services (AWS)

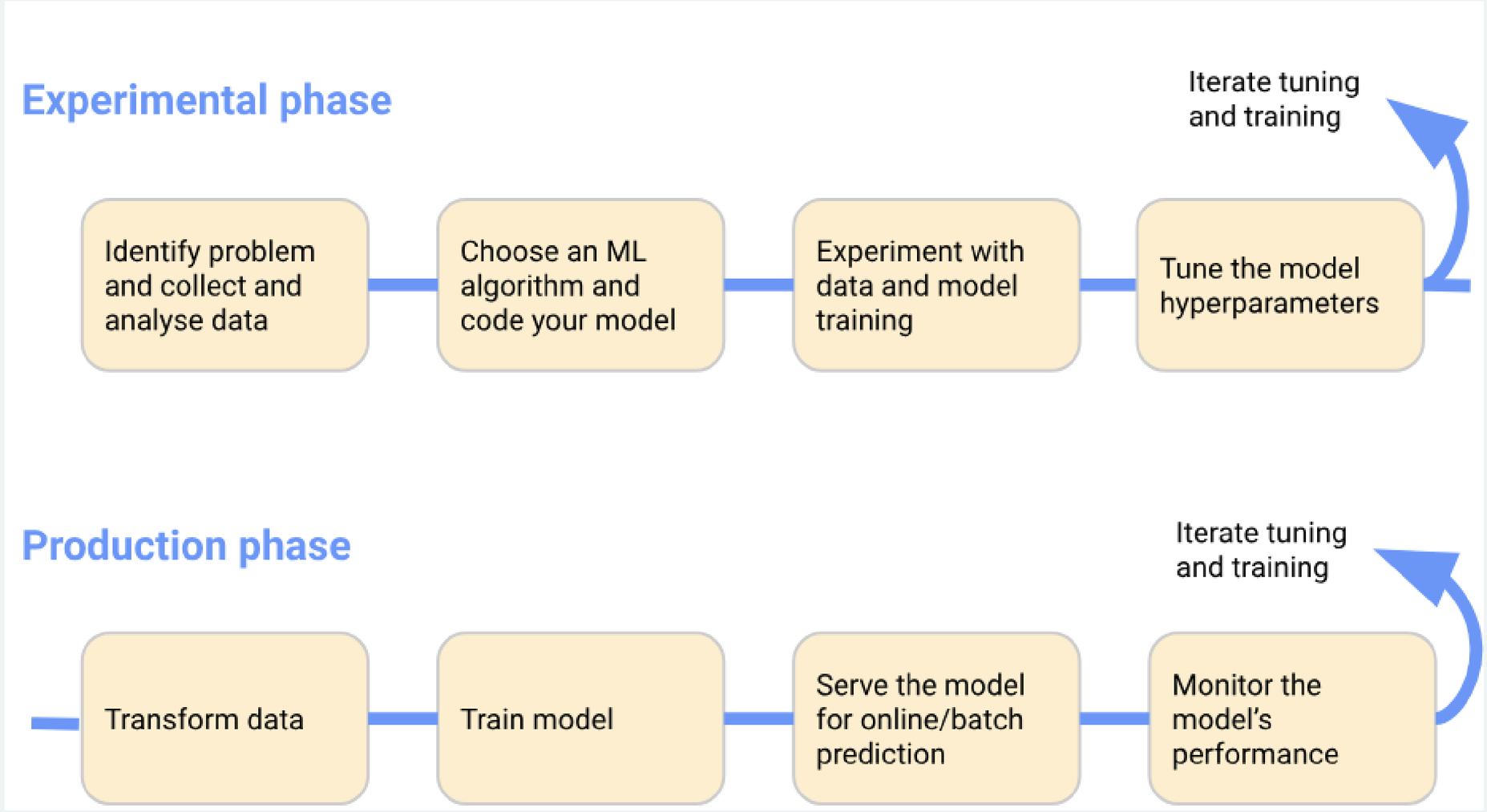
Azure Cloud Platform



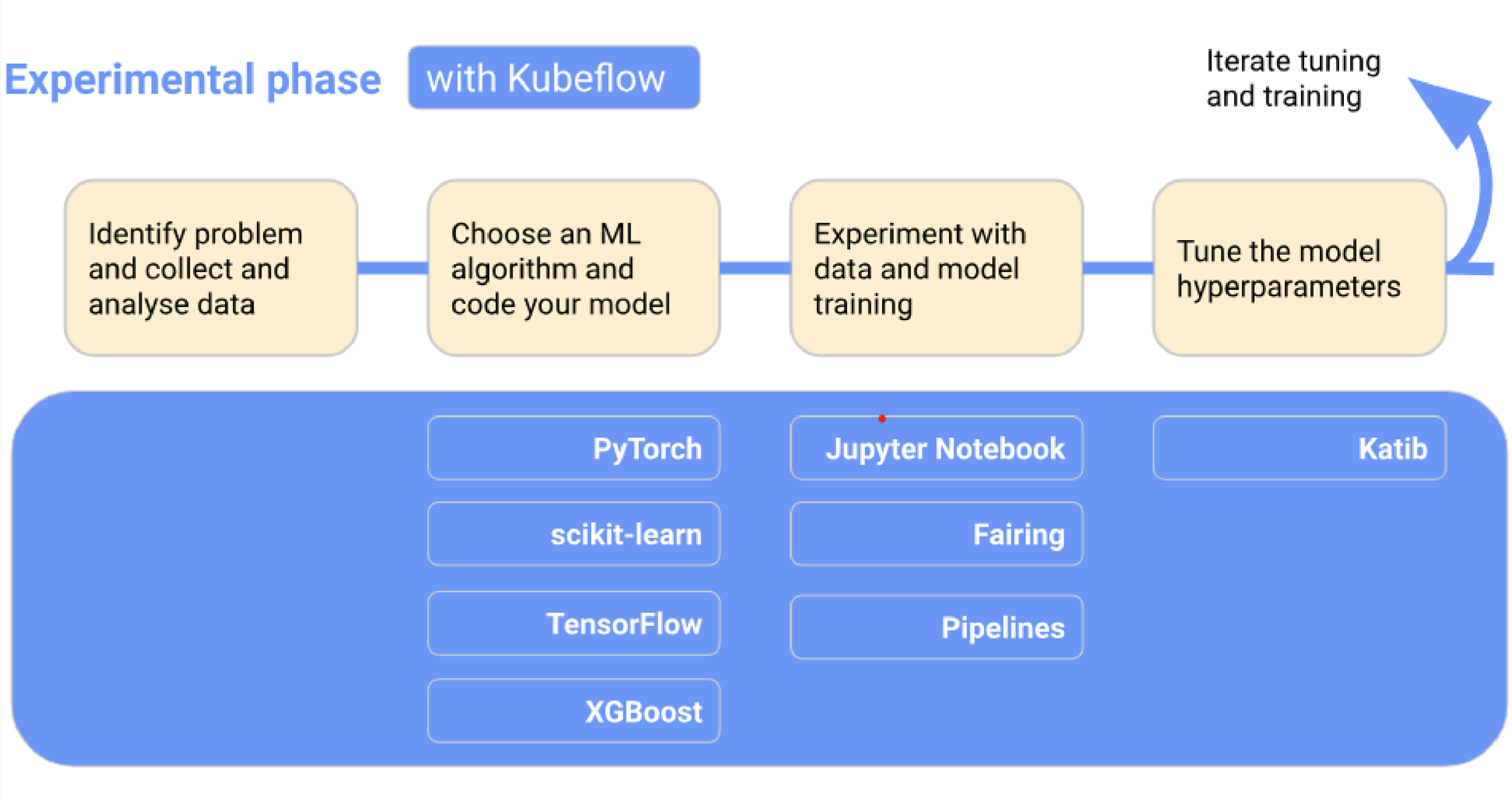
DEPLOY LOCALLY

- Minikube
- deployKF
- MiniKF
- Kubernetes on Docker Desktop
- Local VMs or Bare Metal

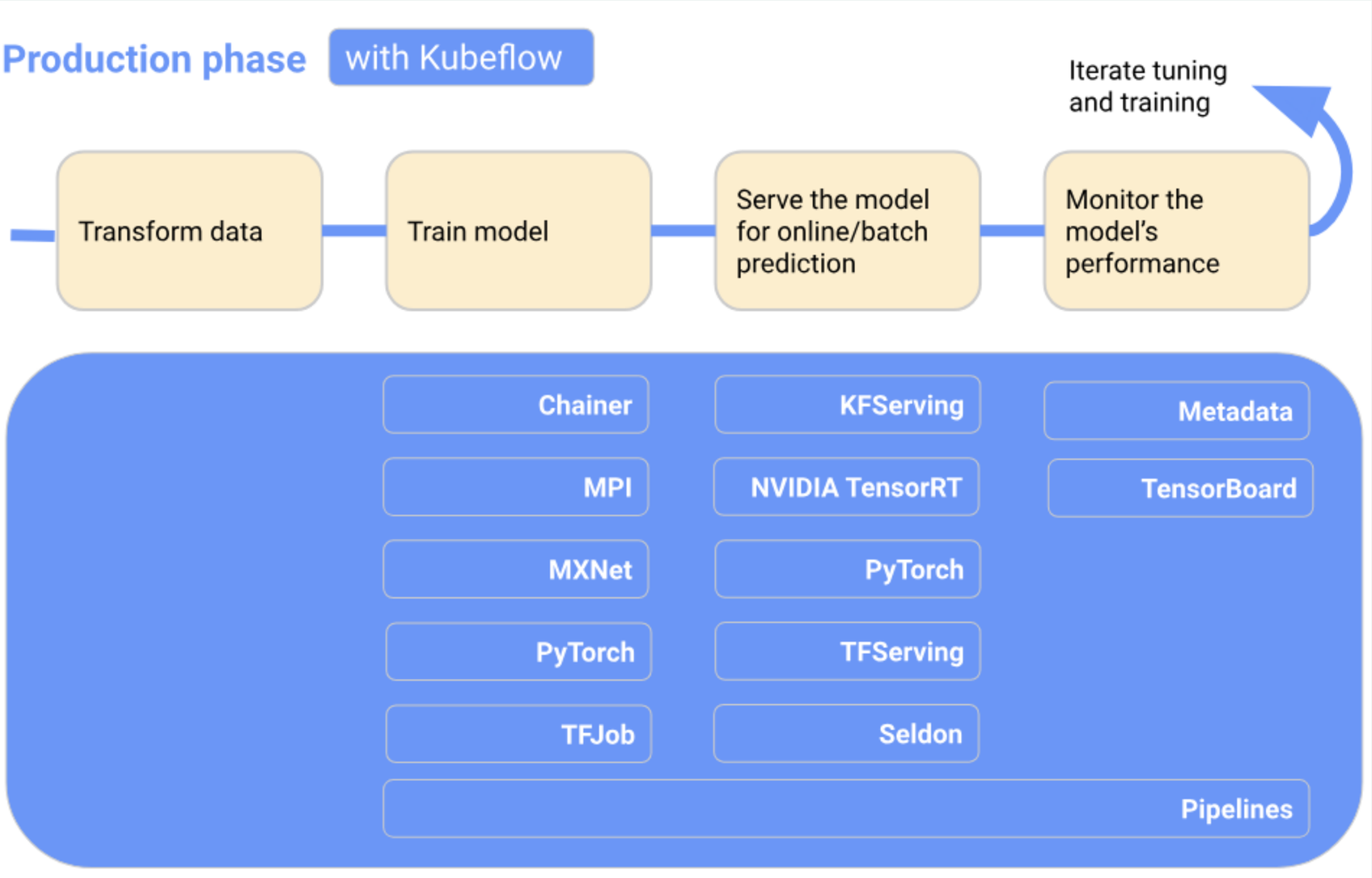
INTRODUCING THE ML WORKFLOW



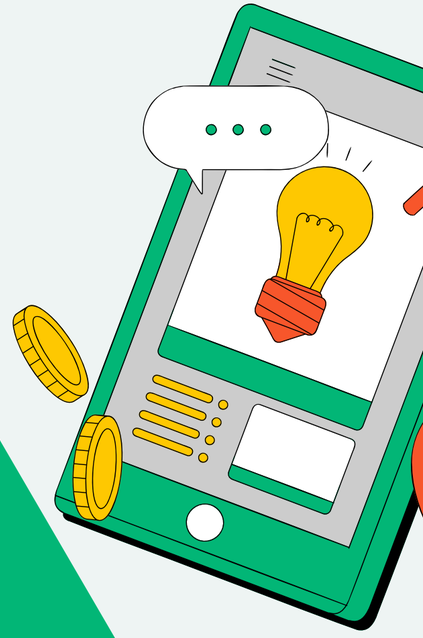
KUBEFLOW COMPONENTS IN THE ML WORKFLOW



KUBEFLOW COMPONENTS IN THE ML WORKFLOW



MAIN COMPONENT



Kubeflow Pipelines

Kubeflow Notebooks

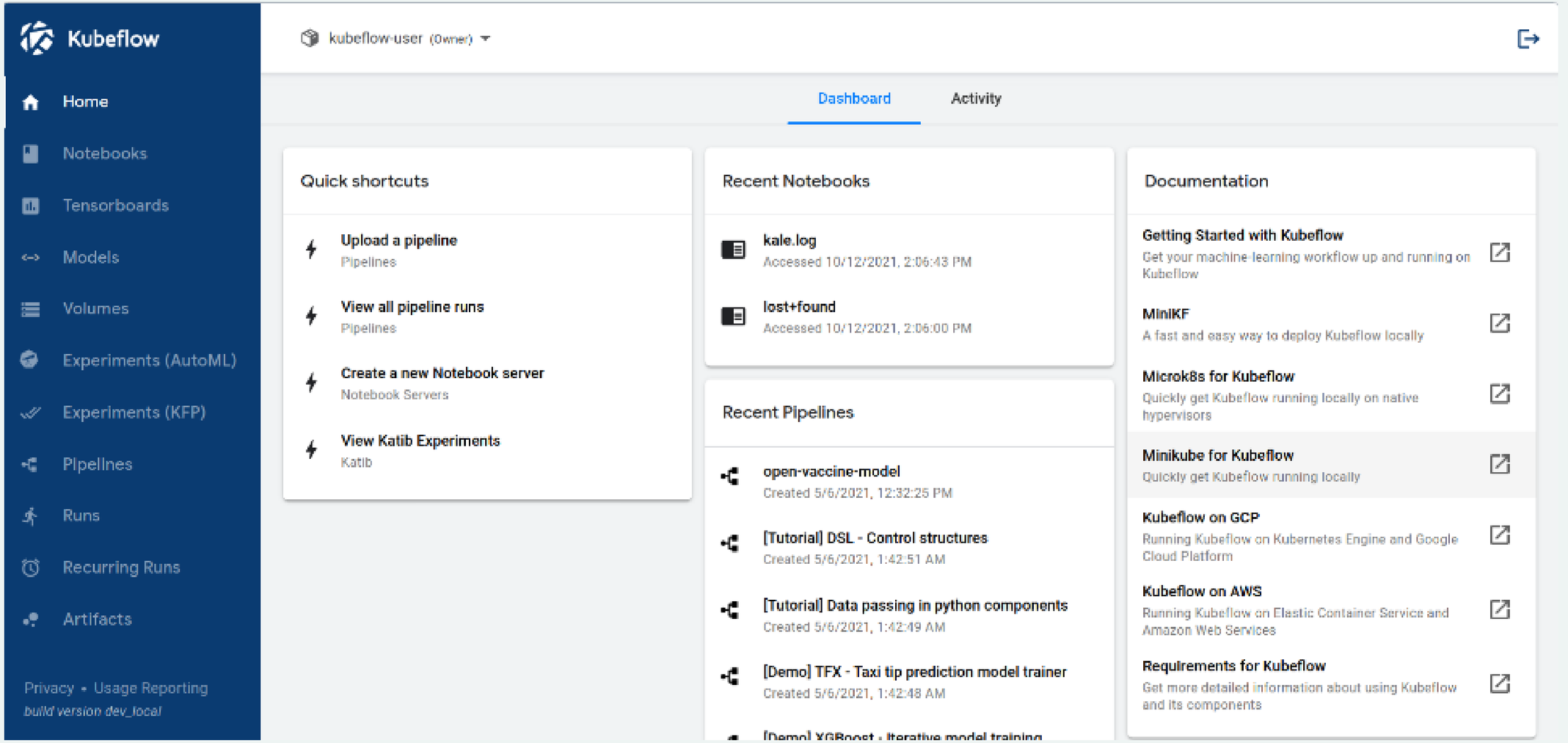
Training Operator

Central Dashboard

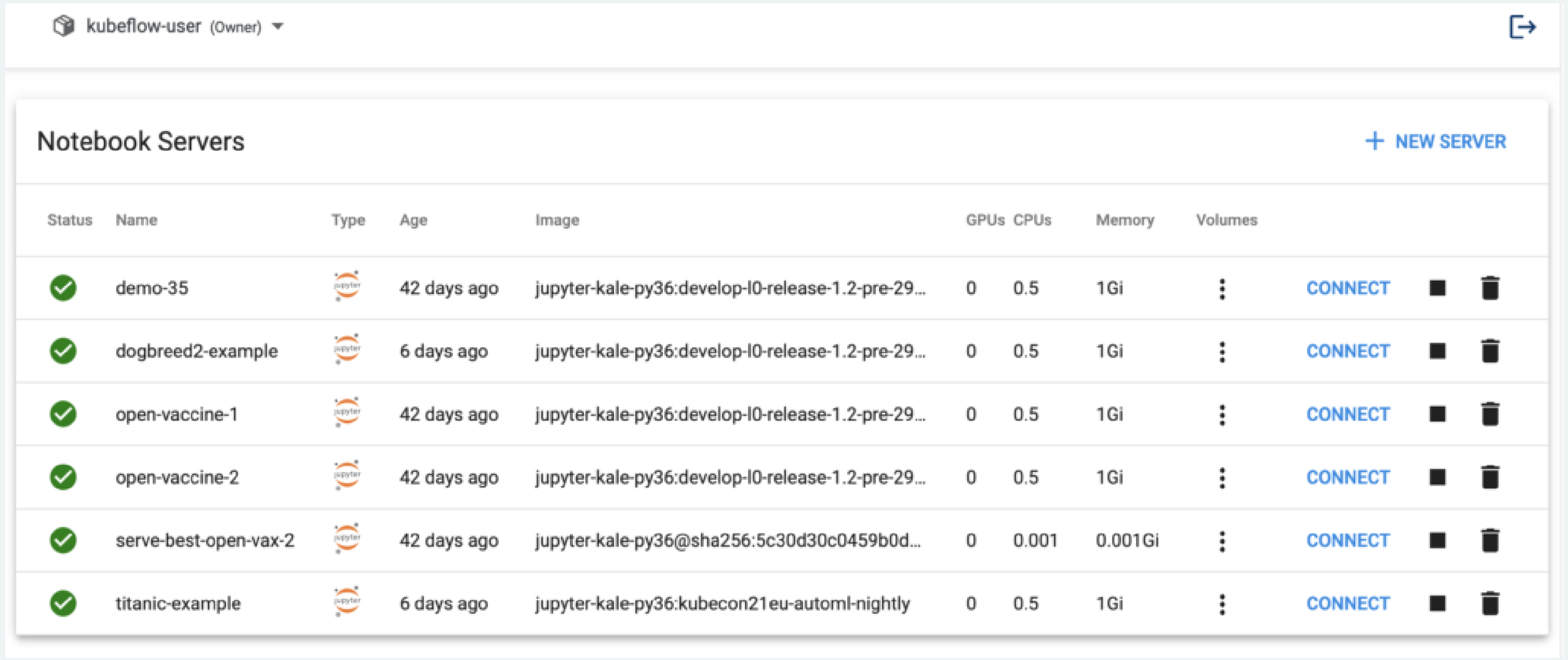
Katib (AutoML)

KServe

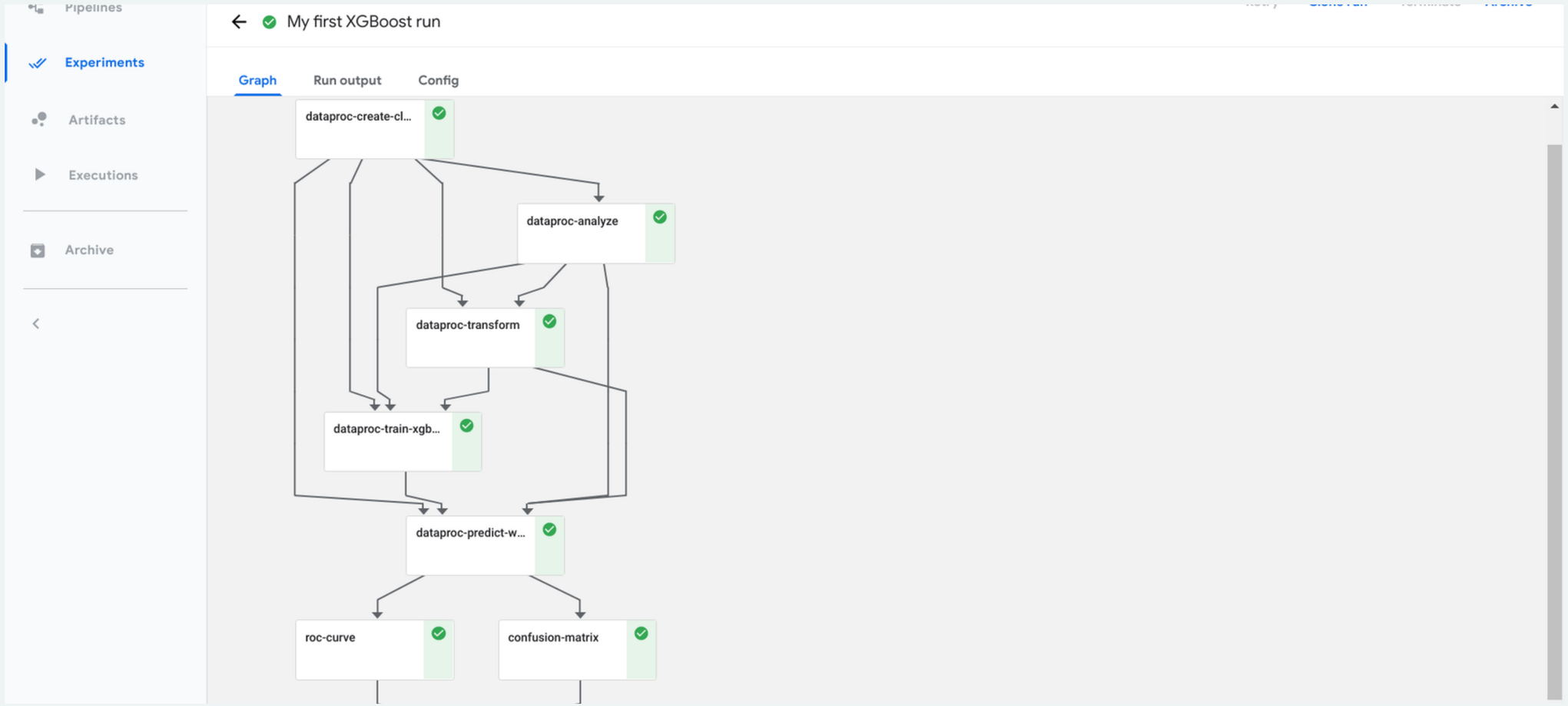
CENTRAL DASHBOARD



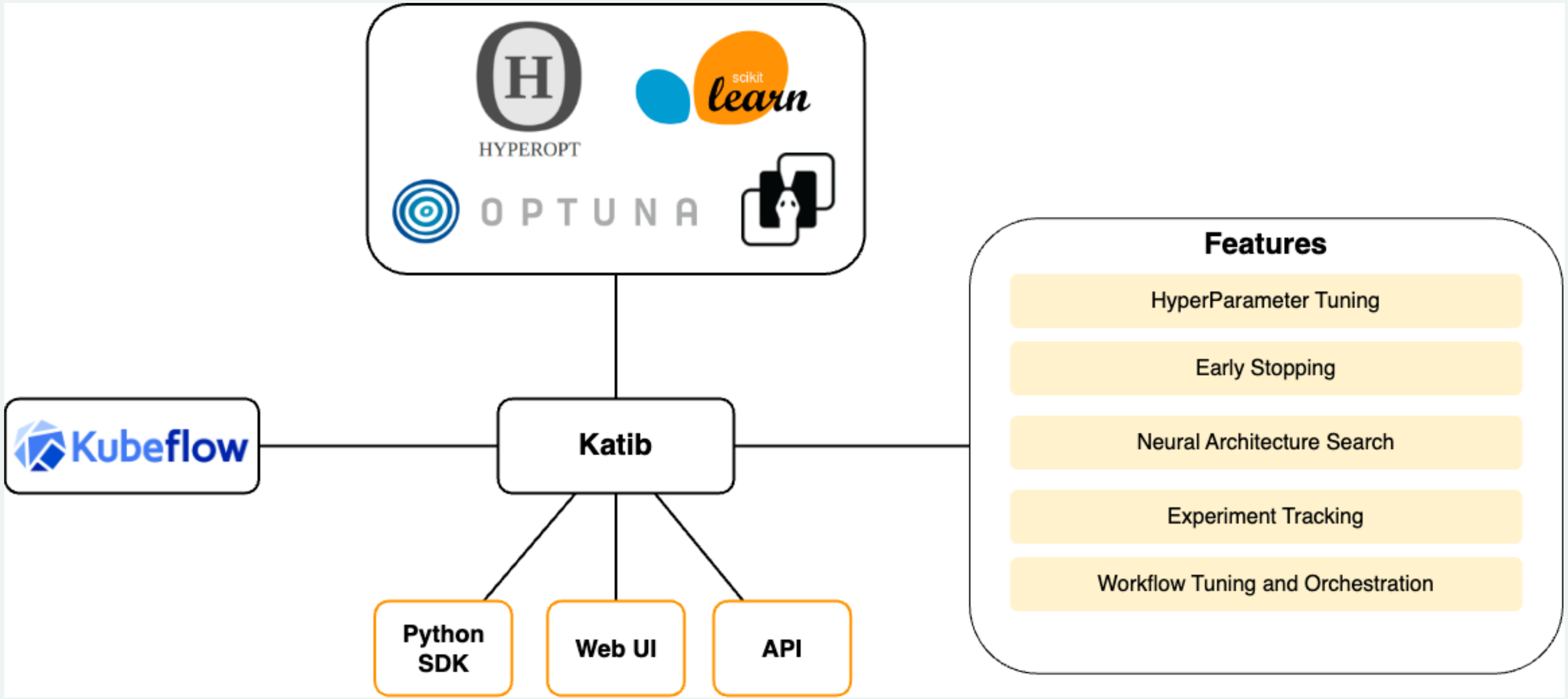
KUBEFLOW NOTEBOOKS



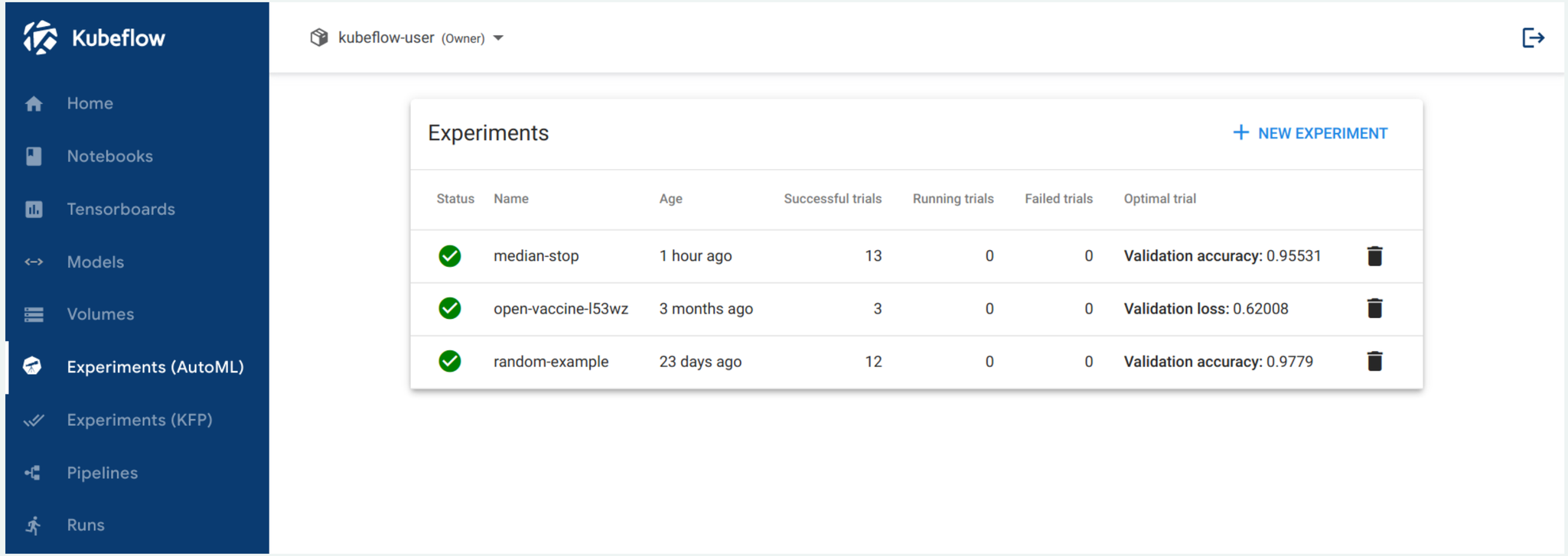
KUBEFLOW PIPELINES



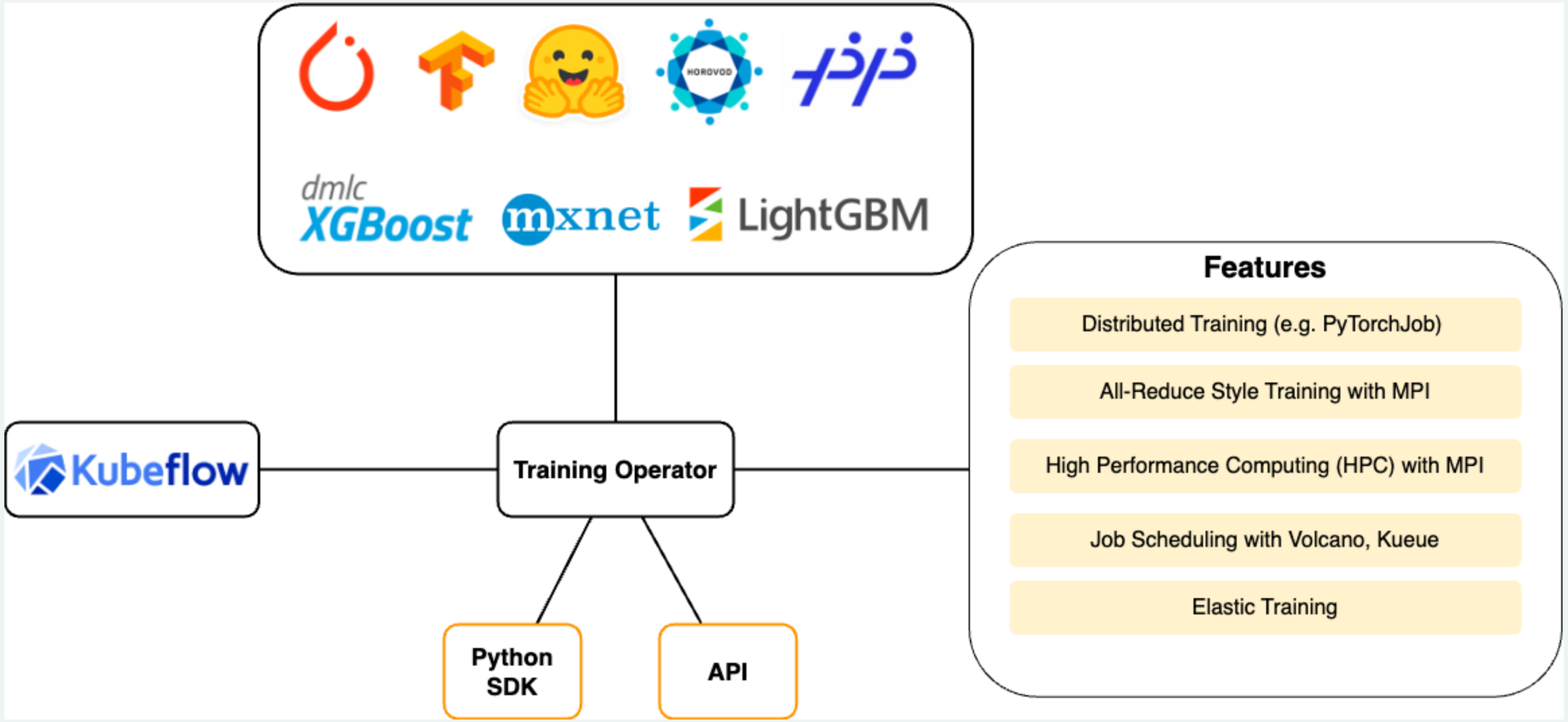
KATIB (AUTOML)



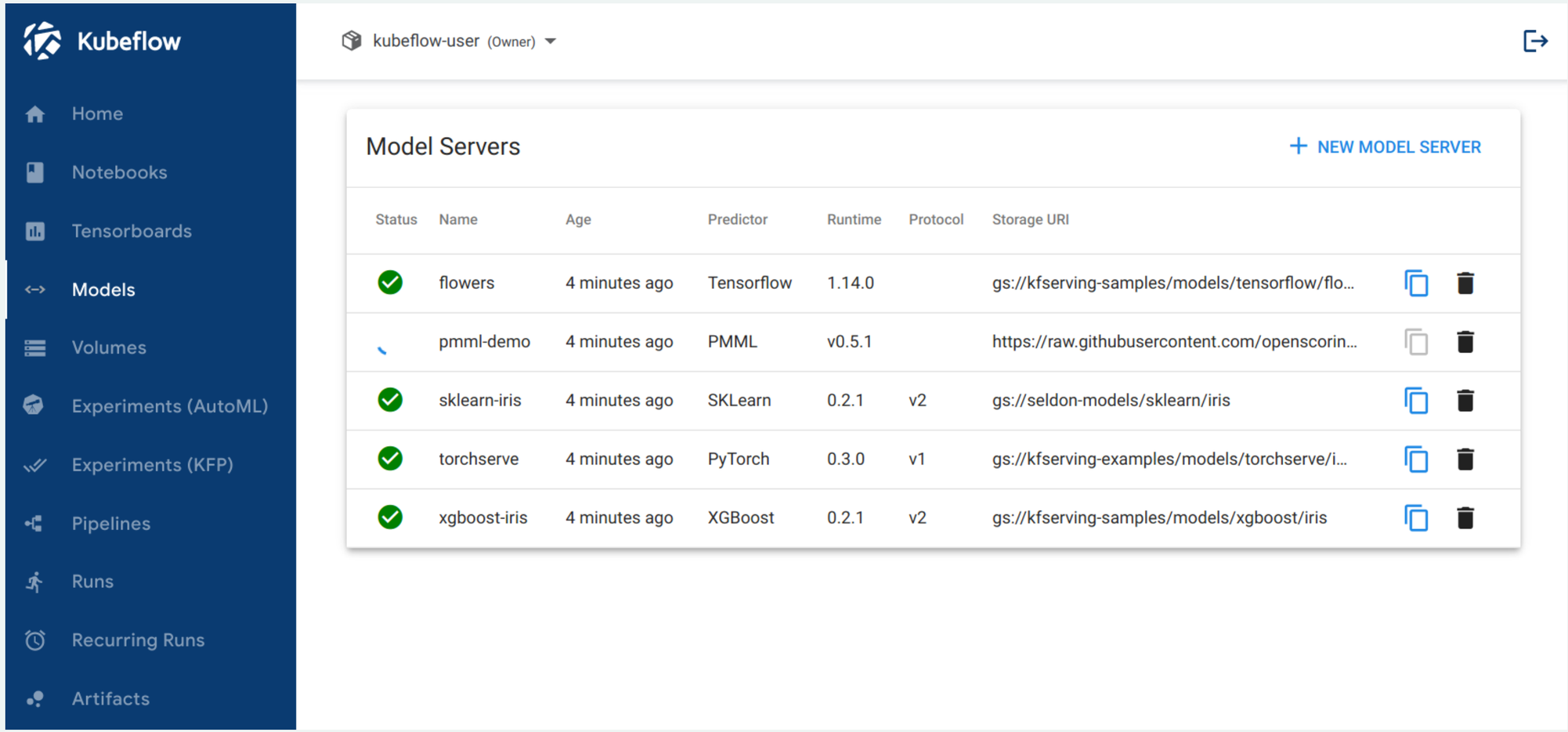
KATIB (AUTOML)



TRAINING OPERATOR



KSERVE


Kubeflow
kubeflow-user (Owner)
Home
Notebooks
Tensorboards
Models
Volumes
Experiments (AutoML)
Experiments (KFP)
Pipelines
Runs
Recurring Runs
Artifacts
Model Servers
+ NEW MODEL SERVER
Status Name Age Predictor Runtime Protocol Storage URI
flowers 4 minutes ago Tensorflow 1.14.0 gs://kfserving-samples/models/tensorflow/flo...
pmml-demo 4 minutes ago PMML v0.5.1 https://raw.githubusercontent.com/openscorin...
sklearn-iris 4 minutes ago SKLearn 0.2.1 v2 gs://seldon-models/sklearn/iris
torchserve 4 minutes ago PyTorch 0.3.0 v1 gs://kfserving-examples/models/torchserve/i...
xgboost-iris 4 minutes ago XGBoost 0.2.1 v2 gs://kfserving-samples/models/xgboost/iris

Comparison with similar solutions

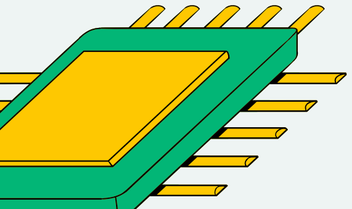
	Kubeflow	mlflow	Apache Airflow
Pricing	Free	Free	Free
Open source	✓	✓	✓
Easy to use	✓	✓	✓
Orientation	Built for deploying and managing ML on Kubernetes	Focus on project management and model performance tracking	Provides flexible workflow management tools for a variety of projects
Integration Capabilities	Powerful integration with Kubernetes and popular machine learning tools	Supports integration with various machine learning frameworks and tools like TensorFlow and PyTorch	Integration with various technologies and services is possible through plugins

ADVANTAGES

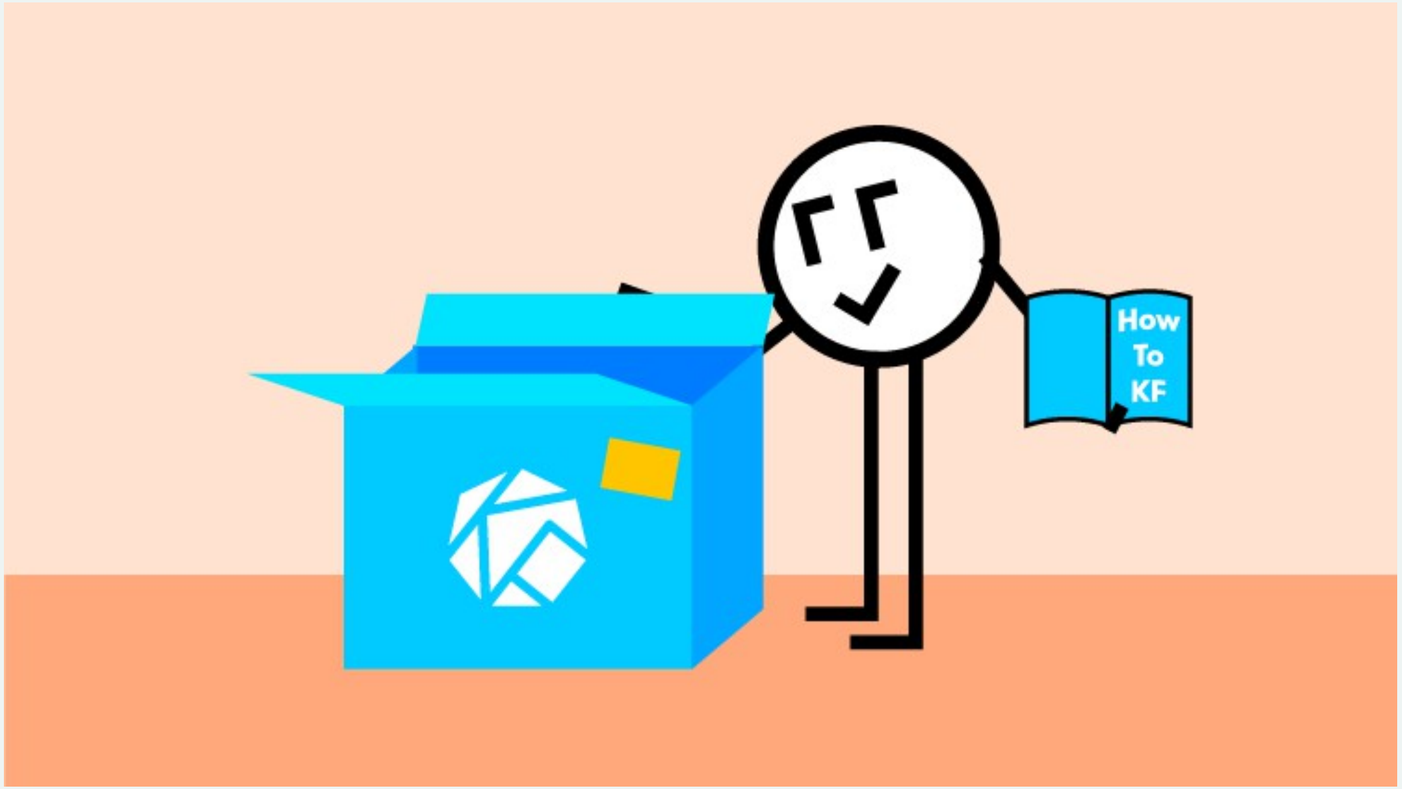
- Scalability
- Portability
- Automation

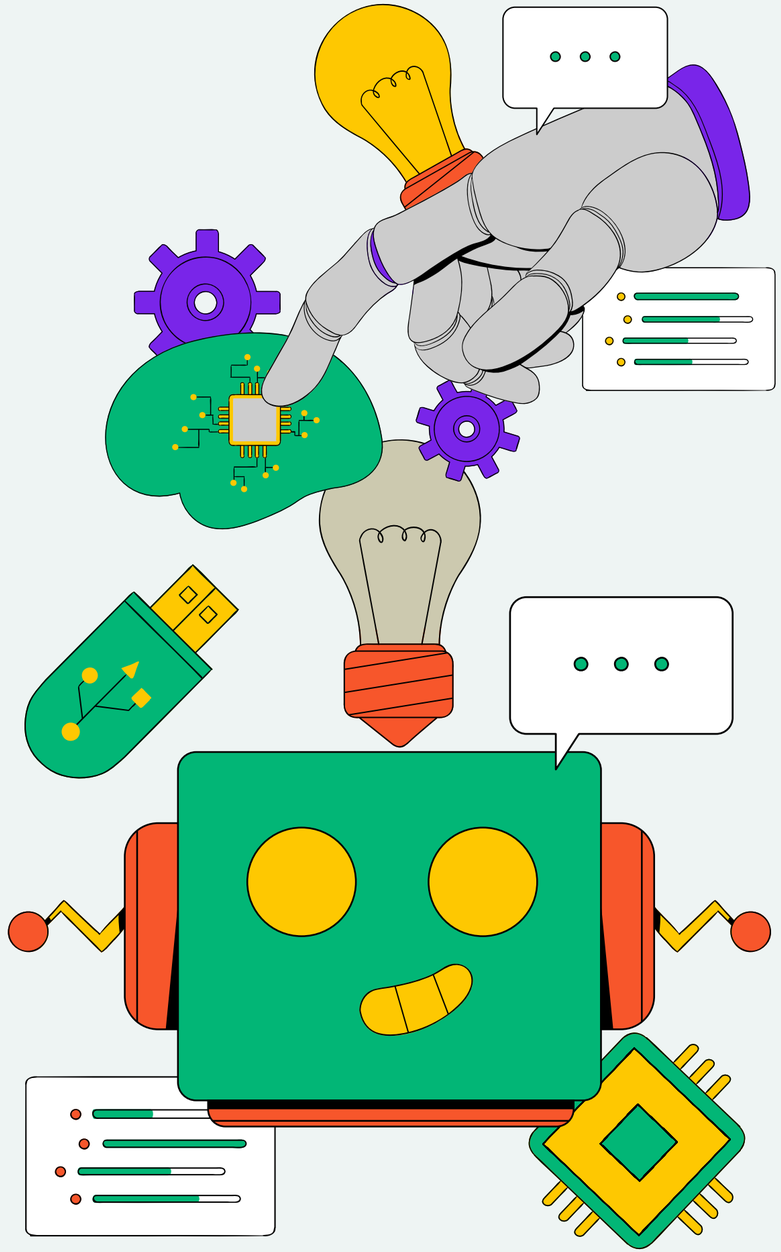
DISADVANTAGES

- Complexity
- High technical requirements
- Integration challenges



DEMO TIME!





THANKS FOR LISTENING!