Offer Recommendation System with Apache Spark at Burger King

Luyang Wang

Director of Machine Learning Engineering & Data Science, Restaurant Brands International

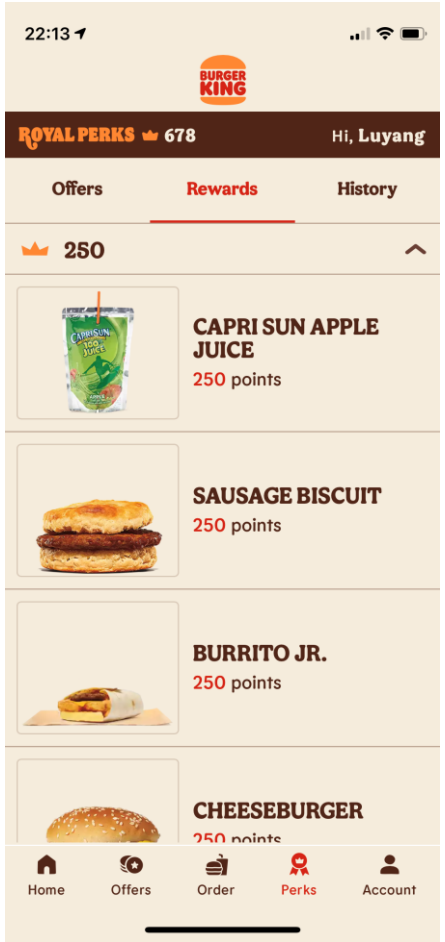
Kai Huang

Software Engineer at Intel Corporation

Agenda

- Use Case Overview
- DeepFlame Offer Recommendation System
- End-to-end offer recommendation system with Apache Spark

Offer Recommendation Use Case



- Offer is the main sales driver in QSR industry
- Different customers have different offer needs
- Different locations serving different pricing tier offers
- Some offers can be time sensitive. e.g., can only be redeemed during breakfast hours

Offer Recommendation Use Case

- 1:1 Recommendation

- Common Approaches:
  - Collaborative Filtering
  - Wide and Deep / Neural Collaborative Filtering
- Challenges:
  - Low interpretability
  - Not flexible to maximize on multiple goals
  - User embedding can be huge to manage

- Customer Segmentation

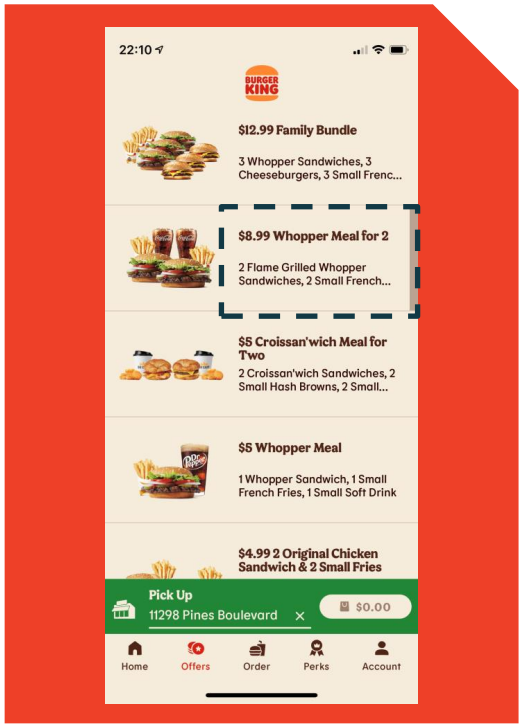
- Common Approaches:
  - RFM
  - K-Means / K-Mode / DBSCAN
- Challenges:
  - Segmentations won't tell marketers directly what offers to assign to each customer segmentation

New Offer Recommendation System Goals

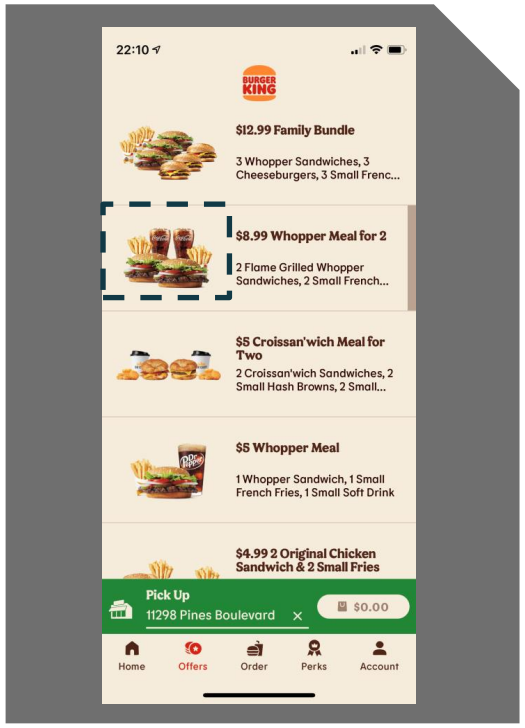
- An interpretable recommendation system
- A system that can consistently track customer's movement across different segments
- Marketers can leverage this system to maximize on different goals to different customers
- Fast deployment, easy to maintain

Burger King's Offer Recommendation System: DeepFlame

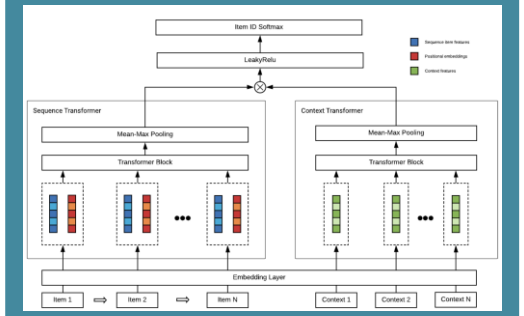
- BERT



- ResNET50



- TxT*



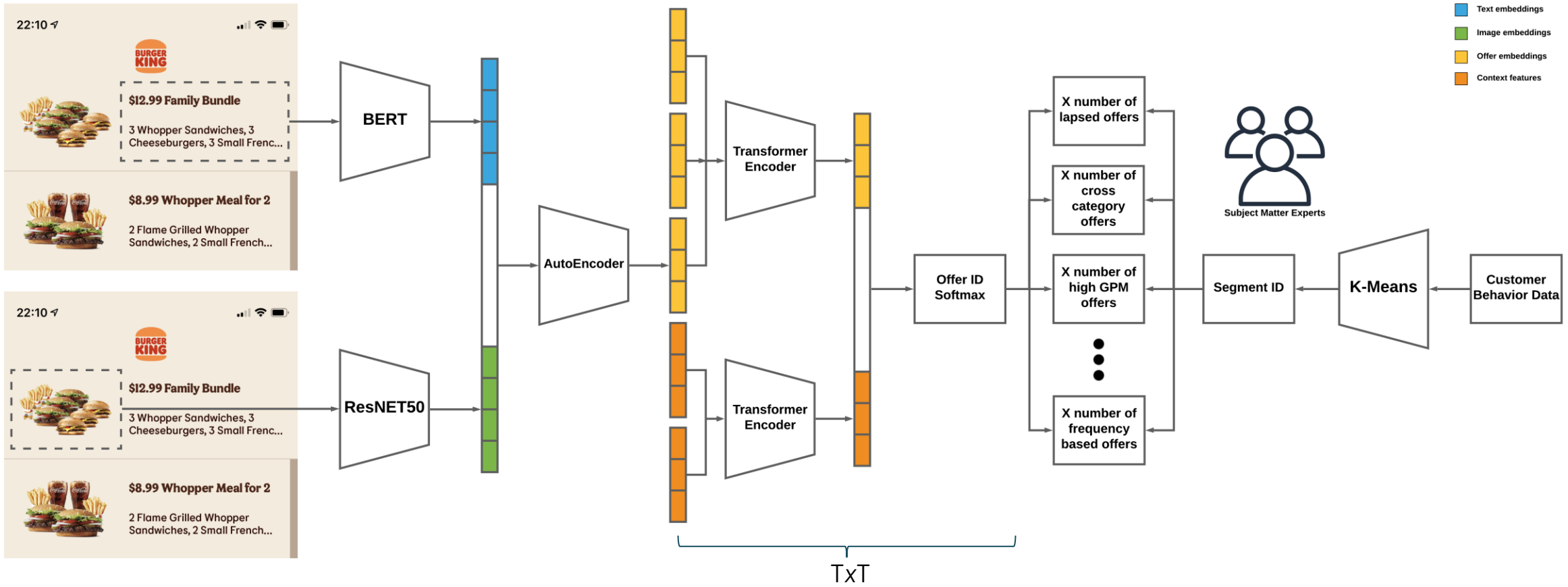
- K-Means

  - K-Means Clustering based on customer's behavior data such as average spend, primary service channel, average ticket GPM, and visit frequency, etc.

*https://arxiv.org/abs/2010.06197
https://github.com/intel-analytics/analytics-zoo/blob/master/pyzoo/zoo/models/recommendation/txt.py

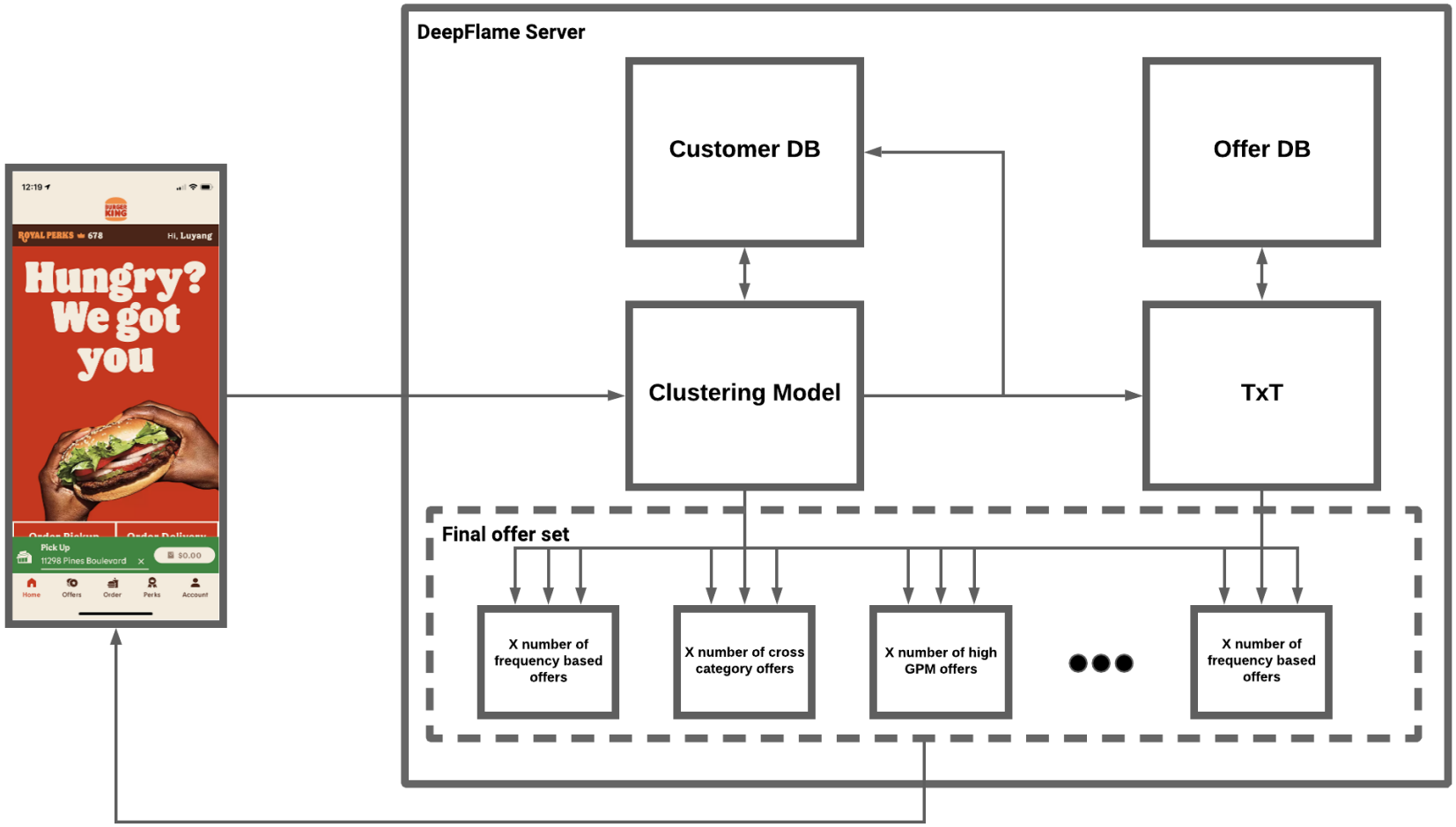
DeepFlame Overview – Model Training

A hybrid approach that allows SME to easily maintain and modify offer rules based on segmentations while still allowing DL models to automatically pick the best offers according to preset offer rules.



DeepFlame Overview – Model Inference

A hybrid approach that allows SME to easily maintain and modify offer rules based on segmentations while still allowing DL models to automatically pick the best offers according to preset offer rules.



Key Advantages of DeepFlame

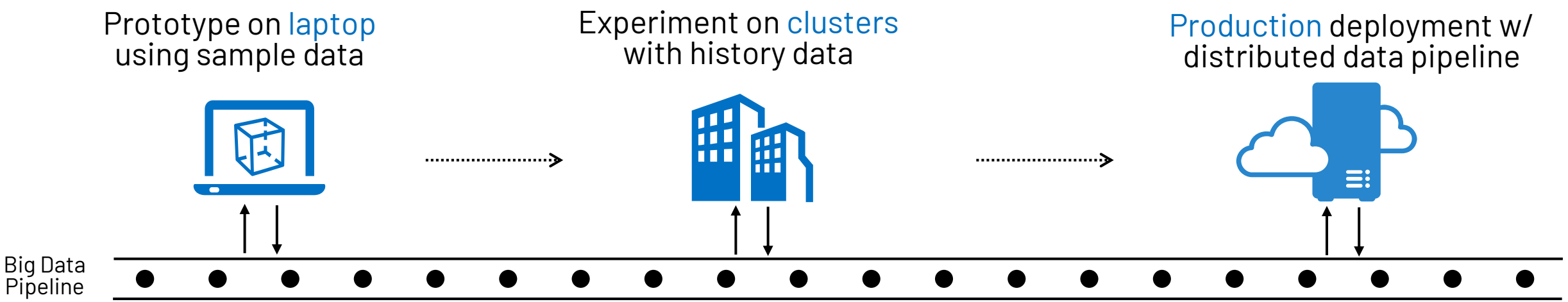
Goals

- An interpretable recommendation system
- A system can consistently tracks customer's movement across different segments
- Marketers can leverage this system to maximize on different goals for different customer segments
- Fast deployment, easy to maintain

DeepFlame Solutions

- The embedded customer segmentation can be used to explain the logic behind offer assignments
- Behavior segmentation only uses behavior level feature which won't be affected by offer or user pool changes
- Offer rules are generated based on segmentations and the DL recommender picks the best offers under the rules
- Unified pipeline built on a single Xeon cluster using Apache Spark and Analytics Zoo

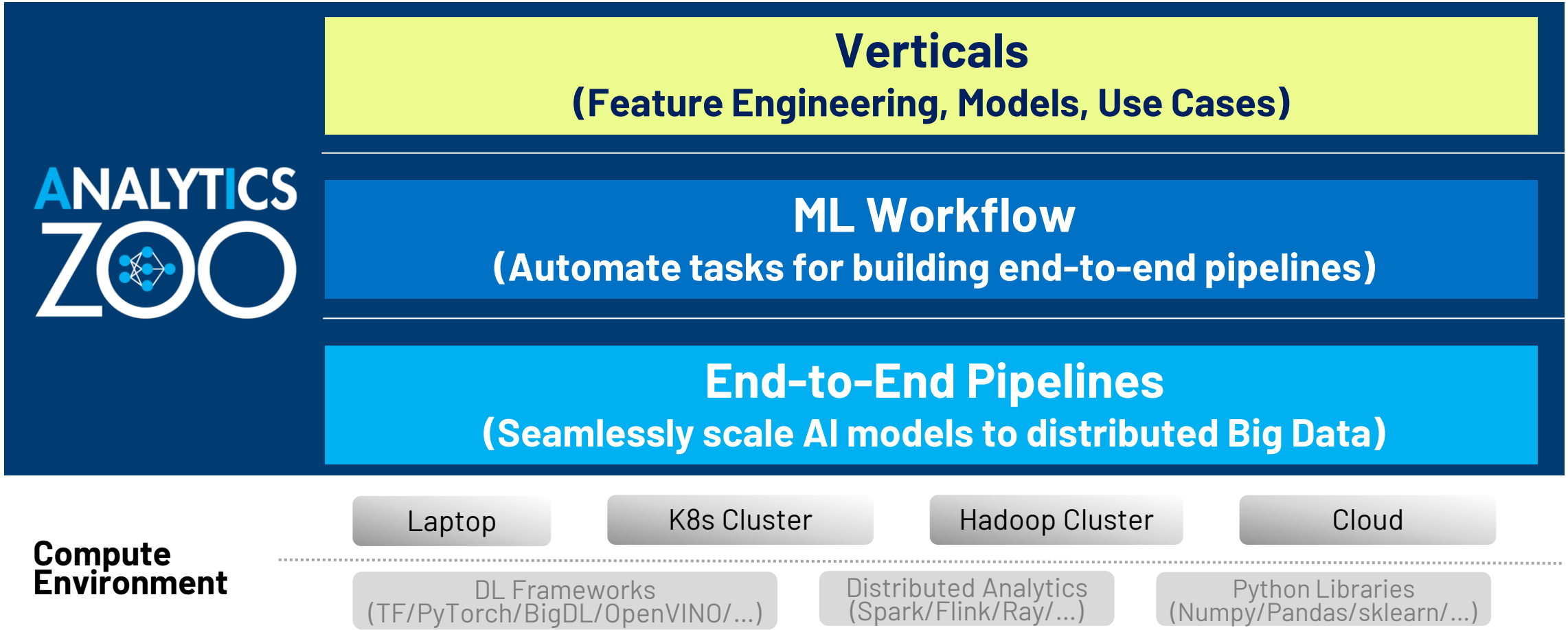
End-to-End Recommendation System on Big Data



It would be beneficial to have a unified recommendation solution that:

- Supports easily prototype end-to-end recommendation pipelines which can apply AI models to big data
- Needs "Zero" code change from laptop to a distributed environment
- Can be seamlessly deployed on production Hadoop/K8s clusters

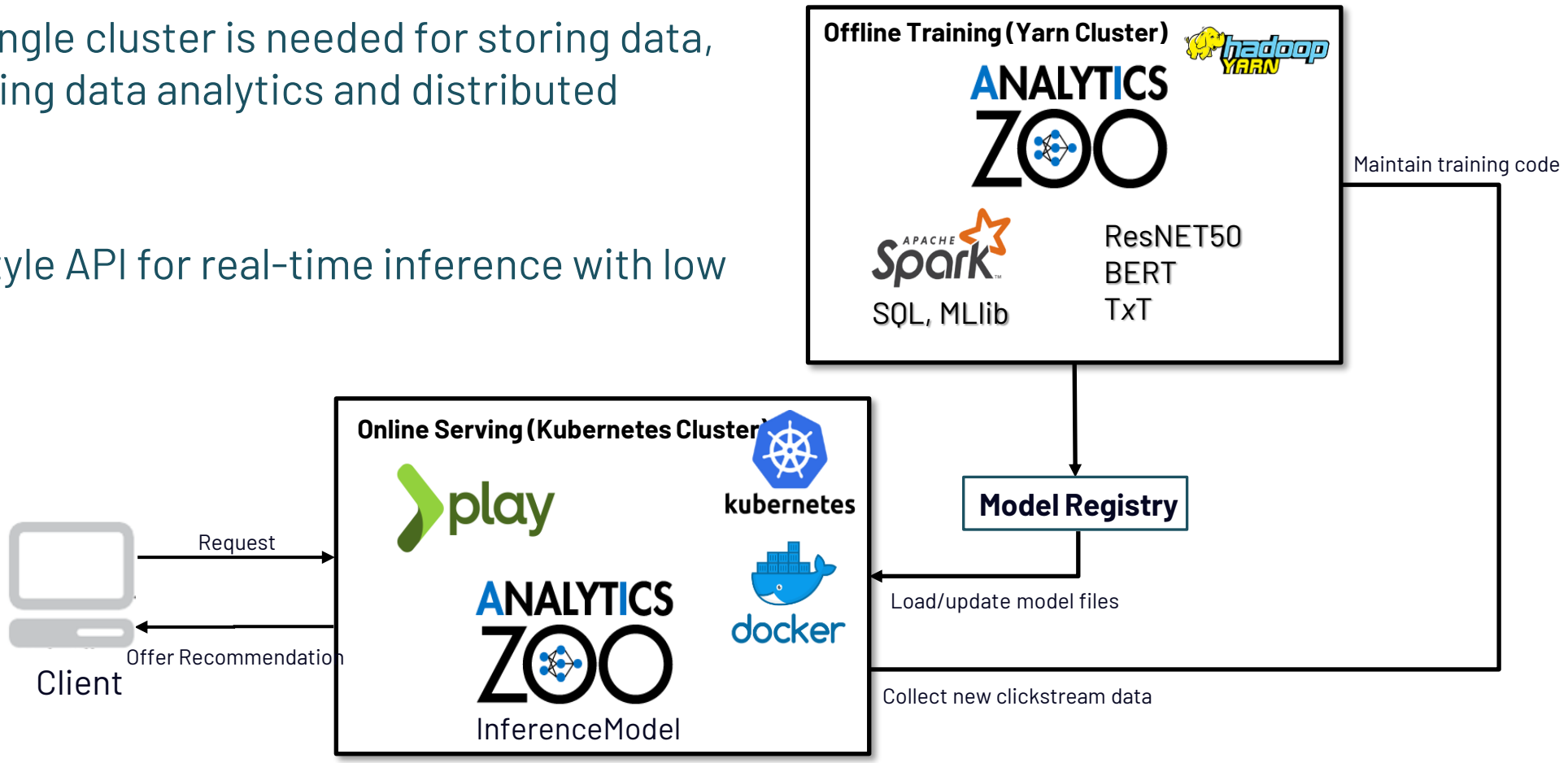
Analytics Zoo: Software Platform for Big Data AI



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

Offer Recommendation System In Production

- Only a single cluster is needed for storing data, performing data analytics and distributed training.
- POJO-style API for real-time inference with low latency.



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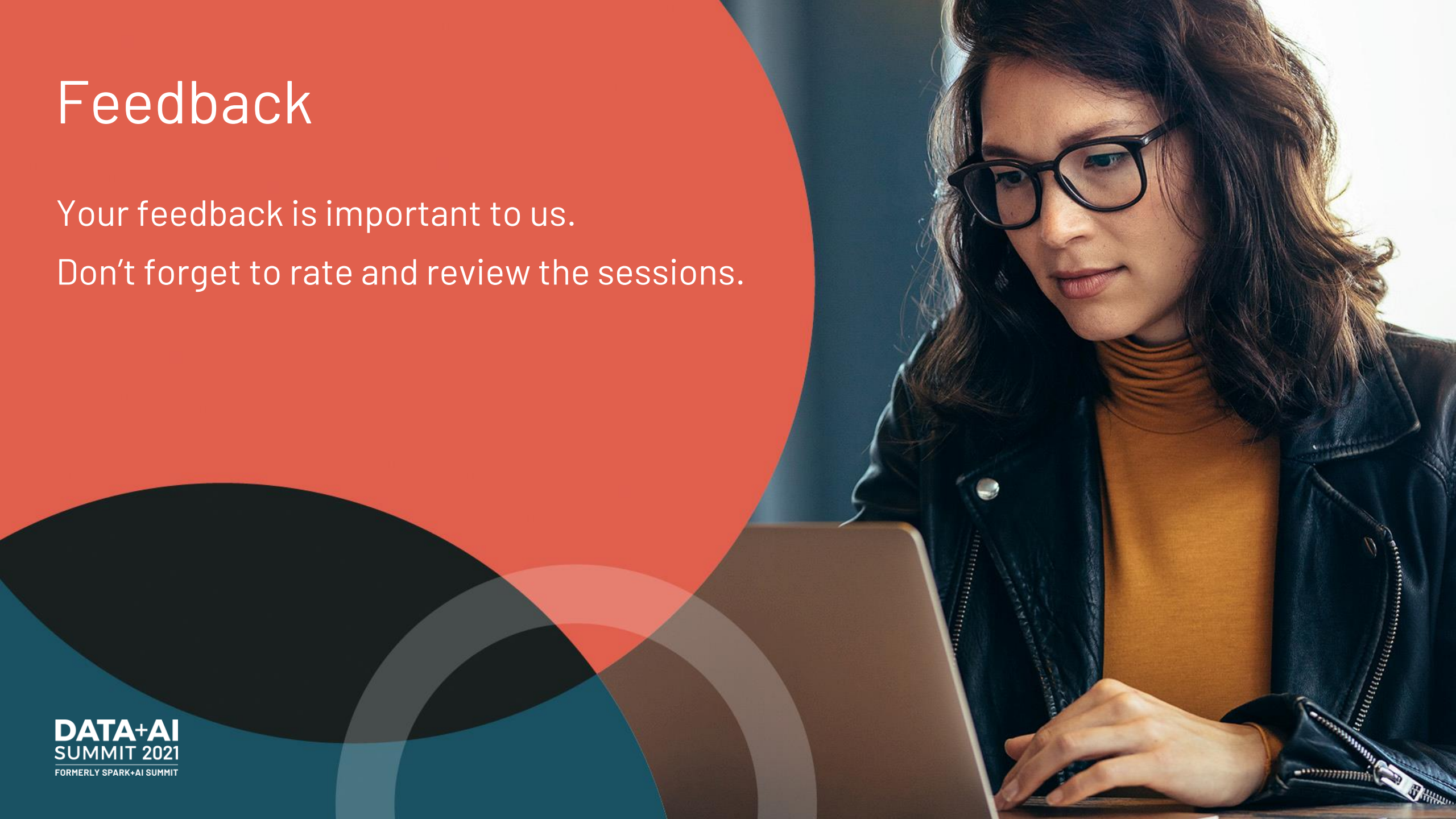

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