What is Analytics Zoo

BigDL

Distributed, High-Performance

Deep Learning Framework

for Apache Spark

https://github.com/intel-analytics/bigdl

ANALYTICS ZOO

Unified Analytics + AI Platform

Distributed TensorFlow, Keras, PyTorch and BigDL on Apache Spark

https://github.com/intel-analytics/analytics-zoo

Accelerating Data Analytics + AI Solutions At Scale

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在Flink上使用Analytics Zoo进行实时、分布式深度学习模型推理

目录 Contents

1. 大规模人工智能应用面临的挑战

   AI production at scale is facing lots of challenges.

2. 统一的大数据分析及人工智能

   Integrated Data Analytics and AI.

3. 跨行业的端到端客户案例实践

   Cross-industry End to End Use Cases.

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01 大规模人工智能应用面临的挑战

01 AI production at scale is facing lots of challenges

以数据为中心的世界

The Data-Centric World

全球超过 OVER

一半 HALF 数据 OF THE WORLD'S DATA

创建于过去

WAS CREATED IN THE LAST

两年 2 YEARS

其中只有不到 LESS THAN

2% 的数据 HAS BEEN ANALYZED

经过了分析

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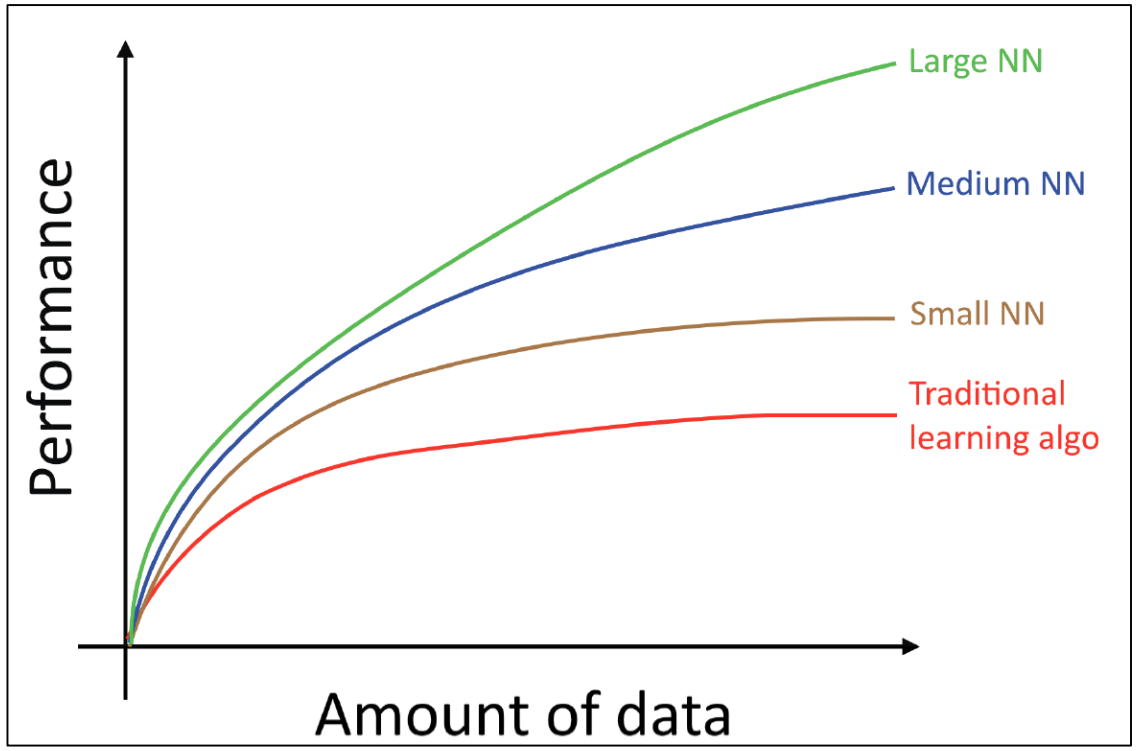
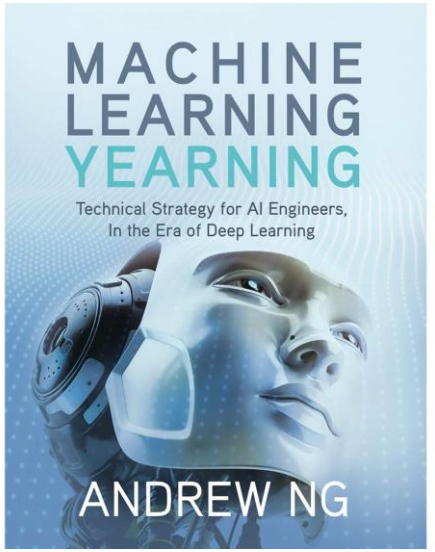
** 文中涉及的其它名称及商标属于各自所有者资产 。*

大规模人工智能应用
AI Production at Scale

数据驱动深度学习和人工智能应用
Data drives deep learning and AI production



“Machine Learning Yearning”, Andrew Ng, 2016



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大规模人工智能应用
AI Production at Scale

正面临巨大的挑战
Facing Lots of Challenges

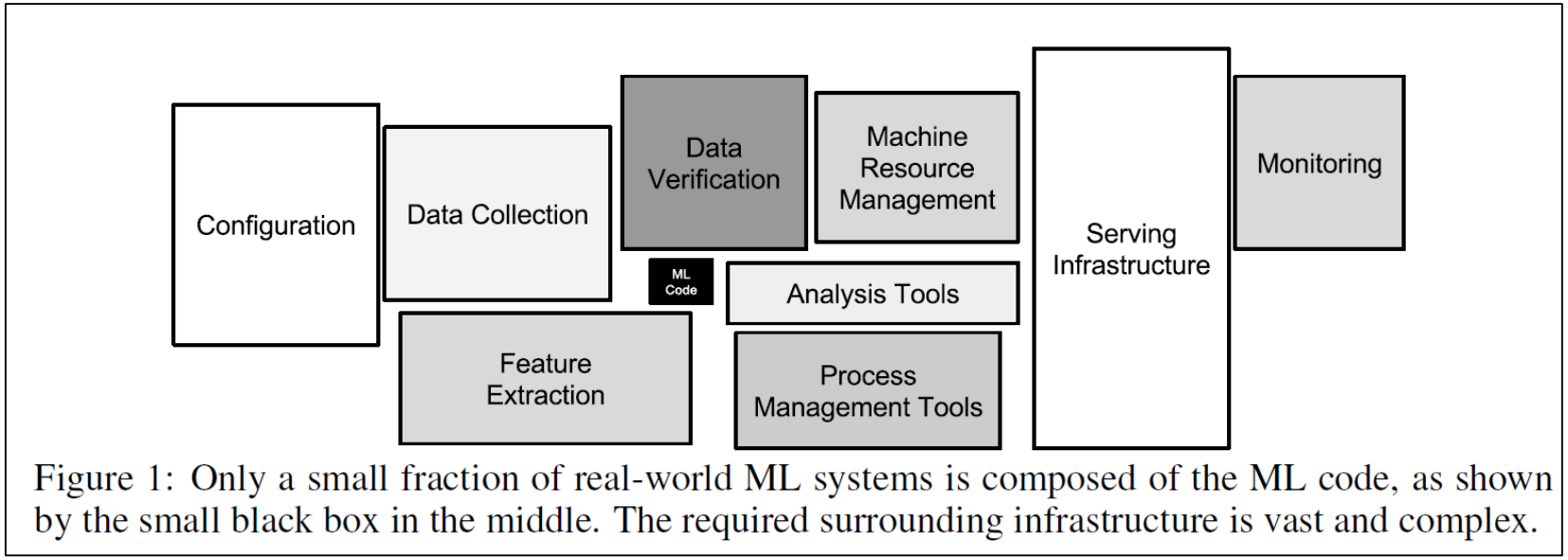

Figure 1: Only a small fraction of real-world ML systems is composed of the ML code, as shown by the small black box in the middle. The required surrounding infrastructure is vast and complex.

"Hidden Technical Debt in Machine Learning Systems", Sculley et al., Google, NIPS 2015

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02 统一的大数据分析及人工智能

02 Integrated Data Analytics and AI

统一的大数据分析及人工智能
Integrated Data Analytics and AI

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大数据上的人工智能
AI on Big Data

加快数据分析及人工智能大规模应用
Accelerating DATA Analytics + AI Solutions DEPLOYMENT At SCALE

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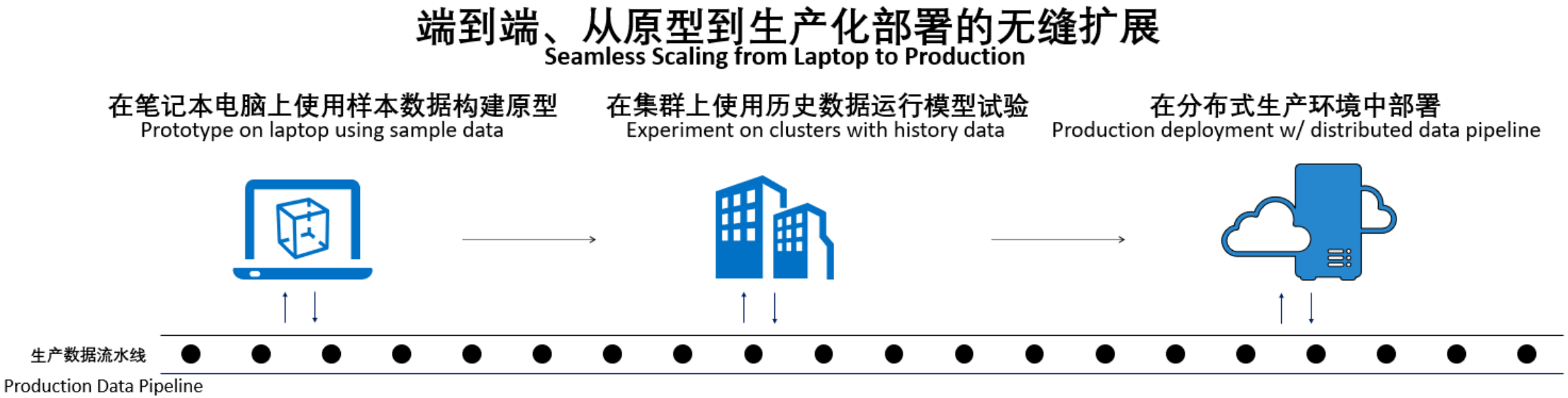
统一的数据分析和AI流水线
End-to-End Big Data Analytics and AI Pipeline



- 从笔记本电脑到分布式集群几乎无需任何代码更改 "Zero" code change from laptop to distributed cluster
- 无需数据拷贝，直接访问生产大数据系统 Directly access production data without data copy
- 高效构建端到端的数据分析+ AI 流水线原型 Easily prototype the end-to-end pipeline
- 无缝扩展部署到大数据集群及生产环境 Seamlessly deployed on production big data clusters

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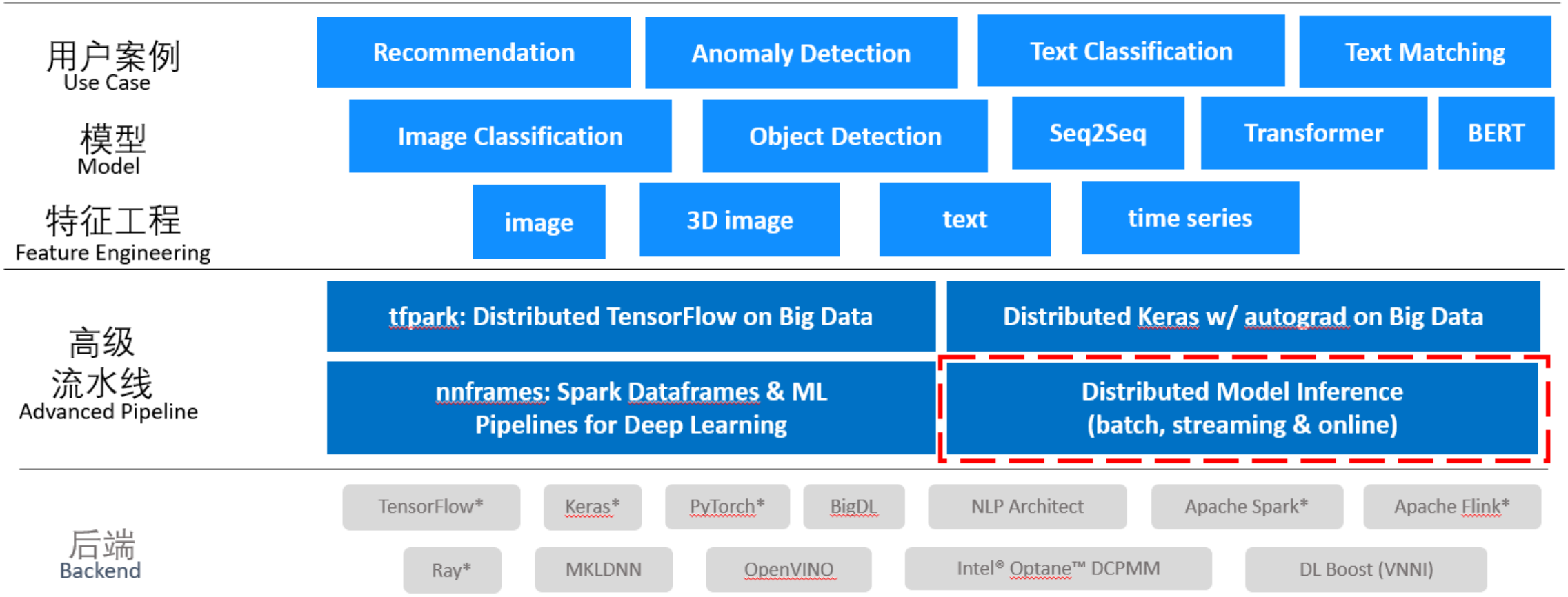
Analytics Zoo

统一的大数据分析+人工智能平台

Integrated Big Data Analytics and AI platform

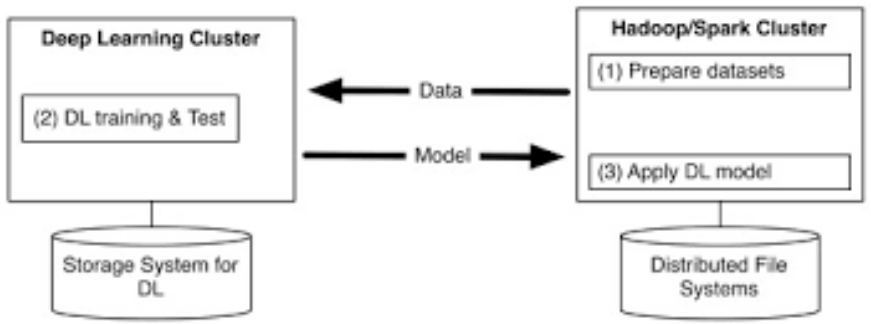


https://github.com/intel-analytics/analytics-zoo

Software

分布式 TensorFlow* 流水线
Distributed TensorFlow* Pipeline

- Data loading, processing and feature engineering with Big Data
- Deep learning model development using TensorFlow* or Keras*
- Distributed training / inference on Big Data




```
#load data
train_data = hadoopFile(...).map(...)
dataset = TFDataset.from_rdd(train_rdd,...)

#tensorflow code
import tensorflow as tf
slim = tf.contrib.slim
images, labels = dataset.tensors
with slim.arg_scope(lenet.lenet_arg_scope()):
  logits, end_points = lenet.lenet(images, ...)
loss = tf.reduce_mean( \
  tf.losses.sparse_softmax_cross_entropy( \
  logits=logits, labels=labels))

#distributed training
optimizer = TFOptimizer.from_loss(loss, Adam(...))
optimizer.optimize(end_trigger=MaxEpoch(5))
```

用大数据计算框架载入数据以及预处理数据或特征工程

用 TensorFlow*或Keras*定义深度学习模型

在大数据上分布式训练或者推理

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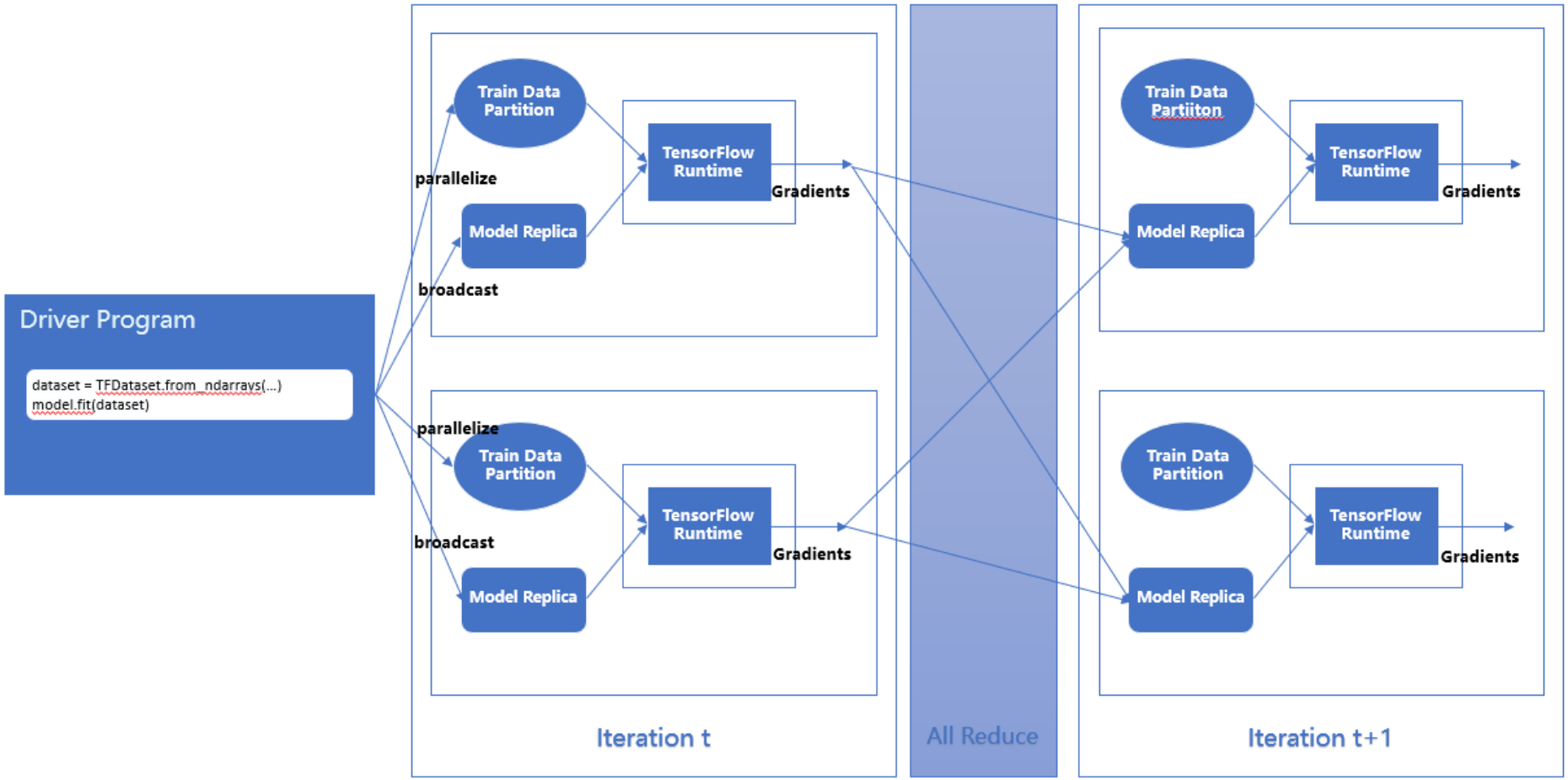
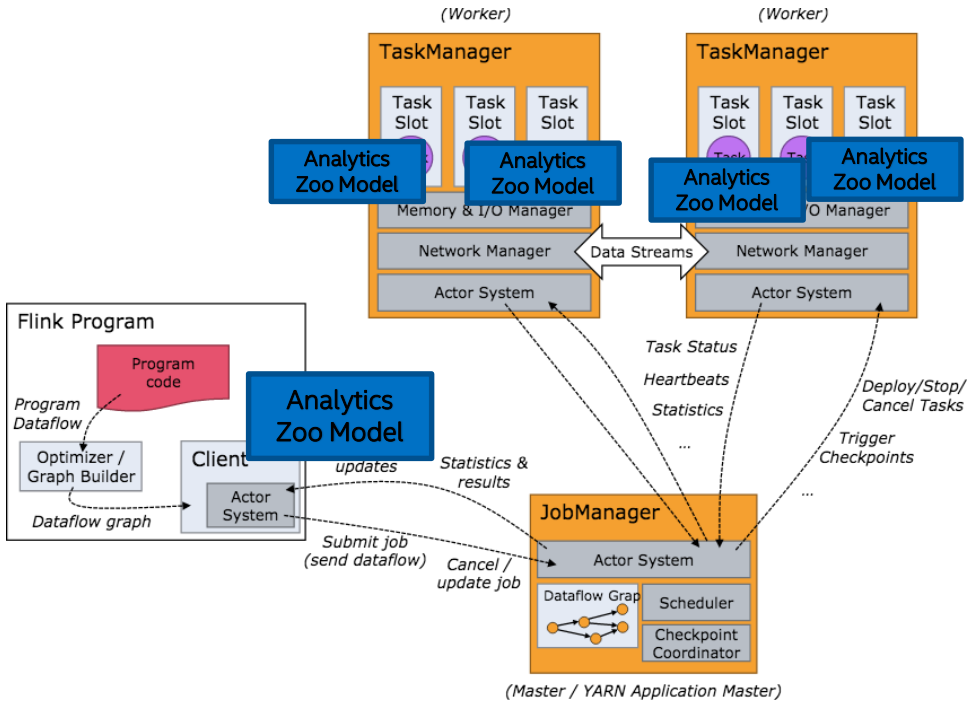
分布式 TensorFlow* 流水线

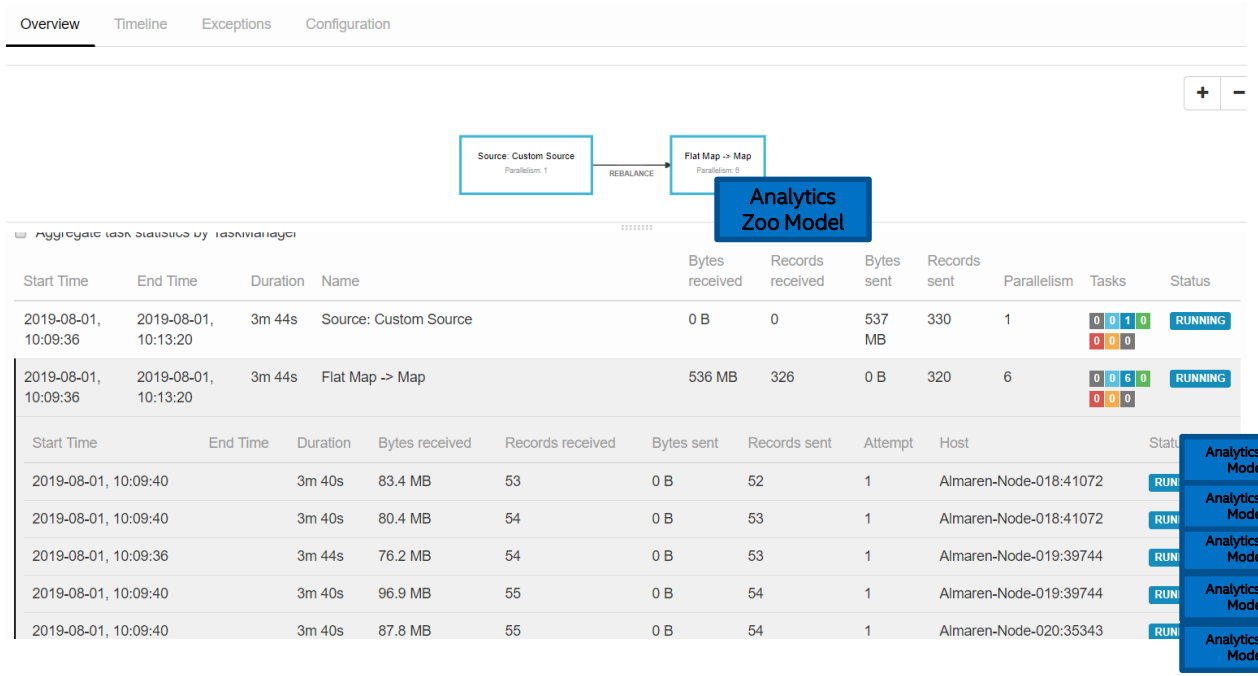
Distributed TensorFlow* Pipeline



分布式、实时 (流式) 模型推理流水线
Distributed and Real time (streaming) Inference Pipeline

- 纯Java或Python API
- 支持Flink*, Spark* Streaming, Storm*, Kafka*等
- 支持Web Services
- 使用OpenVINO和DL Boost(VNNI) 加速

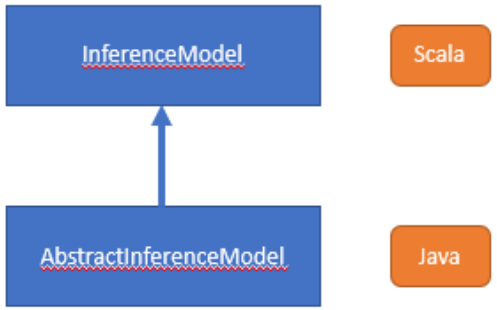




POJO Style的Inference Model

POJO Style Inference Model

- 纯Java API, 不依赖于任何计算框架，不需要特别的上下文
- 可使用于单机Java/Scala程序，Web Serving，Cluster Serving包括批处理，流处理等场景
- 支持Flink*, Spark* Streaming, Storm*, Kafka*等




```
import com.intel.analytics.zoo.pipeline.inference.AbstractInferenceModel;

public class MyModel extends AbstractInferenceModel {
  public MyModel(int concurrentNum) {
    super(concurrentNum);
  }
  ...
}

public class ServingExample {
  public static void main(String[] args) throws IOException {
    MyModel model = new MyModel();
    model.load(modelPath, weightPath);
    A data = ...
    List<JTensor> inputs = preProcess(data);
    List<JTensor> outputs = model.predict(inputs);
    B results = postProcess(outputs);
  }
}
```

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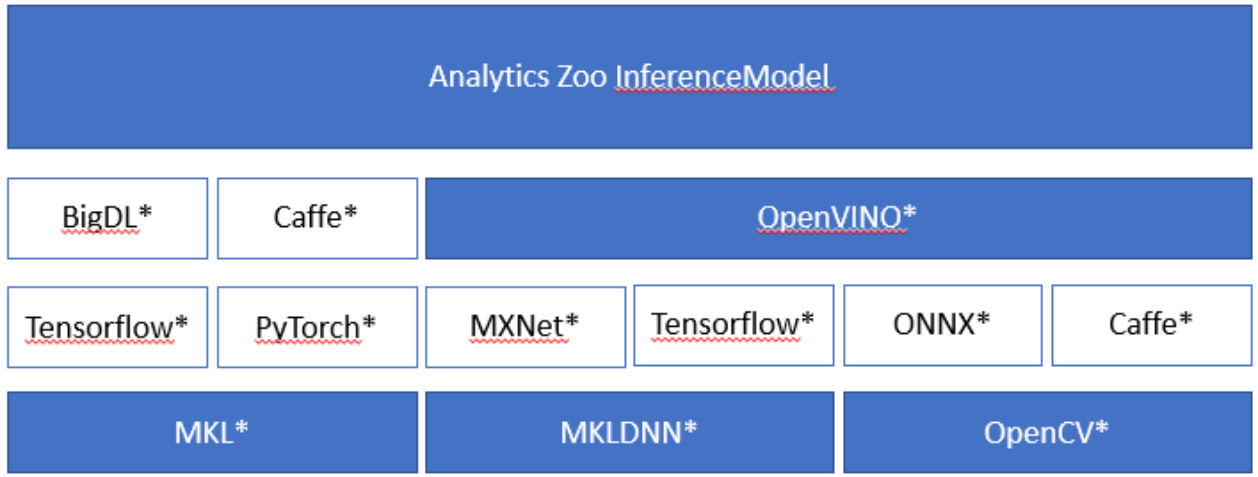
Inference Model 支持多种深度学习框架的模型

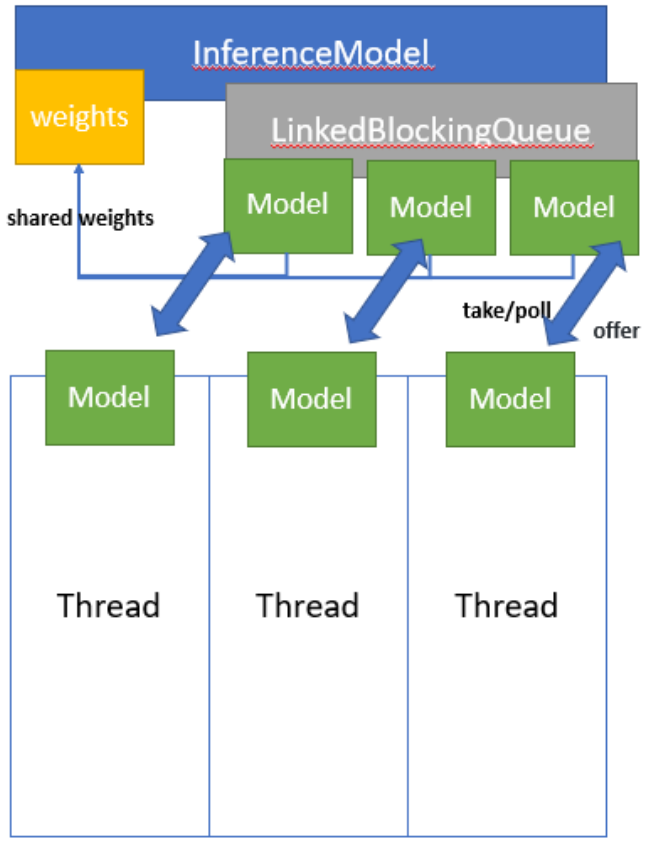
Inference Model supports lots of Deep Learning Frameworks

- 支持多种深度学习框架的模型
  - BigDL
  - Caffe*
  - Tensorflow*
  - PyTorch*
  - OpenVINO*
- 简单易用的API
  - 加载模型
    - Laod
    - loadCaffe
    - loadTF
    - loadPyTorch
    - loadOpenVINO
  - 预测
    - predict



线程安全的Inference Model
Thread-Safe Inference Model

- 支持线程安全多模型
  - concurrentNum
    - model = modelQueue.take
  - autoScalingEnabled
    - model = modelQueue.poll()
    - model = this.originalModel.copy(1)(0)
- 多模型共享weights



使用OpenVINO*加速模型推理
Model inference accelerating with OpenVINO*

- 支持Image Classification 和Object Detection等
- 支持加载TensorFlow*模型
- 支持模型动态Optimize及Calibrate
- 支持直接加载OpenVINO IR

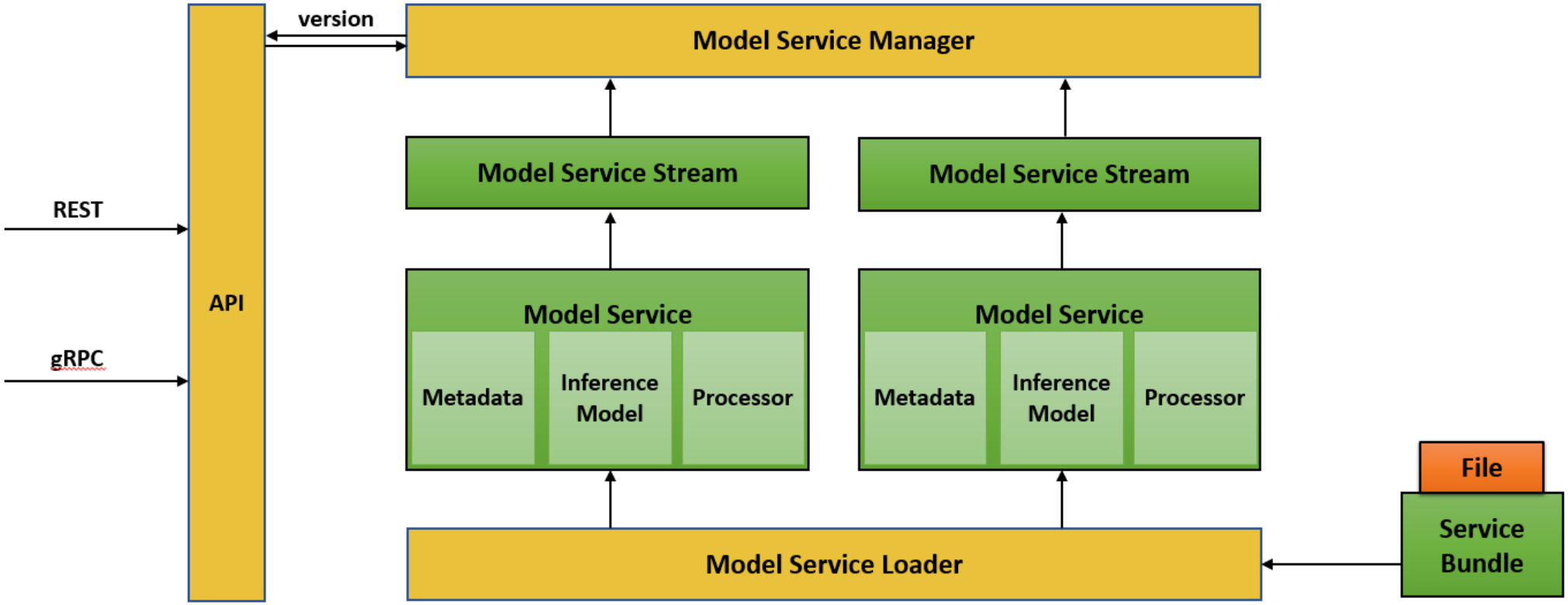
```
from zoo.common.nncontext import init_nncontext
from zoo.feature.image import ImageSet
from zoo.pipeline.inference import InferenceModel

sc = init_nncontext("OpenVINO Object Detection Inference Example")
images = ImageSet.read(options.img_path, sc,
   resize_height=600, resize_width=600).get_image().collect()
input_data = np.concatenate(
   [image.reshape((1, 1) + image.shape) for image in images], axis=0)

model = InferenceModel()
model.load_tf(options.model_path, backend="openvino",
model_type=options.model_type)
predictions = model.predict(input_data)

# Print the detection result of the first image.
print(predictions[0])
```

Web Serving



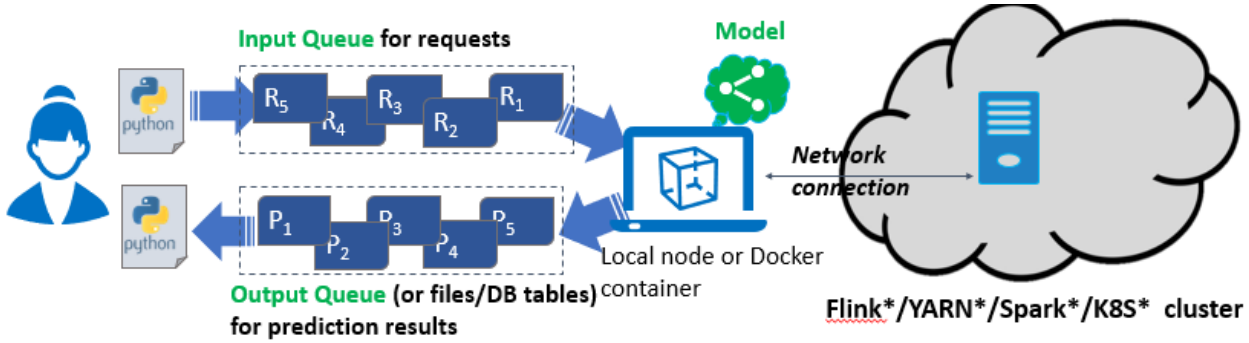
Analytics Zoo *Cluster Serving* 使分布式推理更加简单

Distributed Inference made easy with Analytics Zoo Cluster Serving

部署

√ 一个本地节点或者一个Docker容器

√ 已有的 Flink*/YARN*/Spark*/K8S* 集群



使用

1 一条命令:

- 启动Docker容器以及*Zoo Cluster Serving*

❑ 此命令指定:

- 输入 和 输出 的队列名字
- 模型 的文件路径
- 预/后处理 的文件路径
- 集群 的访问路径

2 一个简单的Python脚本:

- 将请求数据发送到 Input Queue
- 从 Output Queue (或文件/数据库)获得推理结果

3 Analytics Zoo 在集群上自动执行分布式、实时（流式）模型推理

- 支持 TensorFlow*, Keras*, PyTorch*, Caffe*, BigDL 和 OpenVINO 的模型, 可使用 Int8 加速
- 通过Flink* 线性扩展

√ 可扩展的分布式推理由Analytics Zoo托管

√ 用户无需为开发和部署复杂的分布式推理方案而费心

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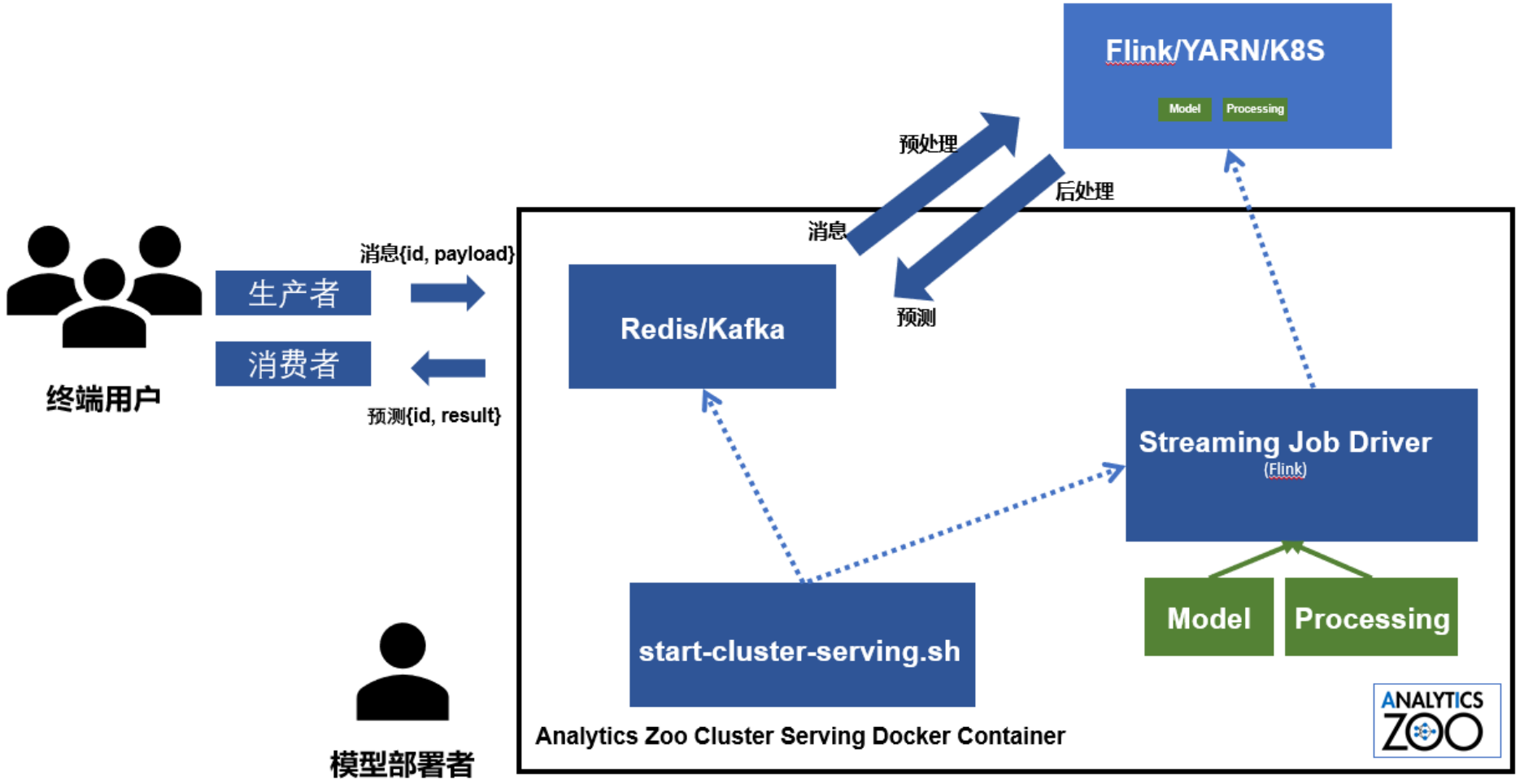
Analytics Zoo *Cluster Serving* 使分布式推理更加简单

Distributed Inference made easy with Analytics Zoo Cluster Serving

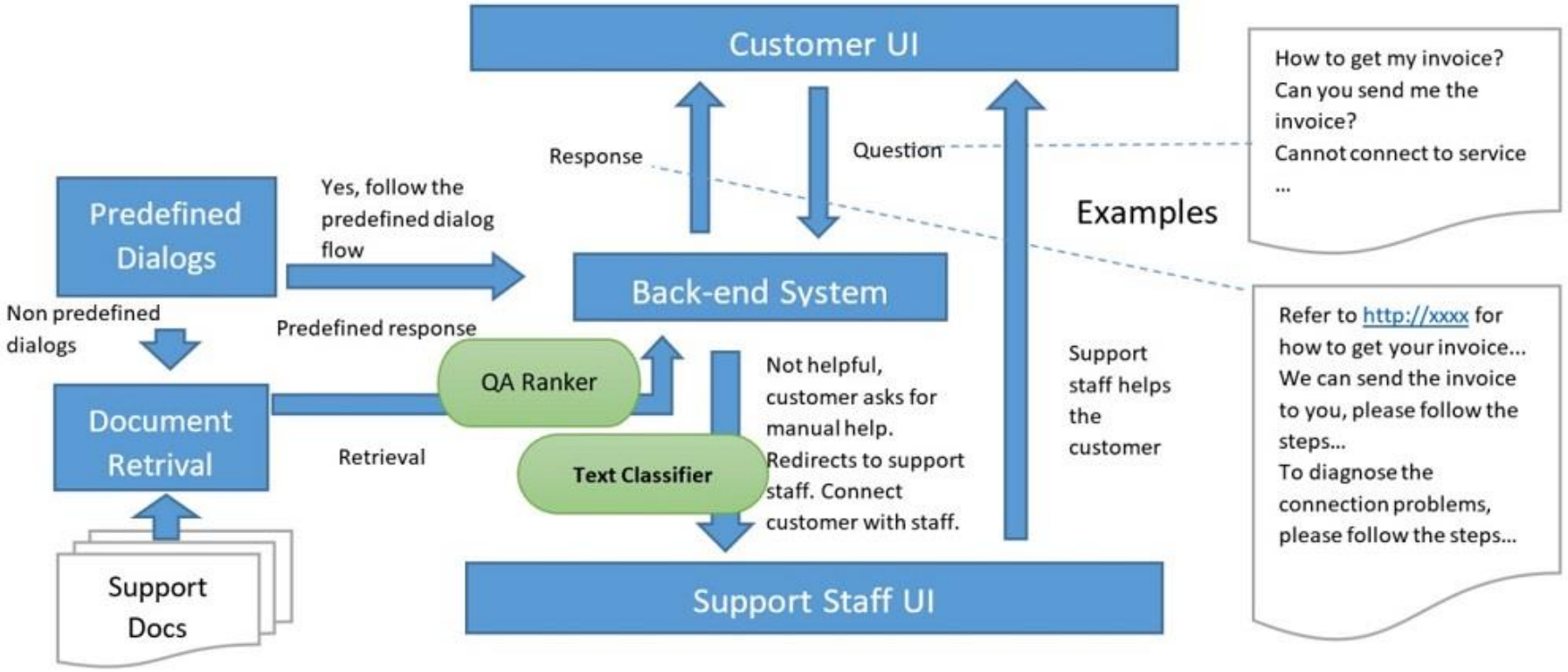


03跨行业的端到端客户案例实践

03 Cross-industry End to End Use Cases

基于NLP的客户服务Chatbot for Microsoft Azure

NLP Based Customer Service Chatbot for Microsoft Azure



https://software.intel.com/en-us/articles/use-analytics-zoo-to-inject-ai-into-customer-service-platforms-on-microsoft-azure-part-1
https://www.infoq.com/articles/analytics-zoo-qa-module/

阿里云 视频直播 中国站

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首届！Apache Flink 极客挑战赛强势来袭，重磅奖项等你拿，快来组队报名啦

Ververica 2019-07-24 17:51:26 浏览175

深度学习 大数据 性能优化 机器学习 性能 Apache 钉钉 开源大数据 流计算 大数据分析 ApacheFlink AI及大数据 实时技术

7 月 24 日，阿里云峰会上海开发者大会开源大数据专场，阿里巴巴集团副总裁、计算平台事业部总裁贾扬清与英特尔高级首席工程师、大数据分析和人工智能创新院院长戴金权共同发布首届 Apache Flink 极客挑战赛。

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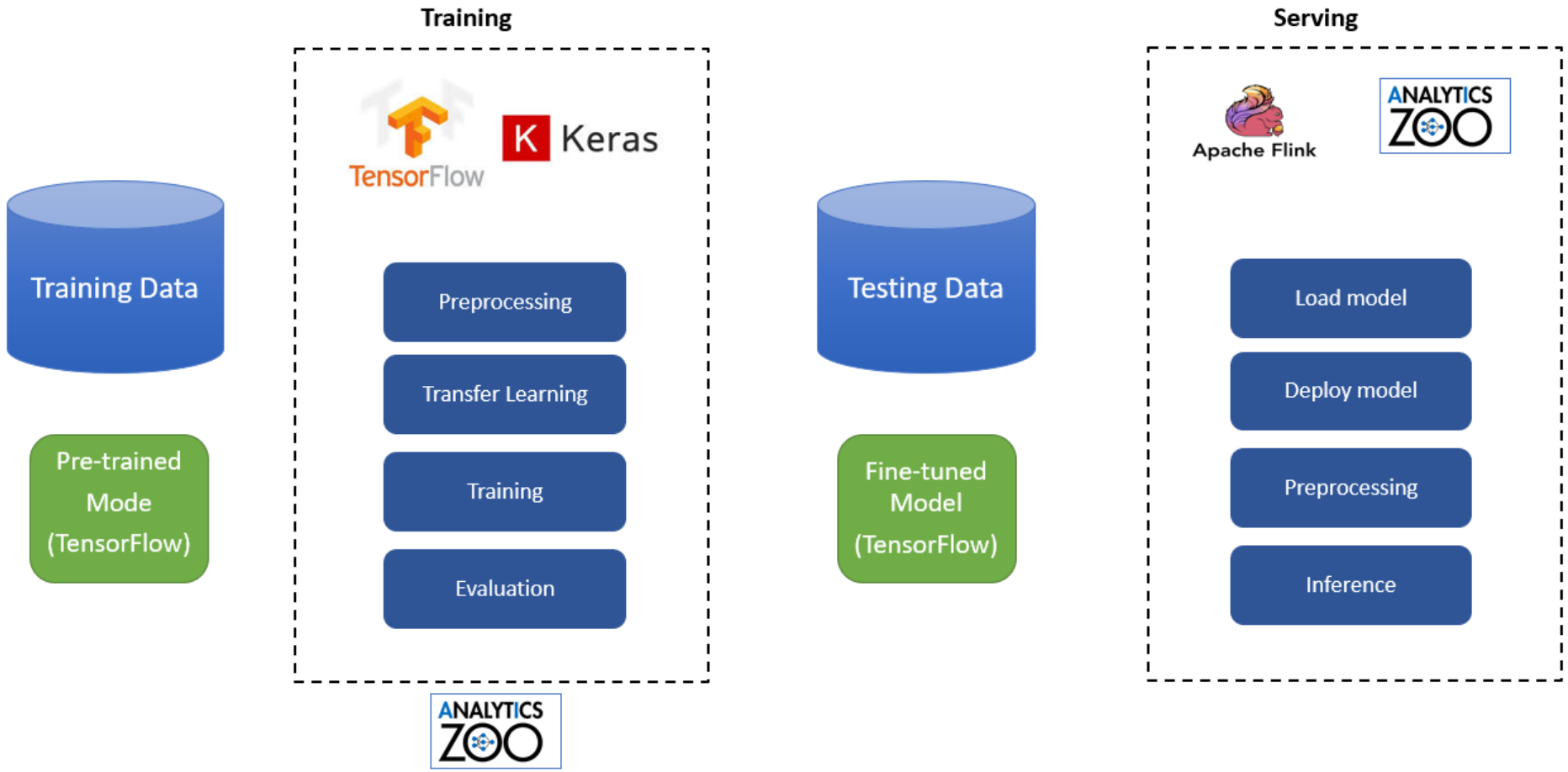
Apache Flink* 极客挑战赛垃圾图片分类



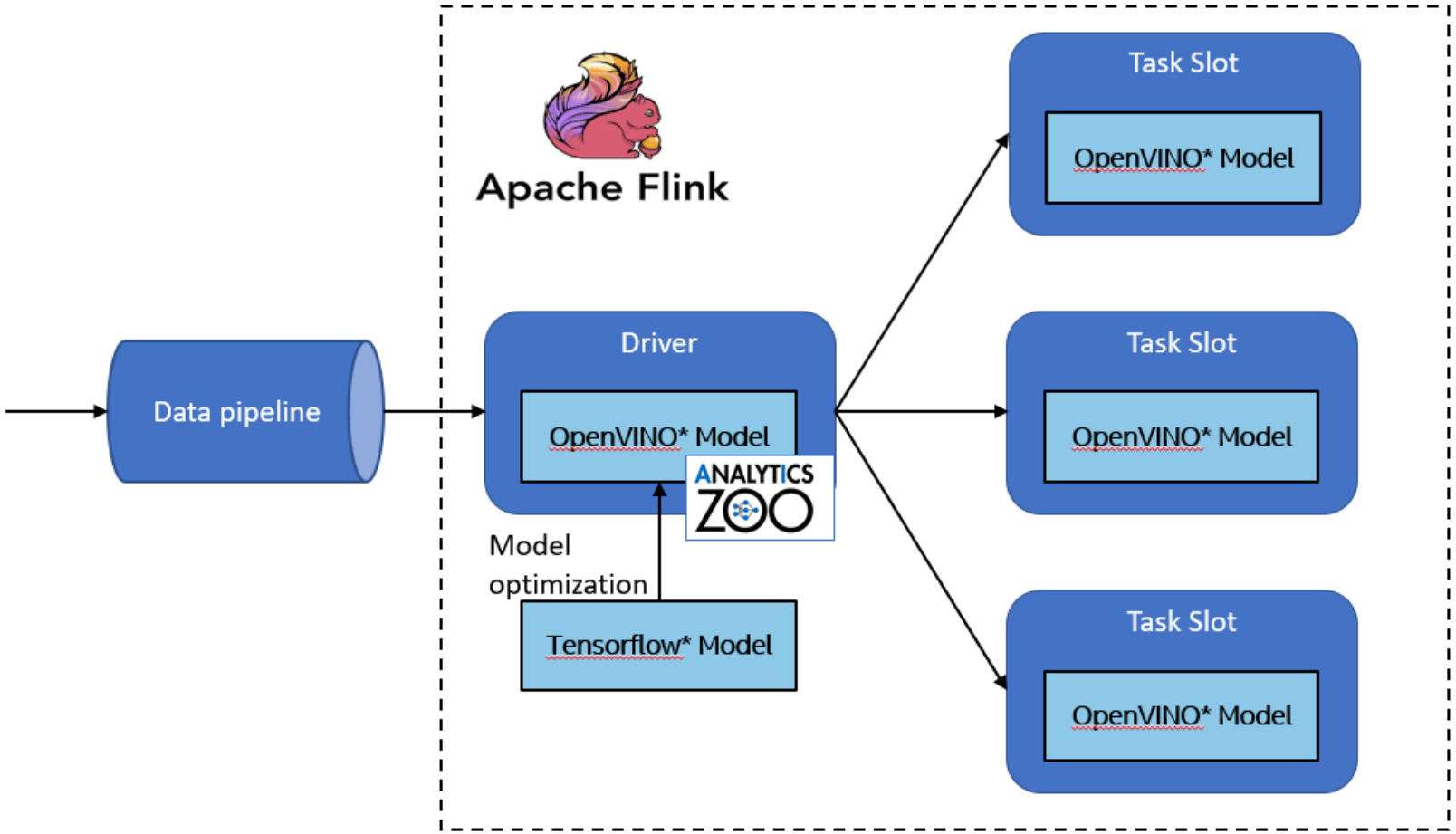
使用Analytics Zoo作迁移学习
Transfer Learning with Analytics Zoo

- TFNet load TensorFlow* Saved Model
- Add extra layers
- Training with Estimator

```
val originalModel = TFNet.fromSavedModel(modelPath, inputs, outputs)

val model = Sequential[Float]()
model.add(originalModel)
model.add(new SpatialAveragePooling[Float](2, 2, globalPooling = true))
model.add(new Linear[Float](2048, 100))

val criterion = new CrossEntropyCriterion[Float]()
val adam = new Adam[Float]()
val validations = Array(new Top1Accuracy[Float], new Loss[Float])
val localEstimator = LocalEstimator(model, criterion, adam, validations,
threadNum)

val trainData = Cifar10DataLoader.loadTrainData(imageDirPath)
   .filter(_.label() <= 100).slice(0, 10 * batchSize)
val testData = Cifar10DataLoader.loadTestData(imageDirPath)
   .filter(_.label() <= 100).slice(0, 10 * batchSize)

localEstimator.fit(trainData, testData,
      ImageProcessing.labeledBGRImageToMiniBatchTransformer,
      batchSize, epoch)
```

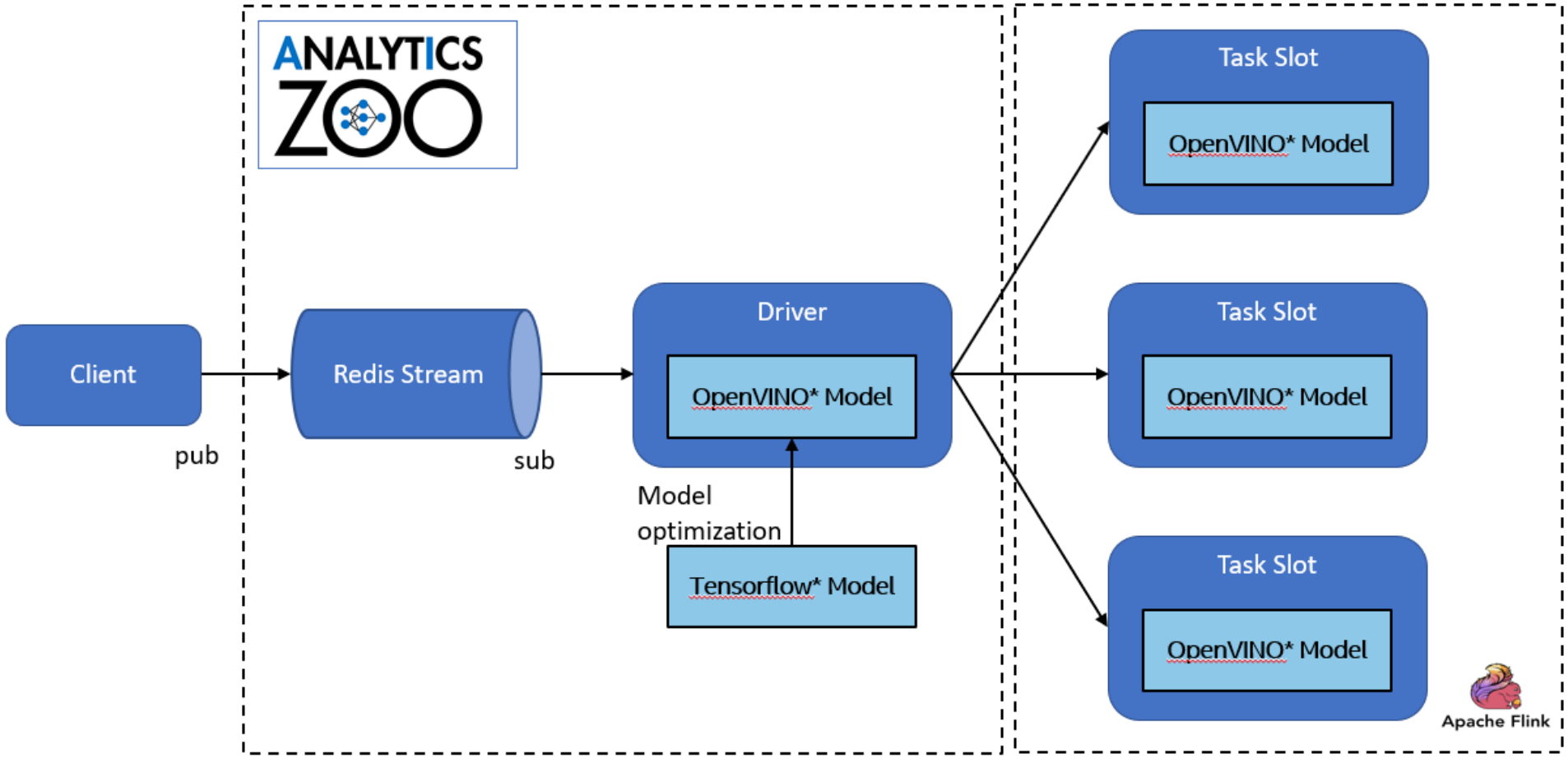
在Apache Flink*中使用Analytics Zoo进行分布式模型推理

Distributed Model Serving with Analytics Zoo in Apache Flink*



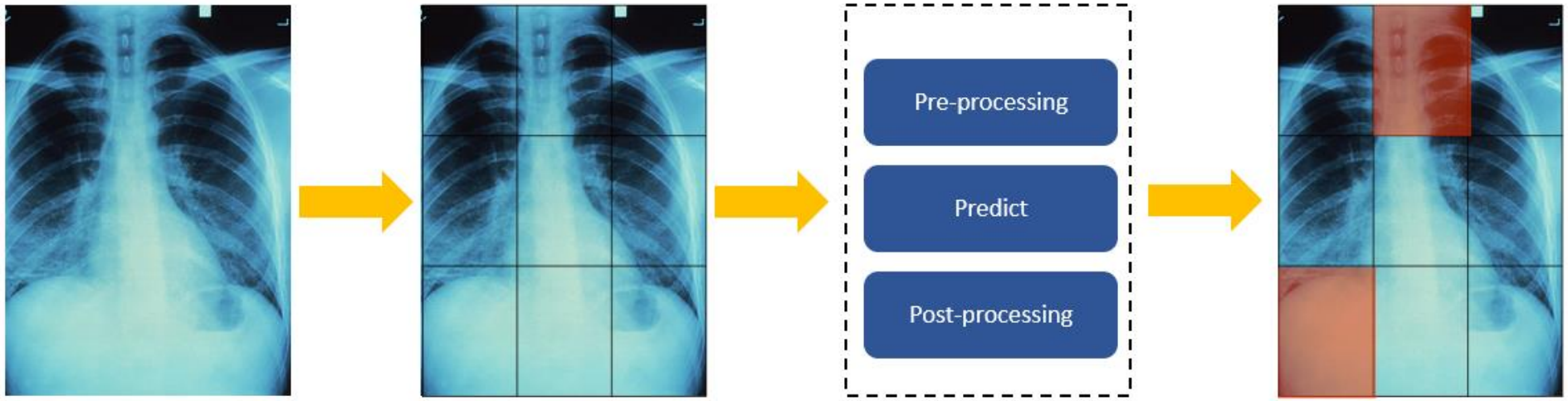
使用Analytics Zoo Cluster Serving进行分布式模型推理

Distributed Model Serving with Analytics Zoo Cluster Serving



使用Analytics Zoo Cluster Serving加速医疗影像分析

Accelerate medical image analysis with Analytics Zoo Cluster Serving



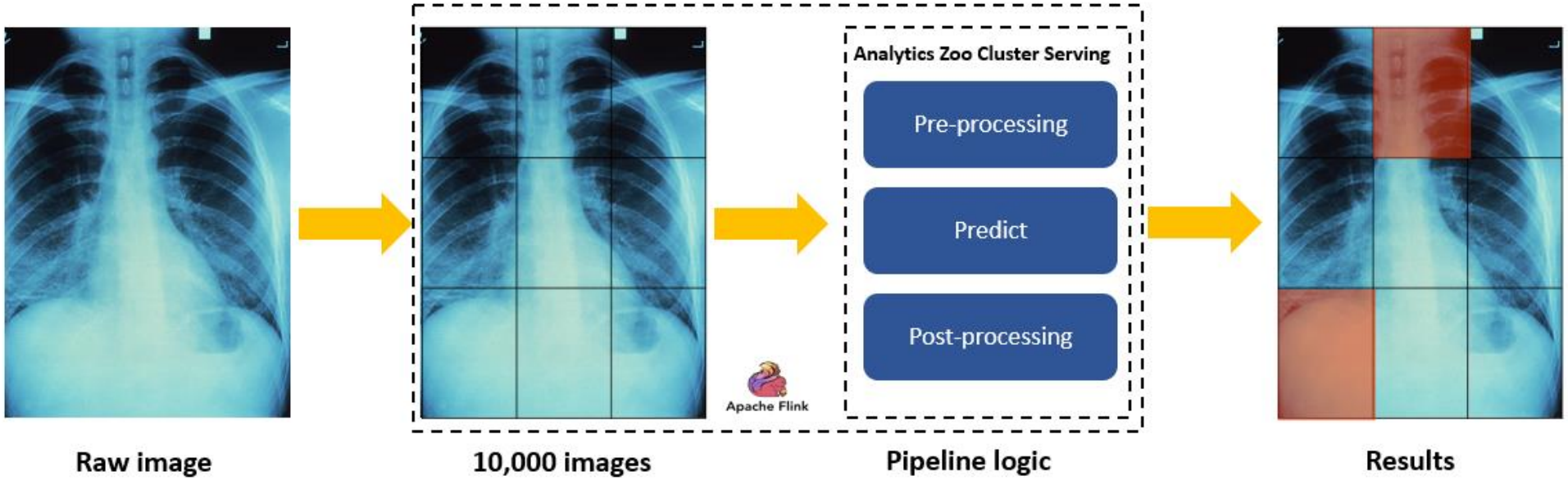
- 结果正确，但性能不可接受，每张原始图片需要1-2小时的处理与预测时间，很难扩展
- 性能瓶颈：预处理（split, crop, resize and normalization），推理

Unacceptable performance, 1-2 hours of processing and prediction, hard to scale
Performance bottlenecks: preprocessing (split, crop, resize and normalization)

https://en.wikipedia.org/wiki/X-ray

使用Analytics Zoo Cluster Serving加速医疗影像分析

Accelerate medical image analysis with Analytics Zoo Cluster Serving



- 使用Analytics Zoo Cluster Serving, 处理时间： 1-2小时→秒级
- 并发式图像处理使用Apache Flink*与Analytics Zoo(OpenCV*)
- 并发式模型推理使用Analytics Zoo(Caffe*， MKLDNN)
- 易于实现及扩展

With Analytics Zoo cluster serving, 1-2 hours → seconds
Parallel image processing using Apache Flink * and Analytics Zoo (OpenCV *)
Parallel model inference using Analytics Zoo (Caffe *, MKLDNN)
Easy to implement and scale

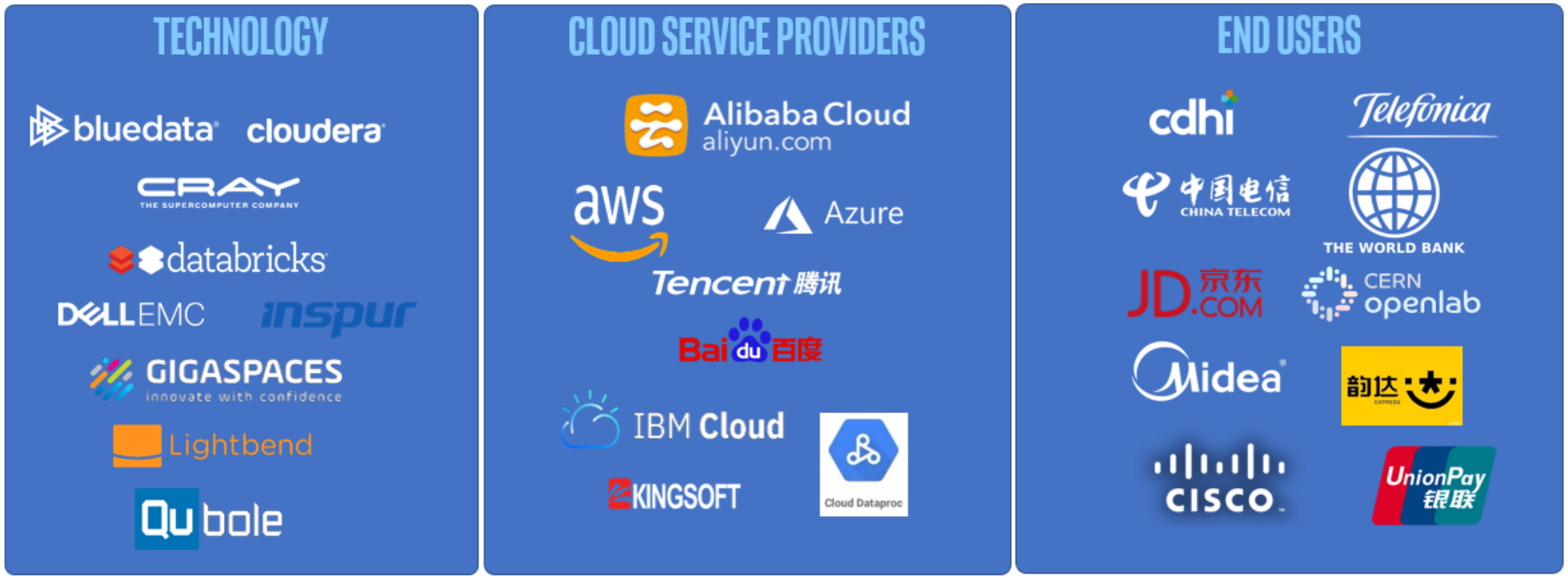
https://en.wikipedia.org/wiki/X-ray

其他跨行业的端到端客户案例实践
Other End to END Use Cases Examples

- Office Depot*：基于用户 Session 行为的产品推荐
  - https://software.intel.com/en-us/articles/real-time-product-recommendations-for-office-depot-using-apache-spark-and-analytics-zoo-on
  - https://conferences.oreilly.com/strata/strata-ca-2019/public/schedule/detail/73079
- 美的*：工业视觉检测云平台
  - https://software.intel.com/en-us/articles/industrial-inspection-platform-in-midea-and-kuka-using-distributed-tensorflow-on-analytics
  - https://www.intel.cn/content/www/cn/zh/analytics/artificial-intelligence/midea-case-study.html
- CERN*：基于深度学习的高能物理粒子事件分类
  - https://db-blog.web.cern.ch/blog/luca-canali/machine-learning-pipelines-high-energy-physics-using-apache-spark-bigdl
  - https://databricks.com/session/deep-learning-on-apache-spark-at-cerns-large-hadron-collider-with-intel-technologies

更多的案例实践
And Many More

Not a full list



software.intel.com/AIonBigData

intel Software

Thanks

BigDL

Distributed, High-Performance
Deep Learning Framework
for Apache Spark

https://github.com/intel-analytics/bigdl

ANALYTICS ZOO

Unified Analytics + AI Platform
Distributed TensorFlow, Keras, PyTorch and BigDL on Apache Spark

https://github.com/intel-analytics/analytics-zoo

Accelerating Data Analytics + AI Solutions At Scale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