



Hadoop **Submarine** Project: Machine Learning & Ecosystem

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极客邦科技 会议推荐2019

5月

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大会: 5月6-8日
培训: 5月9-10日

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培训: 5月25-26日
大会: 5月27-28日

6月

GTLC
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技术领导力峰会

时间: 6月14-15日

GMTC 北京

全球大前端技术大会

大会: 6月20-21日
培训: 6月22-23日

7月

ArchSummit 深圳

全球架构师峰会

大会: 7月12-13日
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10月

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全球软件开发大会

大会: 10月17-19日
培训: 10月20-21日

11月

GMTC 深圳

全球大前端技术大会

大会: 11月8-9日
培训: 11月10-11日

AiCon 北京

全球人工智能与机器学习大会

大会: 11月21-22日
培训: 11月23-24日

12月

ArchSummit 北京

全球架构师峰会

大会: 12月6-7日
培训: 12月8-9日

自我介绍

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Apache Hadoop Submarine Project Team Member

Apache Zeppelin Committer

Staff Engineer @NetEase

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为什么会发起 Hadoop Submarine 项目？

1. 在越来越多的 YARN 和 K8s 混合部署环境中，需要能够跨平台的机器学习框架
2. Hadoop（生态）是企业级大数据最稳定可靠的开源框架
 - Hive、Spark、Flink 能够很好的帮助机器学习系统进行数据处理
3. YARN 2.7+ 以上版本中支持了 Tensorflow, PyTorch 机器学习框架
4. YARN 3.10+ 以上版本中提供 Docker 容器化的机器学习服务
5. 降低使用门槛，能够轻松安装运行环境、一键式运行分布式训练

Machine Learning in a Unified Platform

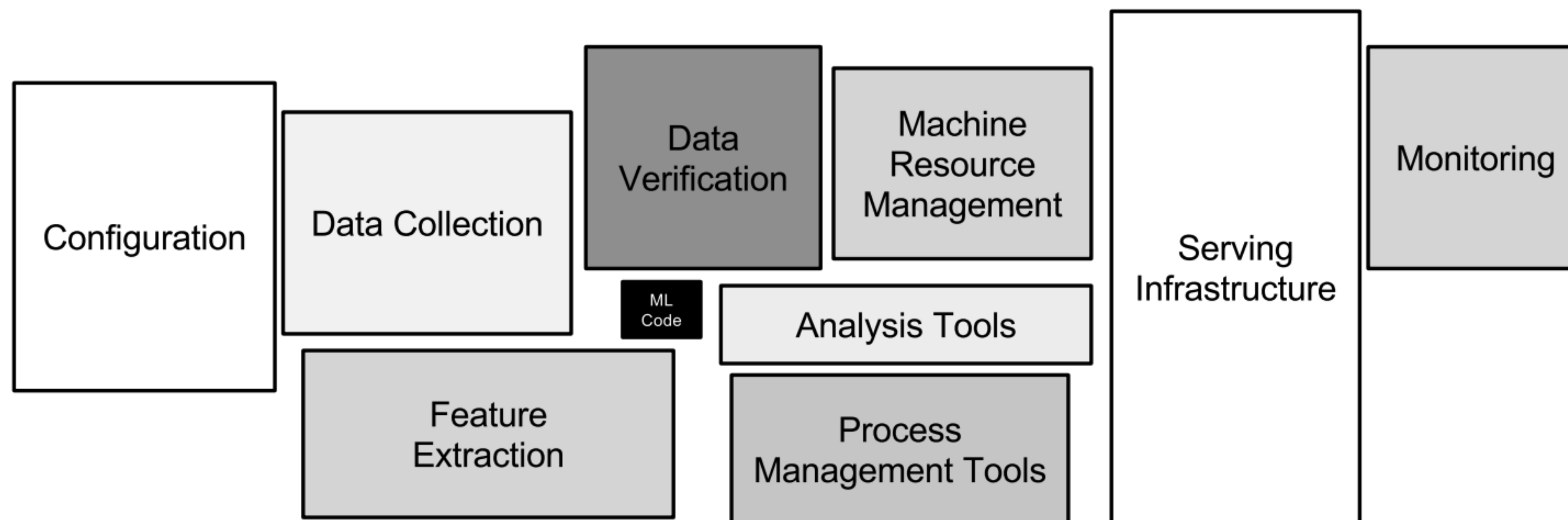
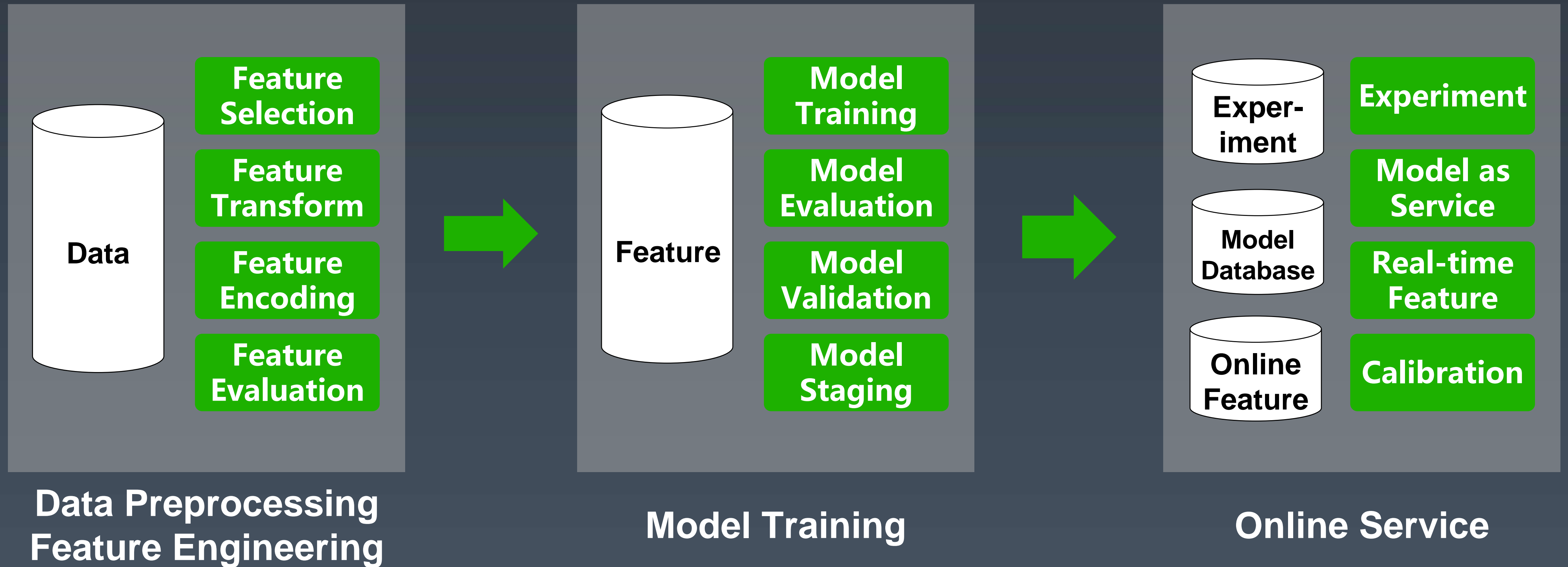
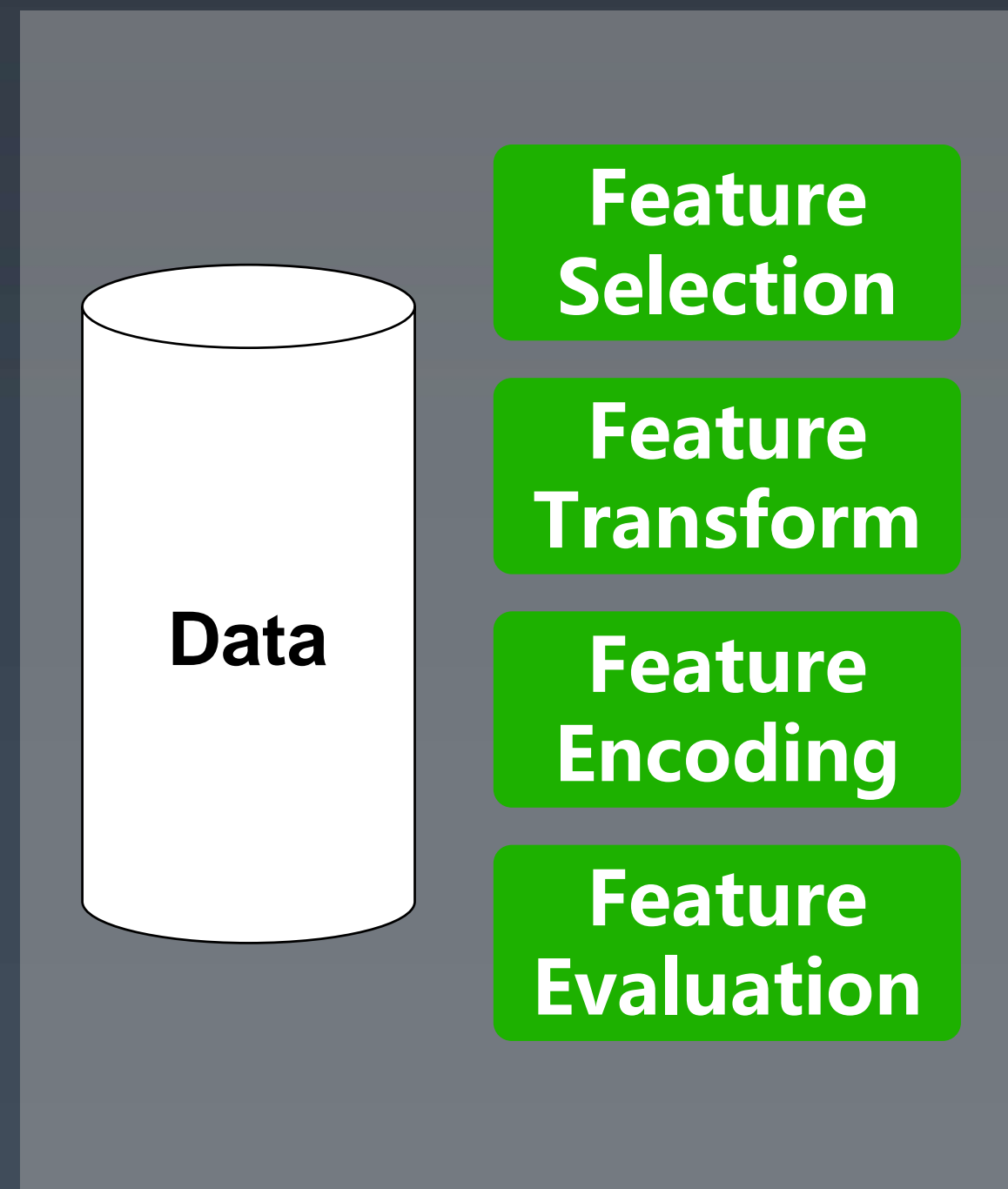


Figure 1: Only a small fraction of real-world ML systems is composed of the ML code, as shown by the small black box in the middle. The required surrounding infrastructure is vast and complex.

Machine learning workflow



Data Preprocessing & Feature Engineering



Data Preprocessing
Feature Engineering

- Import data
 - HDFS
 - AWS S3
 - RDBMS



- Join Data



- Data exploration



- Data sample

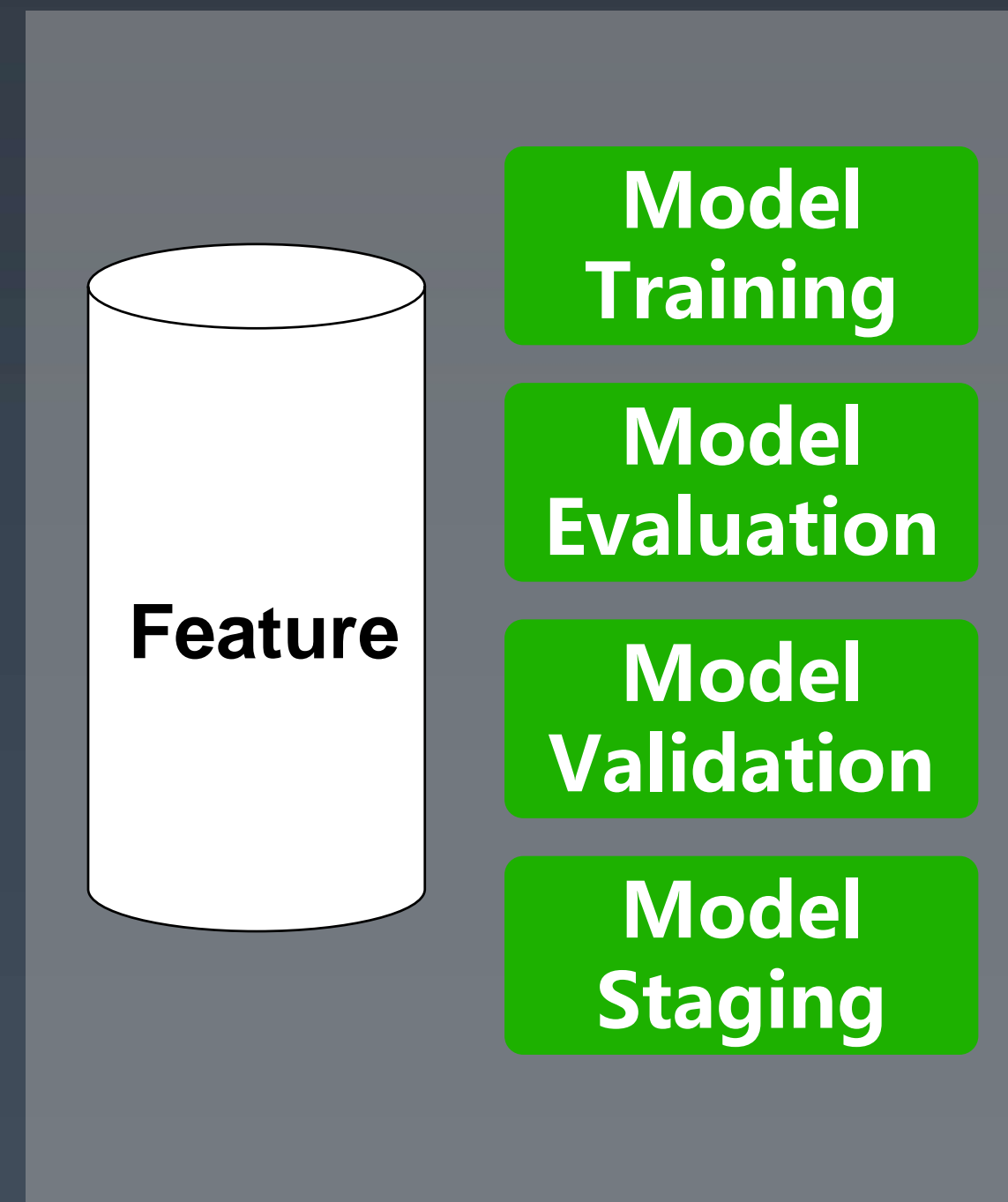


- Training / Test



Model Training

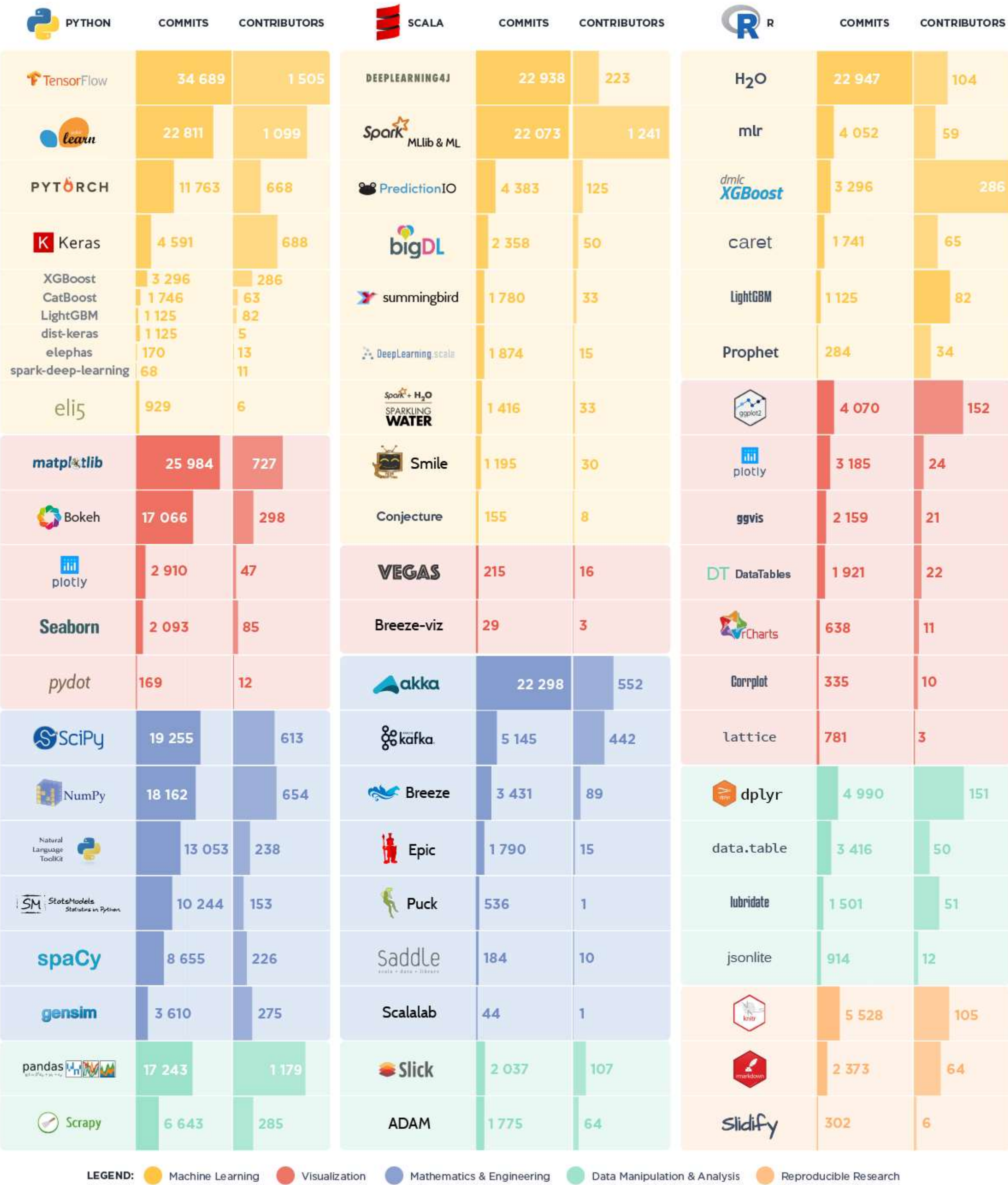
- Traditional machine learning models
 - Logistic Regression
 - Gradient boosting tree
 - Recommendation/ALS
 - LDA
- Libraries
 - Python Lib
 - Apache Spark MLlib
 - XGBoost



Model Training

- Deep learning models
 - DNN
 - CNN
 - RNN
 - LSTM
- Libraries
 - TensorFlow
 - PyTorch
 - MXNet

Top
Python
Scala
R
Librarines in
Data Science



Model Serving

- Model Manager



- Model depoly

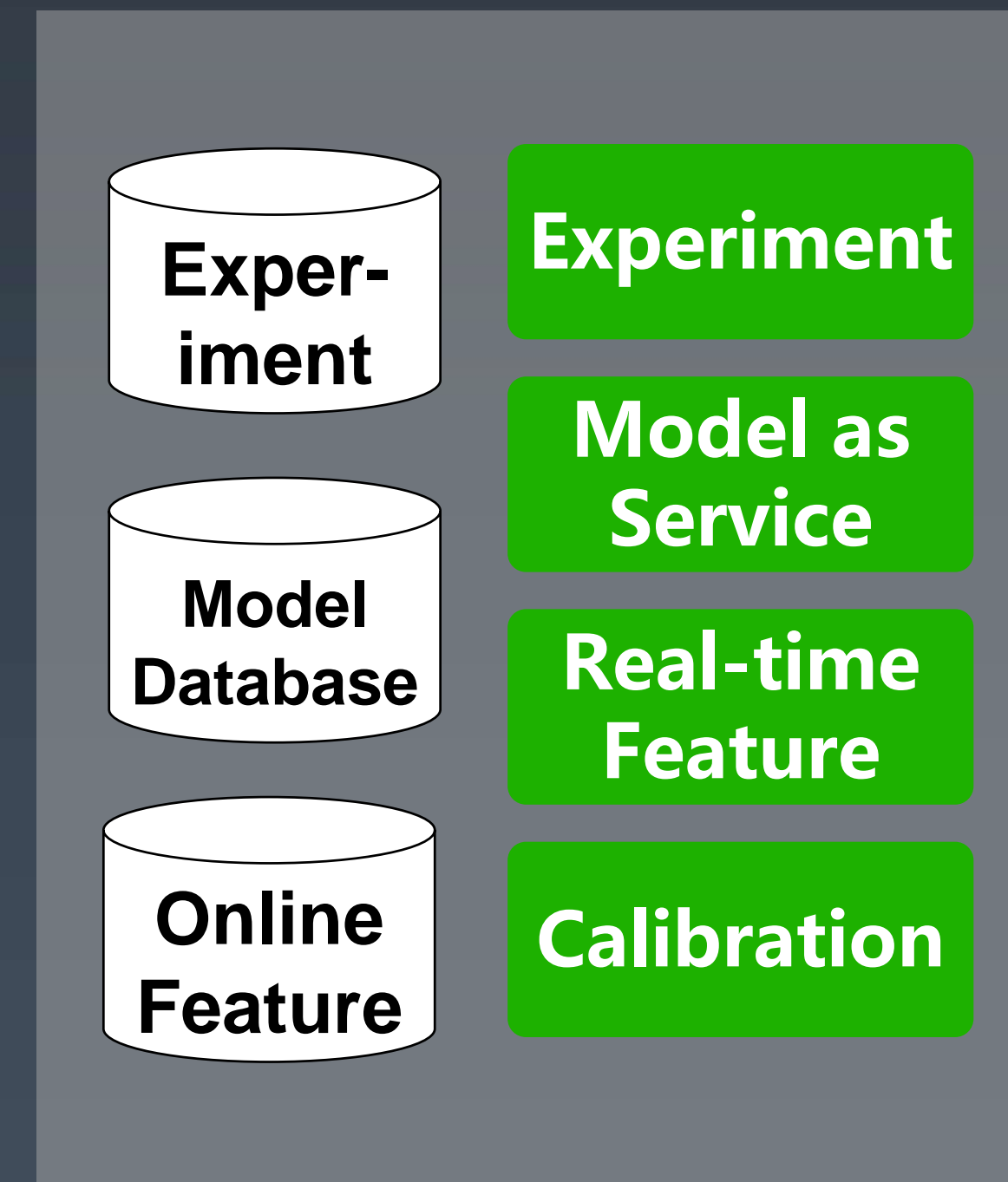


- Model serving
 - Batch
 - Streaming



- Exploration

- offline
- online (A / B test)



Online Service

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为什么会发起 Hadoop Submarine 项目？

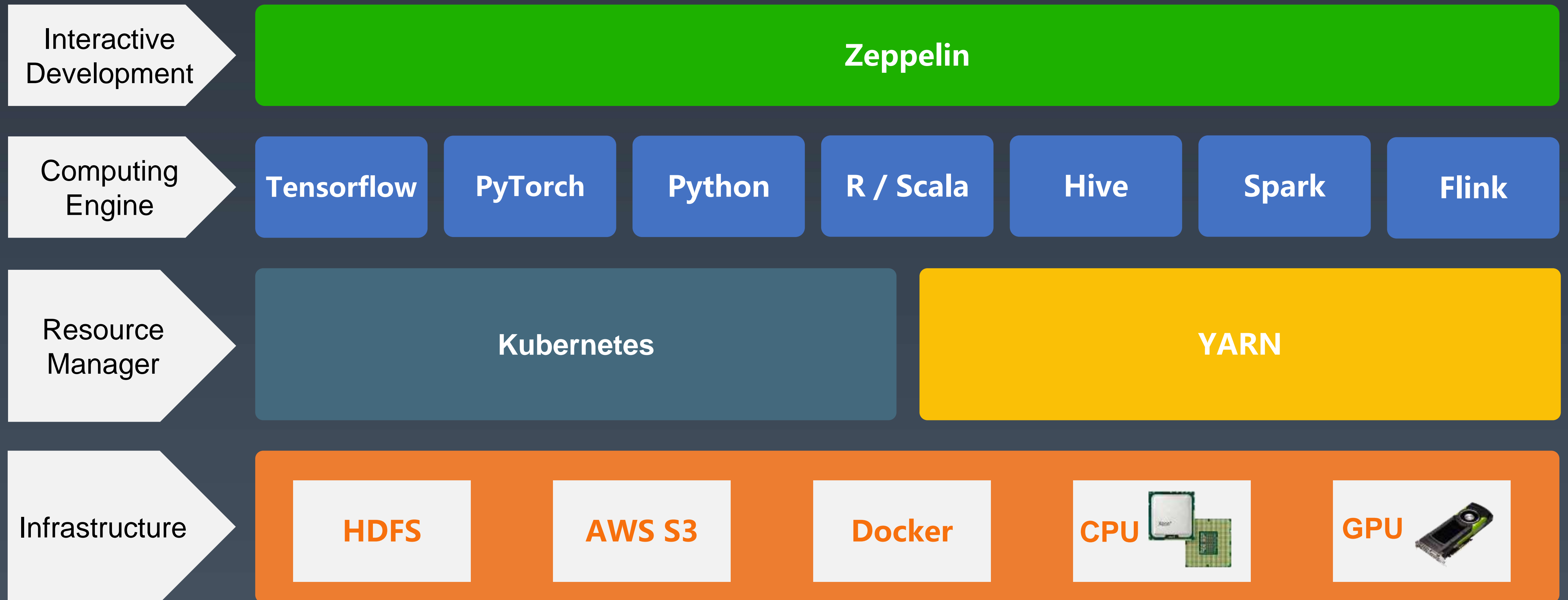
Hadoop Submarine 能够做什么？

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Submarine - Architecture



Submarine- “Launch distributed TF job like hello world”

Only a K8s or YARN(cluster 2.7+)

Run distributed TF training with one command:

```
jar -cp hadoop-submarine-<version>.jar job run
--name tf-job-001
--docker_image <your docker image>
--input_path hdfs://default/dataset/cifar-10-data
--checkpoint_path hdfs://default/tmp/cifar-10-jobdir
--num_workers 2
--worker_resources memory=8G,vcores=2,gpu=2
--worker_launch_cmd "cmd for worker ..."
--num_ps 1
--ps_resources memory=4G,vcores=2,gpu=0
--ps_launch_cmd "cmd for ps ..."
```

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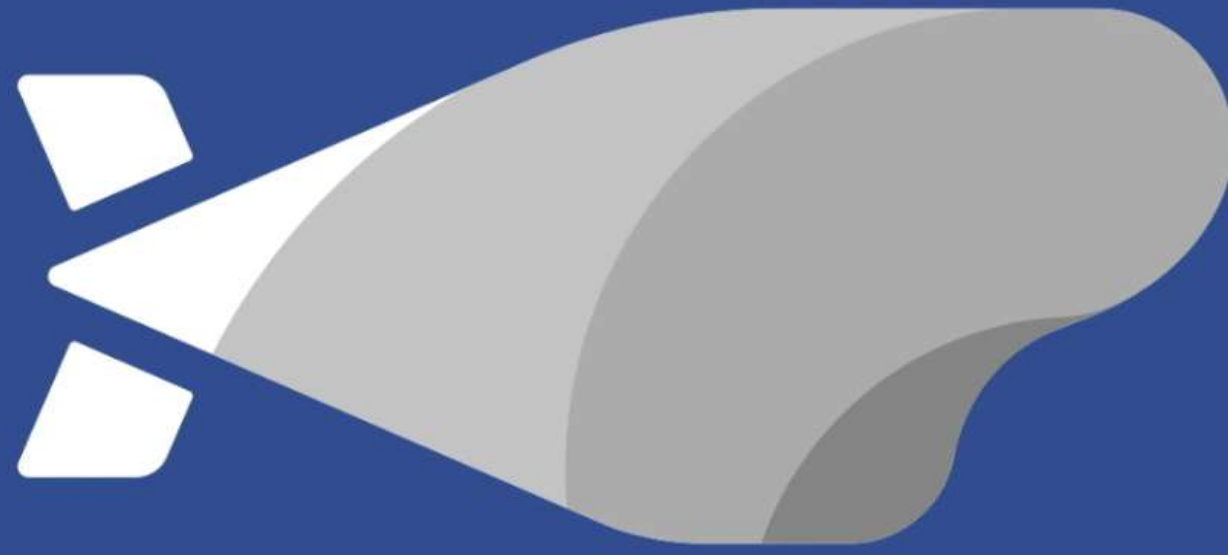
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Hadoop Submarine 能够做什么？

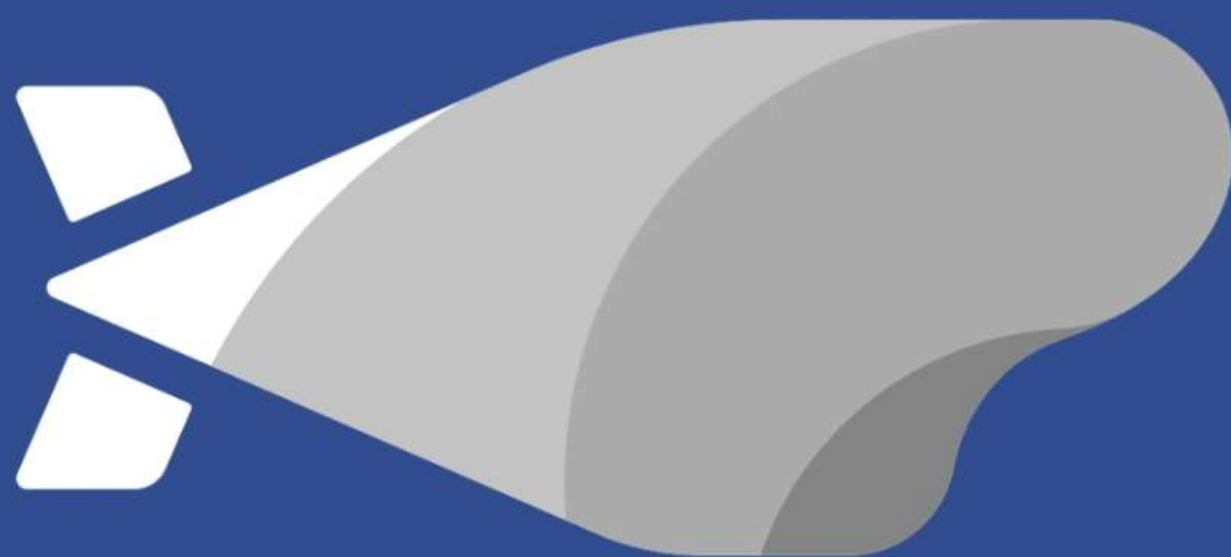
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Submarine On Kubernetes



Submarine On YARN

Welcome to Zeppelin!












Zeppelin is web-based notebook that enables interactive data analytics.

You can make beautiful data-driven, interactive, collaborative document with SQL, code and even more!

Notebook ↻

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-  [angular](#)
-  [liuxun1](#)
-  [python1](#)
-  [sh-test1](#)
-  [submarine-cifar10-test20](#)
-  [submarine-sh](#)
-  [submarine1](#)   

Rename note

Help

Get started with [Zeppelin documentation](#)

Community

Please feel free to help us to improve Zeppelin,
Any contribution are welcome!

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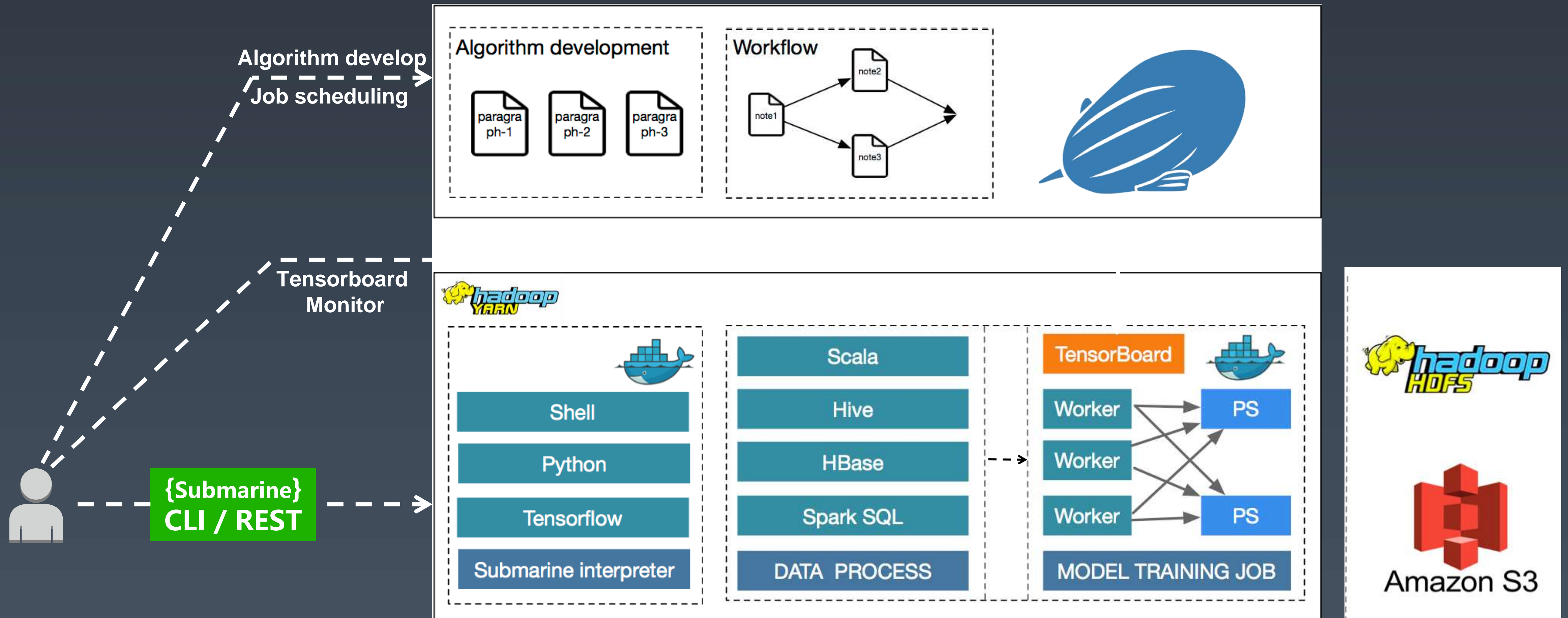
Hadoop Submarine 能够做什么？

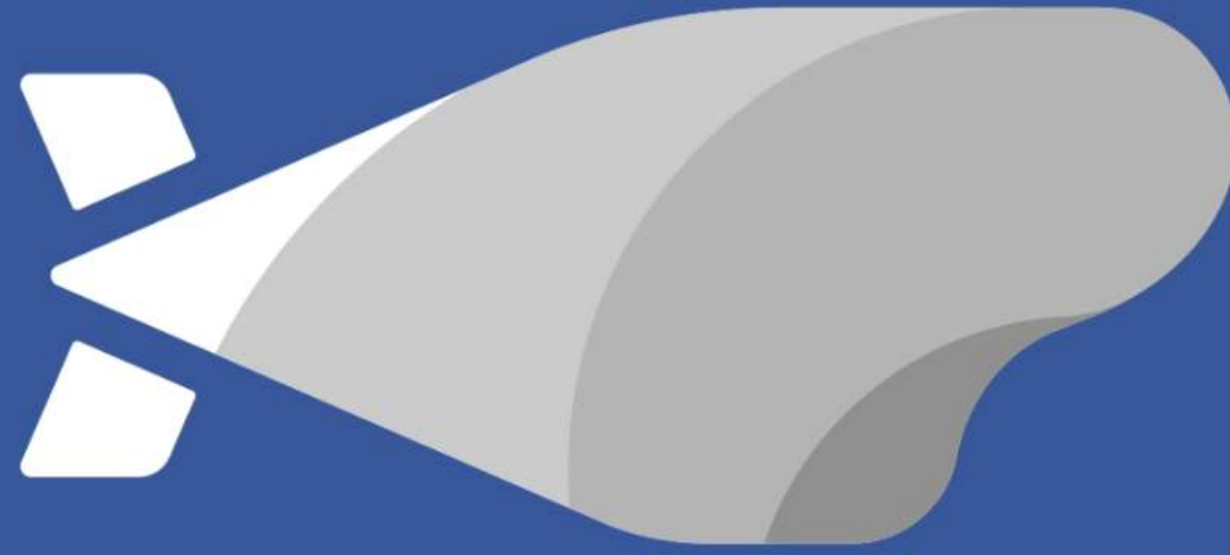
Demo

Hadoop Submarine Ecosystem

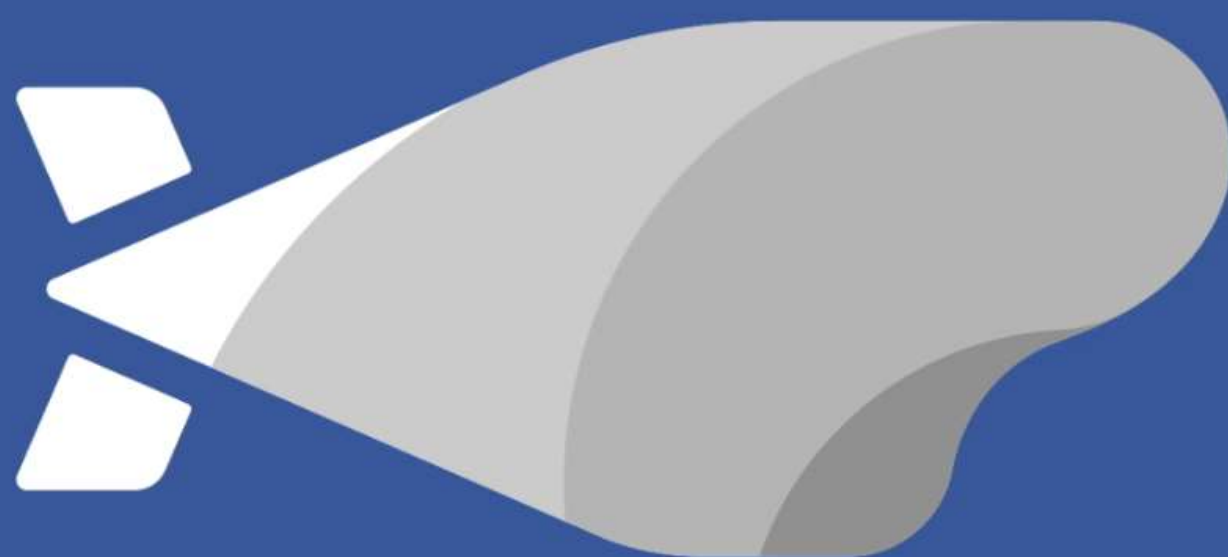
Present & Future

Submarine Integration Zeppelin





Train And Inference



Zeppelin Integrate Submarine

FINISHED

You can execute the selected command by entering the parameters in the interface below.

☐ Clean checkpoint

Data Path: hdfs://mldev/tmp/cifar-10-data

Submarine Runtime: **YARN RUNNING** Started at: Sat Feb 09 23:56:28 CST 2019 Launch at: Sat Feb 09 23:56:28 CST 2019 Elapsed time: 38sec

Save algorithm file

WARN: The title of the [0] paragraph is empty and was not submitted to HDFS.

```
INFO: You commit total of 15 algorithm files.
INFO: [Aggregate-data.spark] -> hdfs://mldev/user/hadoop/zeppelin/algorithm/2E3FDWARX/Aggregate-data.spark
INFO: [Load-Sample-Data.spark] -> hdfs://mldev/user/hadoop/zeppelin/algorithm/2E3FDWARX/Load-Sample-Data.spark
INFO: [Load-dimension-data.spark] -> hdfs://mldev/user/hadoop/zeppelin/algorithm/2E3FDWARX/Load-dimension-data.spark
INFO: [Write-the-data-directory-of-the-hdfs-algorithm.spark] -> hdfs://mldev/user/hadoop/zeppelin/algorithm/2E3FDWARX/Write-the-data-directory-of-the-hdfs-algorithm.spark
INFO: [azkaban-task1] -> hdfs://mldev/user/hadoop/zeppelin/algorithm/2E3FDWARX/azkaban-task1
```

```
/home/hadoop/hadoop-current/bin/yarn jar /home/hadoop/hadoop-current/share/hadoop/yarn/hadoop-yarn-submarine-3.3.0-SNAPSHOT.jar \
  job run \
  --name anonymous-2e3fdwarx \
  --env DOCKER_JAVA_HOME=/opt/java \
  --env DOCKER_HADOOP_HDFS_HOME=/hadoop-current \
  --env PYTHONPATH="./submarine_algorithm:$PYTHONPATH" \
```

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HADOOP SUBMARINE – PRESENT STATUS

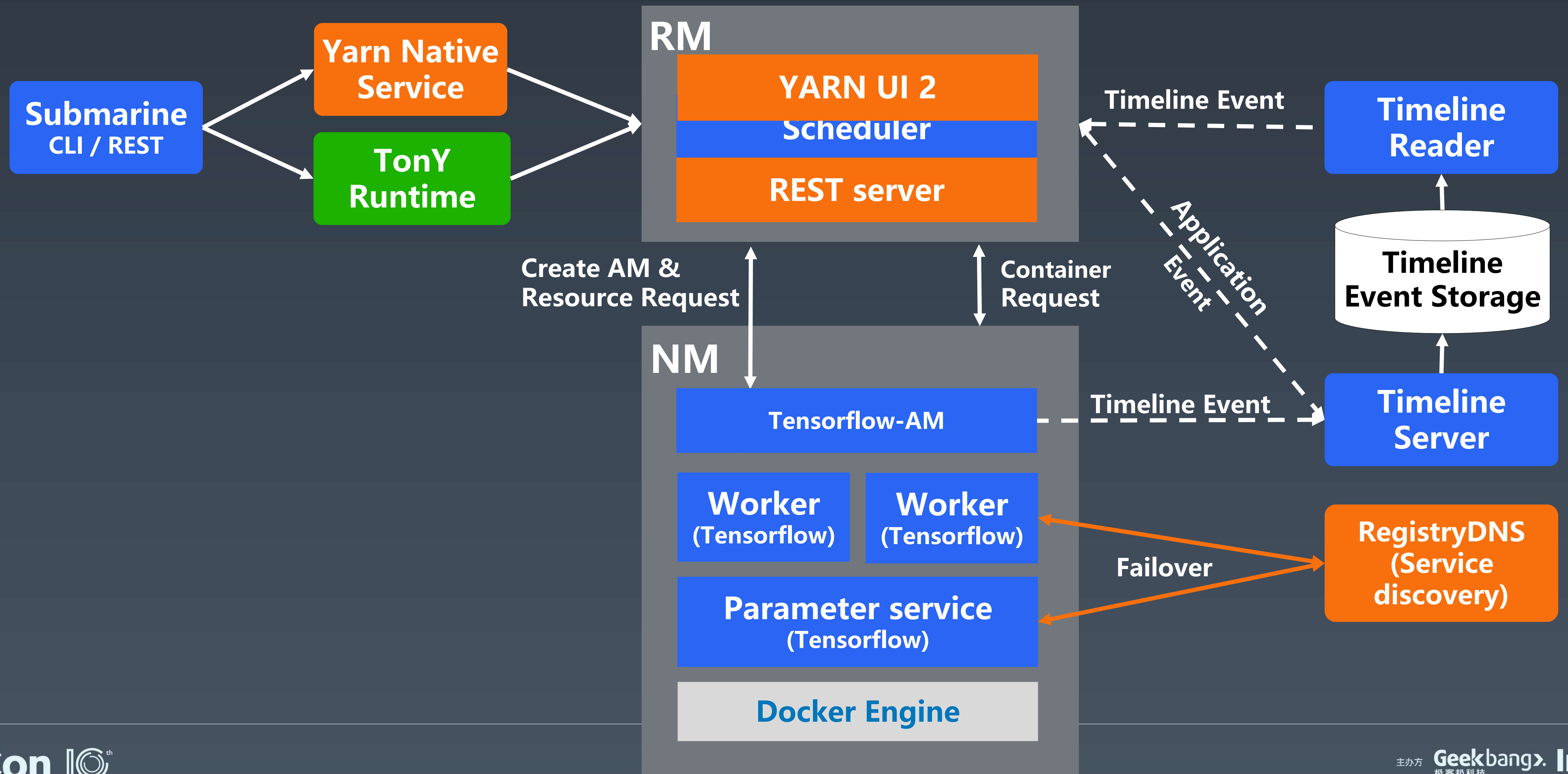
Submarine v0.10 release

- Released v0.10 with Apache Hadoop v3.2.0 release.
- Now Submarine is a sub project under Hadoop!
- Support Tensorflow On Kubernetes & YARN
- Zeppelin Integrate Submarine
- Submarine Installer

Submarine v0.20 release

- Integrate LinkedIn' s TonY as a new runtime
- Support YARN-2.7+
- Integrate PyTorch

Submarine – YARN 2.70+ & 3.10+




Submarine Installer

```
liuxun — hadoop@atlas236: ~/hzliuxun/netease/hdp-submarine-assembly — ssh ◀ login.sh atlas236 — 84x25
=====
                        HADOOP SUBMARINE ASSEMBLY 0.7
=====
HOST:10.120.196.236      DOWNLOAD_SERVER:http://10.120.196.236:19000
=====
[menu]
-----
1.prepare system environment [..]
2.install component [..]
3.uninstall component [..]
4.start component [..]
5.stop component [..]
6.start download server [..]

q.quit
=====

Please input your choice [1-6,q(quit)]:
```

Future - Model Serving

**Zeppelin**

Notebook ▾ Job Serving

Q Search

anonymous ▾


Serving

My awesome model note

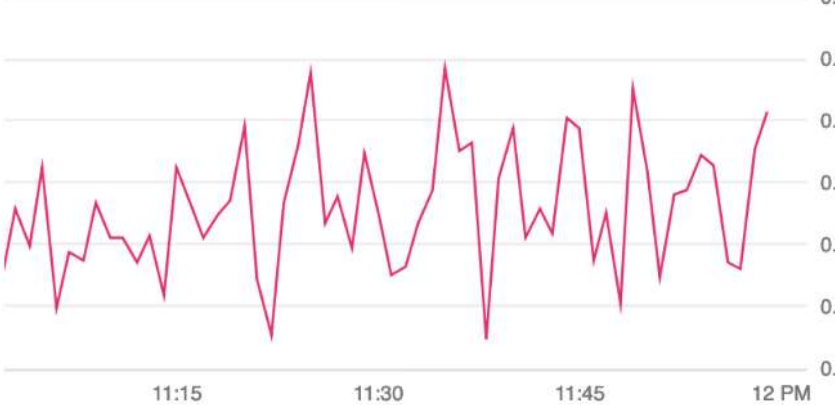
v2

Endpoint - https://local.zeppelin.org/serving/2B28313/v1/my_model

Req/second



Custom metrics : score



Number of instances 2 ▾


Apply

Stop


v1

Endpoint - https://local.zeppelin.org/serving/2B28313/v2/my_model

Req/second



Custom metrics : score




Number of instances 1 ▾

Apply

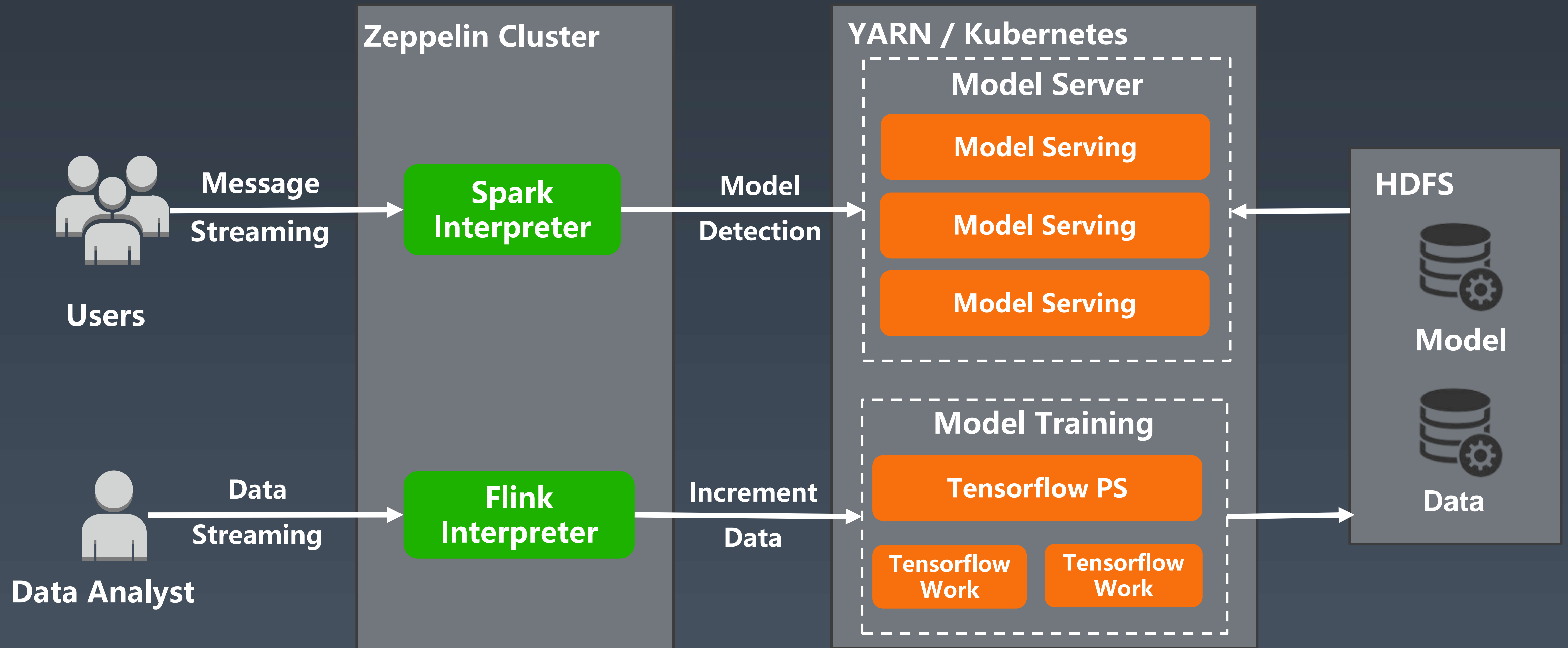
Stop

Other awesomeness

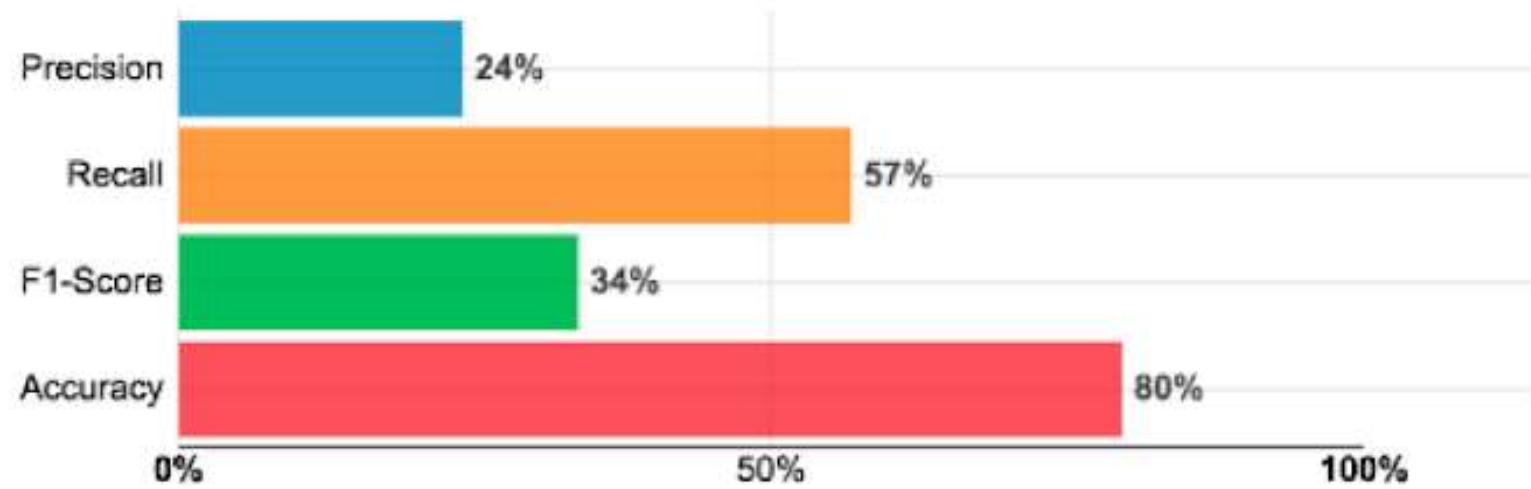
QCon 

主办方 **Geekbang** InfoQ 极客邦科技

Future - Model Detection & Increment training

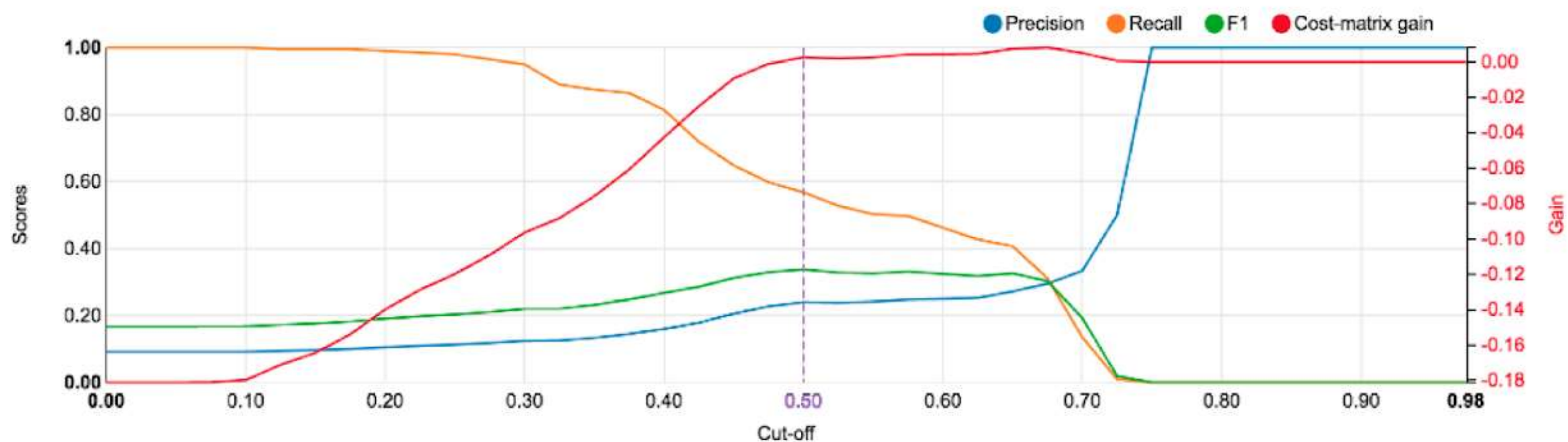


Future -可视化调参



Cost matrix

If model predicts True	and value is True	the gain is	1	×	113	=	113.00
	but value is False	the gain is	-0.3	×	358	=	-107.40
Model predicts False	and value is False	the gain is	0	×	1620	=	0.00
	but value is True	the gain is	0	×	86	=	0.00



Cost matrix

If model predicts True	and value is True	the gain is	1
	but value is False	the gain is	-0.3
Model predicts False	and value is False	the gain is	0
	but value is True	the gain is	0

Description

A classifier produces a probability that a given record is "positive" (here, that `high_revenue` is `True`). The threshold (or "cut-off") is the probability above which the prediction is considered positive. If set too low, it may predict `True` too often, if set too high, too rarely.

This chart shows how the overall performance metrics of the classifier vary depending on the threshold.

Metrics definitions

Accuracy: Proportion of correct predictions (positive and negative) in the sample.

Precision: Proportion of correct “positive” predictions in the sample.

Recall: Proportion of "positive" actual records correctly predicted as "positive"

HADOOP SUBMARINE – COMMUNITY

WebSite: <https://hadoop.apache.org/submarine/>

Code: <https://github.com/apache/hadoop>

JIRA: <https://issues.apache.org/jira/browse/SUBMARINE>

Ecosystem: <https://github.com/hadoopsubmarine>

YouTube: <https://www.youtube.com/channel/UC4JBt8Y8VJ0BW0IM9YpdCyQ>

Apache Hadoop Submarine is Hadoop community driven joint development program and quite a few companies (like [Cloudera](#), [Netease](#), [Linkedin](#), [Alibaba](#), [Didi](#), [Huawei](#), etc.) are making contributions.

WELCOME TO JOIN THE COMMUNITY



Hadoop Submarine 用户群



该二维码7天内(5月14日前)有效, 重新进入将更新

Hadoop Sumbarine 微信群



Apache Zeppelin 社区合作群



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想做团队的领跑者 需要迈过这些“槛”

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THANKS! | QCon  th