mlflow

and the Lifecycle of ML & AI

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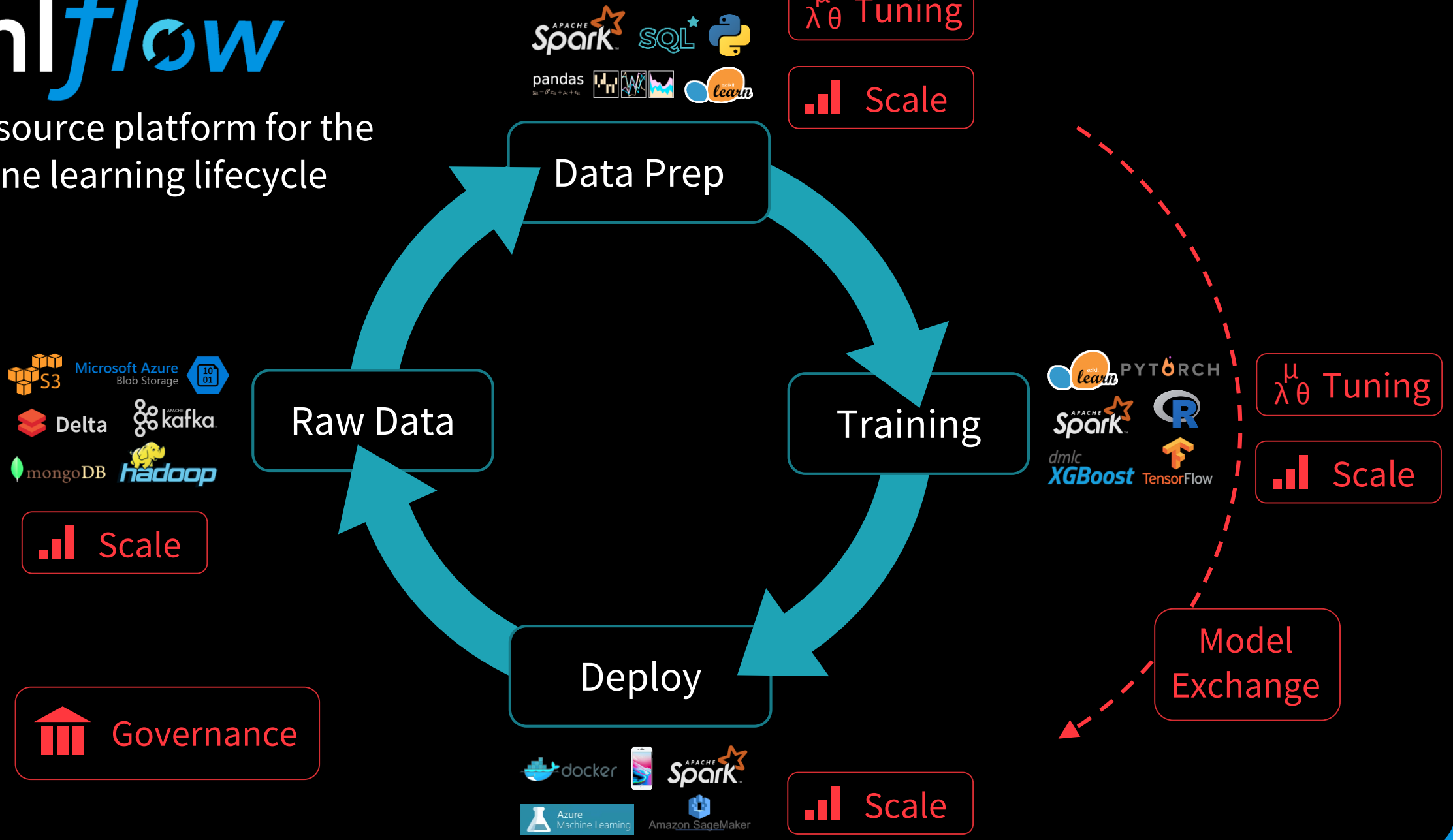
Machine Learning Development is Complex

mlflow

An open source platform for the machine learning lifecycle



What is mlflow

Open source project
Conventions, specs, tools
CLI, libraries, REST service
Community

 databricks.com/mlflow

 mlflow.org

 github.com/mlflow

 twitter.com/MLflow

Design Philosophy

API-first

Allow submitting runs, models, etc. from any library & language

E.g., “model” as lambda function that can be deployed anywhere

Key enabler: built around REST APIs,
language libs, CLI

Modular

E.g., use MLflow's project format but not its deployment tools

Easy to integrate into existing ML platforms & workflows

Key enabler: independent components (Tracking/Projects/Models)

Easy

Runs the same way anywhere (local, cloud platforms)
Easy for a single dev to use locally, ***or*** very large teams

Key enabler: minimal, ubiquitous dependencies
Python, pip, Conda, that's it!

Open Source

Everyone is solving a similar problem

Lots of benefits in having a common API across orgs

- Can open source & share individual workflow steps
- ML tool developers can easily reach lots of users
  - E.g. a new ML library can use MLflow Models to reach many serving tools

MLflow Components

mlflow Tracking

Record and query experiments: code, data, config, results

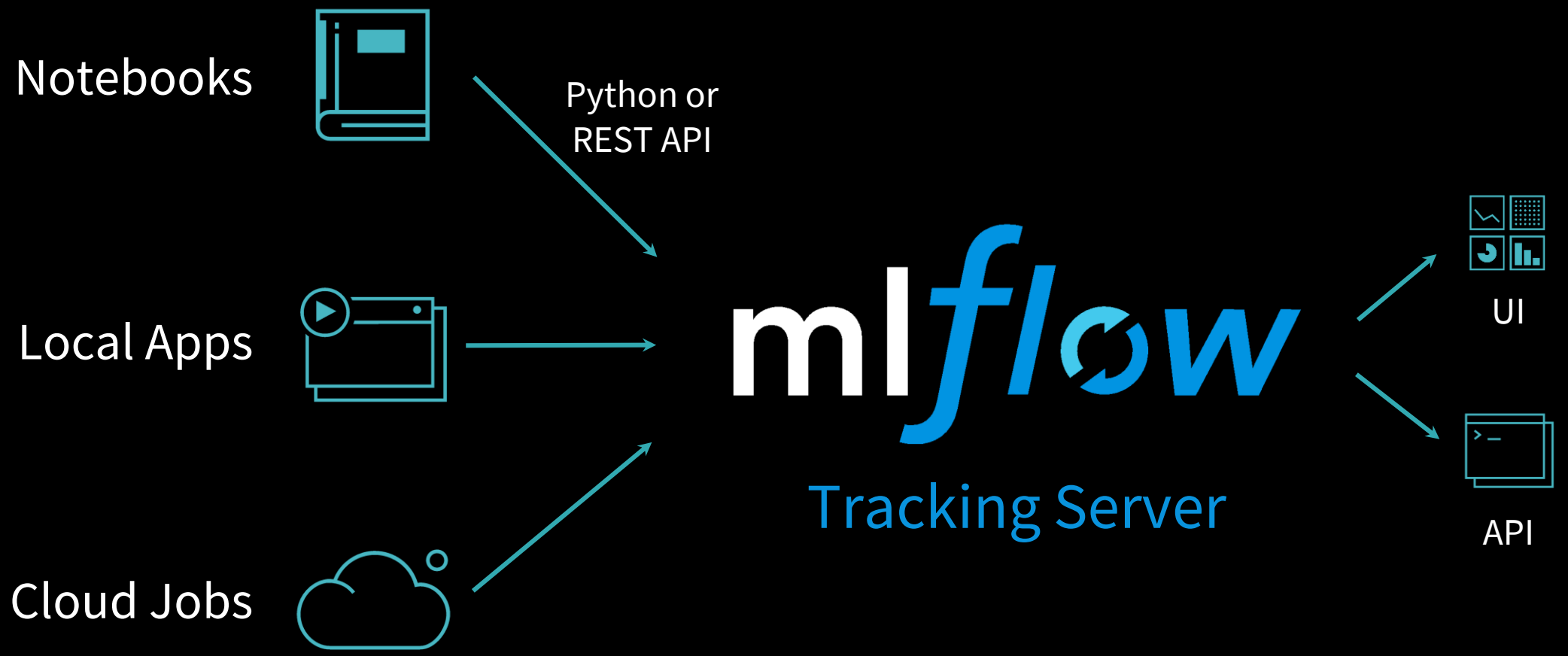
mlflow Projects

Packaging format for reproducible runs on any platform

mlflow Models

General model format that supports diverse deployment tools

MLflow Tracking



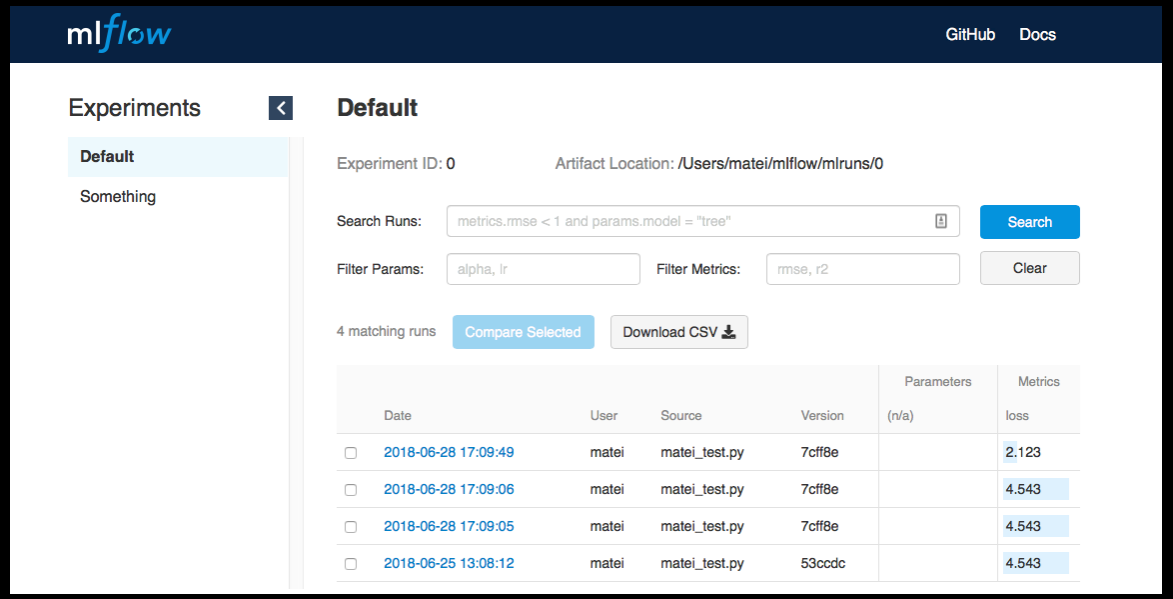
Key Concepts in Tracking

Parameters: key-value inputs to your code

Metrics: numeric values (can update over time)

Artifacts: arbitrary files, including models

Source: what code ran?



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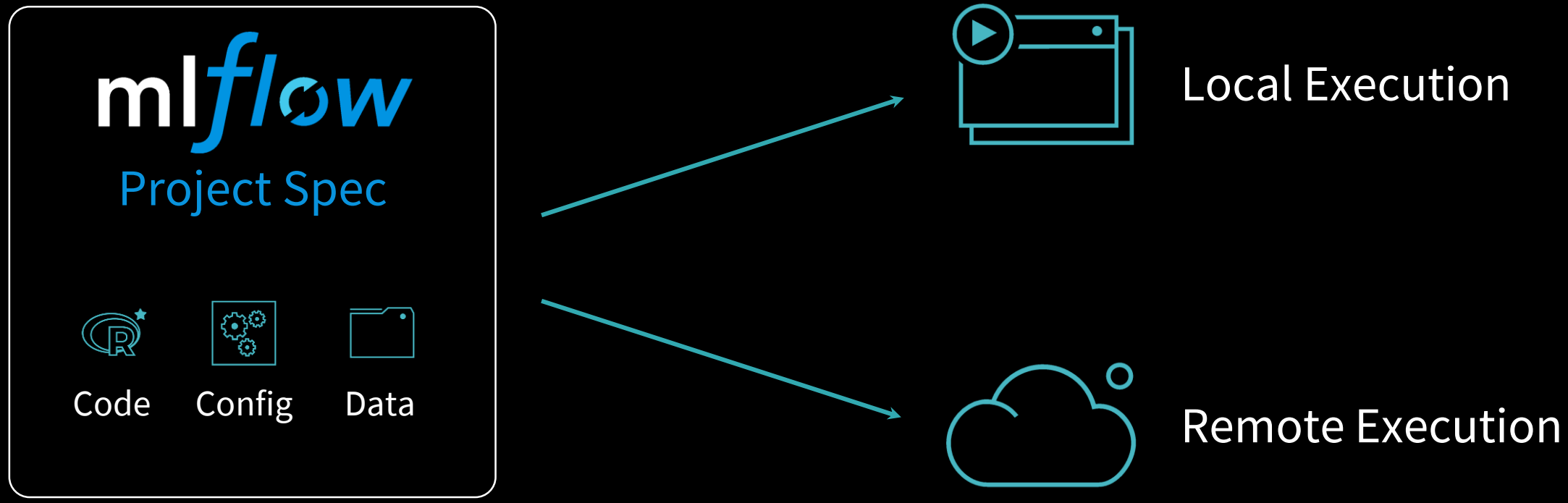
MLflow Projects



Example MLflow Project

```
my_project/
├── MLproject
├── conda.yaml
├── main.py
└── model.py
    ...
```

```
conda_env: conda.yaml

entry_points:
  main:
    parameters:
      training_data: path
      lambda: {type: float, default: 0.1}
    command: python main.py {training_data} {lambda}
```

```
$ mlflow run git://<my_project>
```

```
mlflow.run("git://<my_project>", ...)
```

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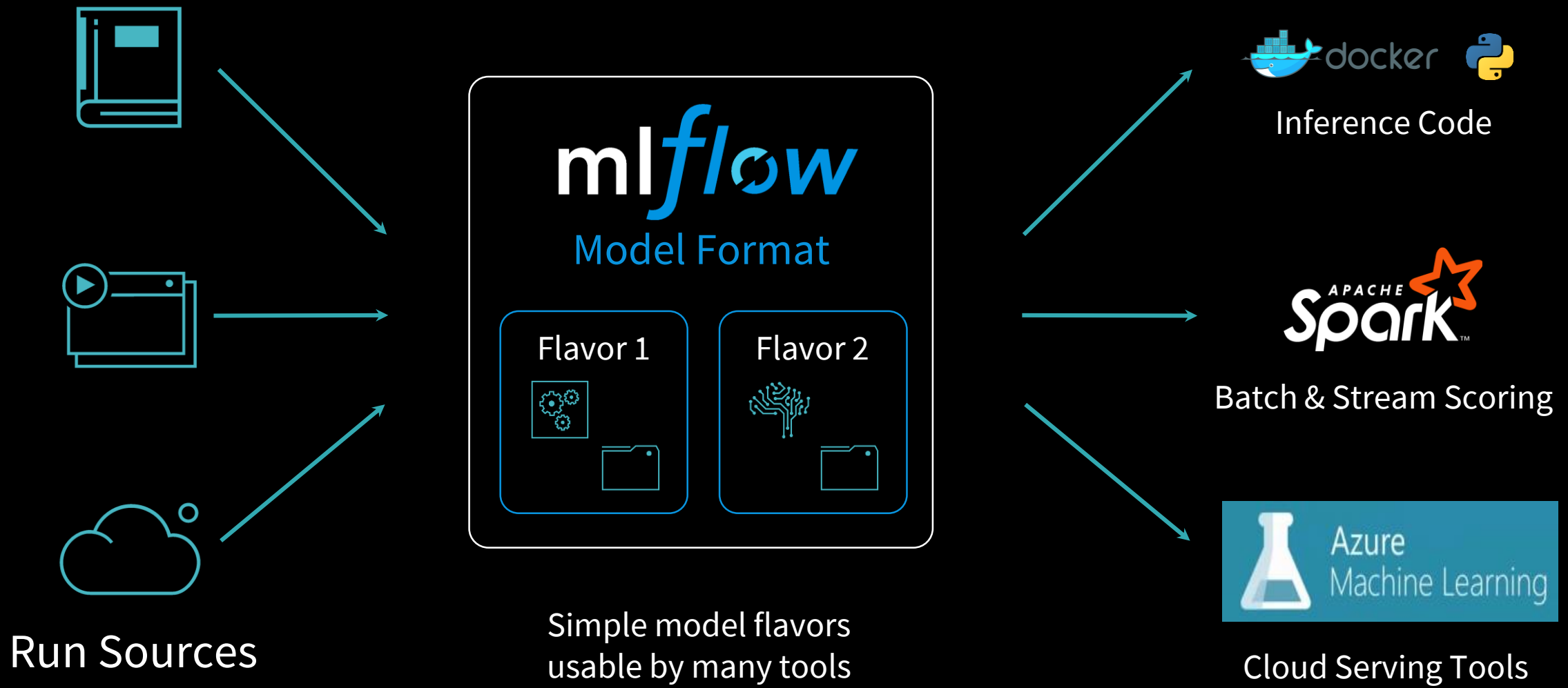
MLflow Models



Example MLflow Model

```
my_model/
├── MLmodel
└── estimator/
    ├── saved_model.pb
    └── variables/
        ...
```

```
run_id: 769915006efd4c4bbd662461
time_created: 2018-06-28T12:34
flavors:
  tensorflow:
    saved_model_dir: estimator
    signature_def_key: predict
  python_function:
    loader_module: mlflow.tensorflow
```

Usable by tools that understand TensorFlow model format

Usable by any tool that can run Python (Docker, Spark, etc!)

mlflow Model Deployment Options

In-Line Code

Containers

Batch & Stream Scoring

OSS Inference Solutions

Cloud Inference Services

Conclusion

Powerful workflow tools can simplify the ML lifecycle

- Improve usability for both data scientists and engineers
- Same way that software dev lifecycle tools simplify dev

MLflow is a lightweight, open platform that integrates easily into existing workflows

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Managed MLflow in Databricks

Demo

Thank you!

/BenSadeghi

LinkedIn, GitHub, Twitter

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