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Sparkling Water 2.0: The next generation of machine learning on Apache Spark

Spark Summit Europe, Brussels
October 26, 2016

Who am I

- Finishing high-performance cluster monitoring tool for JVM based languages (instrumentation, JNI, JVMTI)
- Finishing Master’s at Charles Uni in Prague
- Core engineer in Sparkling Water team in H2O.ai
- Tea lover (doesn’t mean I don’t like beer!)

Distributed Sparkling Team

- Michal - Mt. View, CA
- Kuba - Prague, CZ
- Mateusz – Tokyo, JP
- Vlad - Mt. View, CA

H2O.ai

- Open Source AI Platform
- H2O, Steam, Sparkling Water, DeepWater
- Core algorithms written in high-perf Java
- Bindings for R/Python/Java/Scala/REST API
- Tries to make AI simple

H2O+Spark = Sparkling Water

H_2O.ai

Machine Intelligence

Sparkling Water

- Transparent integration of H2O with Spark ecosystem - MLlib and H2O side-by-side
- Transparent use of H2O data structures and algorithms with Spark API
- Platform for building Smarter Applications
- Excels in existing Spark workflows requiring advanced Machine Learning algorithms

Functionality missing in H2O can be replaced by Spark and vice versa

Benefits

- **Additional algorithms**
  - **NLP**
- **Powerful data munging**
- **ML Pipelines**

- **Advanced algorithms**
- **Speed v. accuracy**
- **Advanced parameters**
- **Fully distributed and parallelised**
- **Graphical environment**
- **R/Python interface**

How to use Sparkling Water?

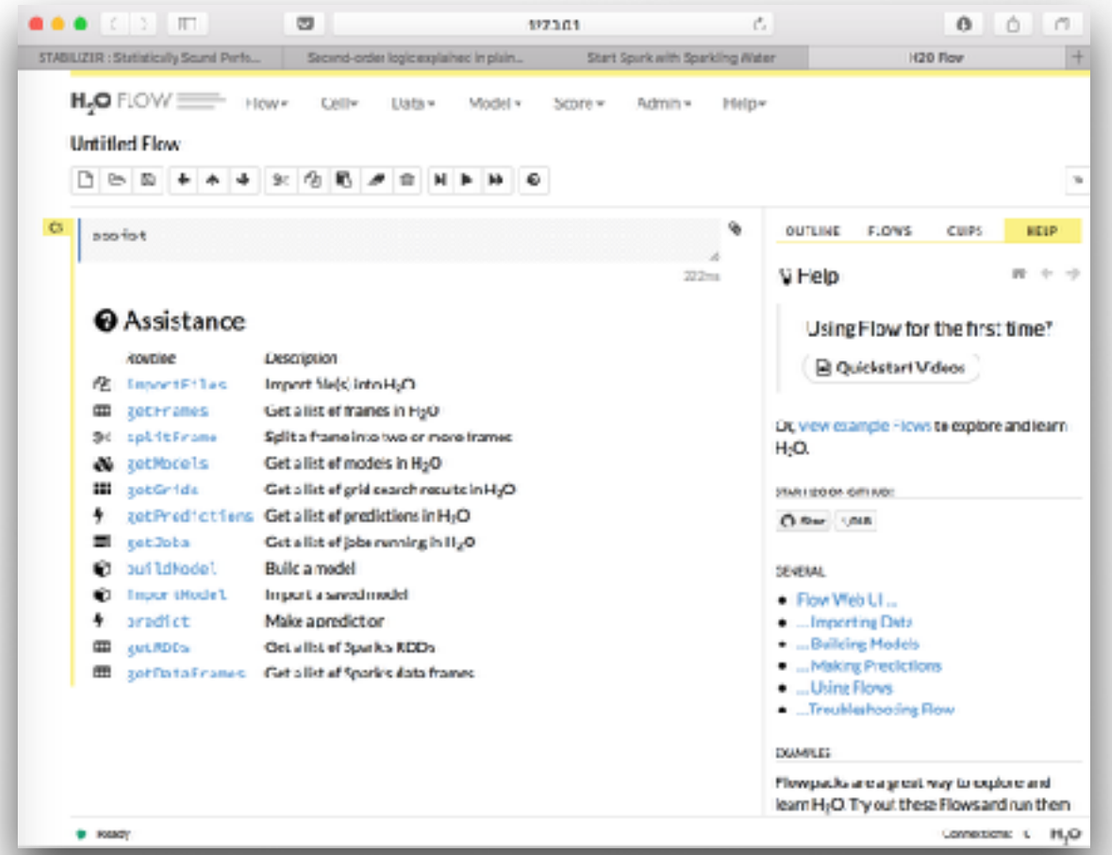
H_2O.ai

Machine Intelligence

Start spark with Sparkling Water

start.sh — Raw

```
$SPARK_HOME/bin/spark-submit \
--class water.SparklingWaterDriver \
--packages ai.h2o:sparkling-water-examples_2.10:1.6.3 \
--executor-memory=6g \
--driver-class-path scalastyle.jar /dev/null
```

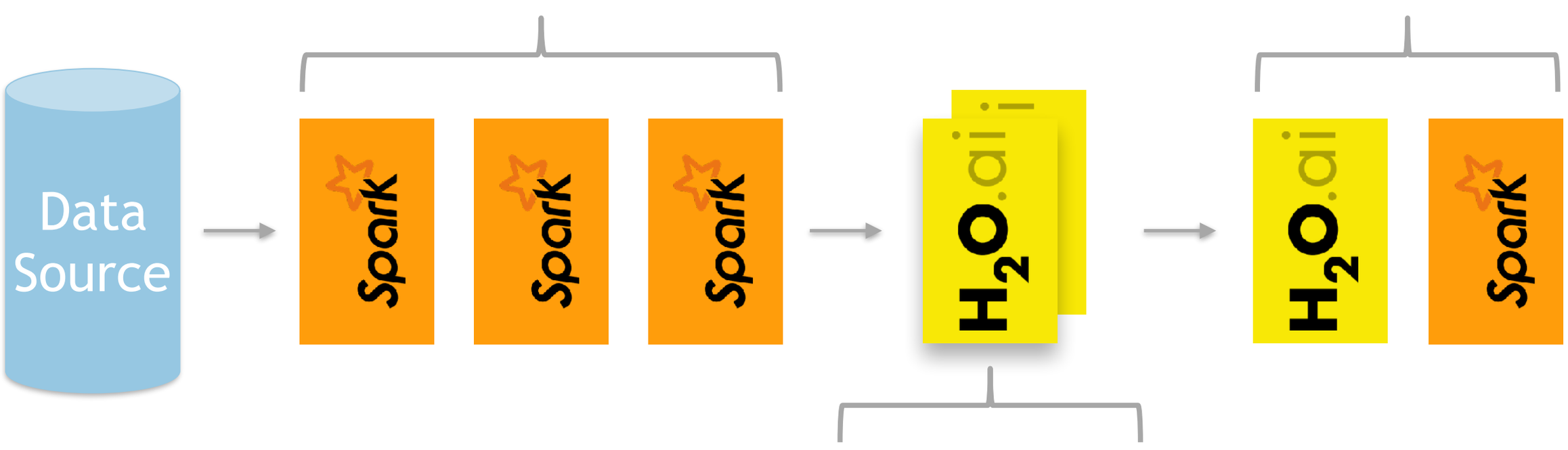


Model Building

Data munging

Modelling

Prediction processing

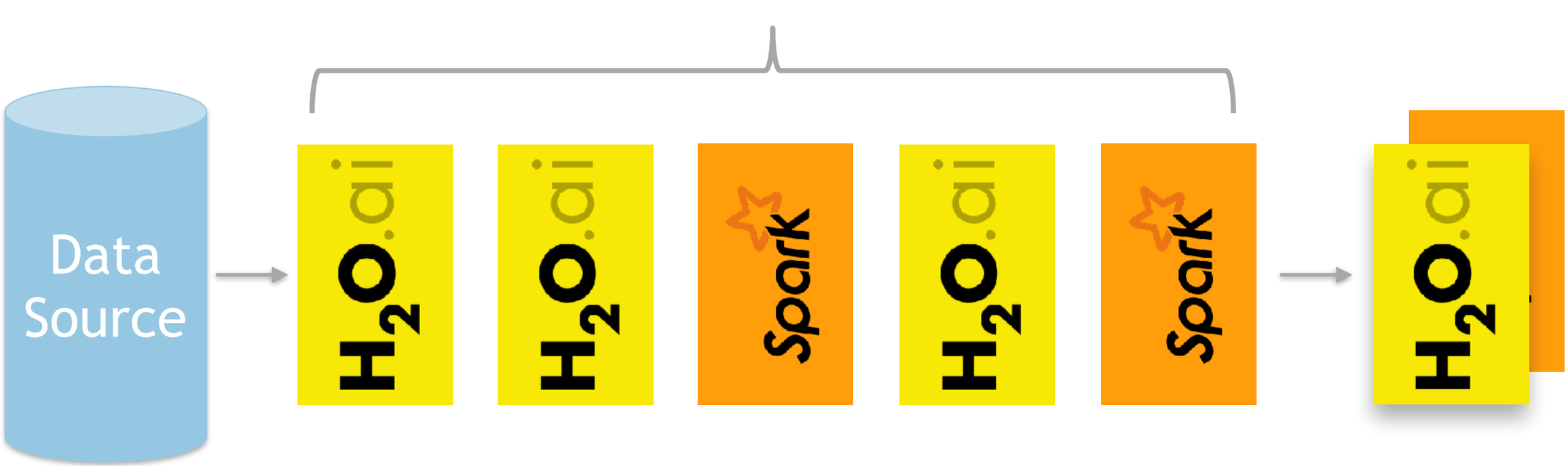


Deep Learning, GBM
DRF, GLM, GLRM
K-Means, PCA
CoxPH, Ensembles

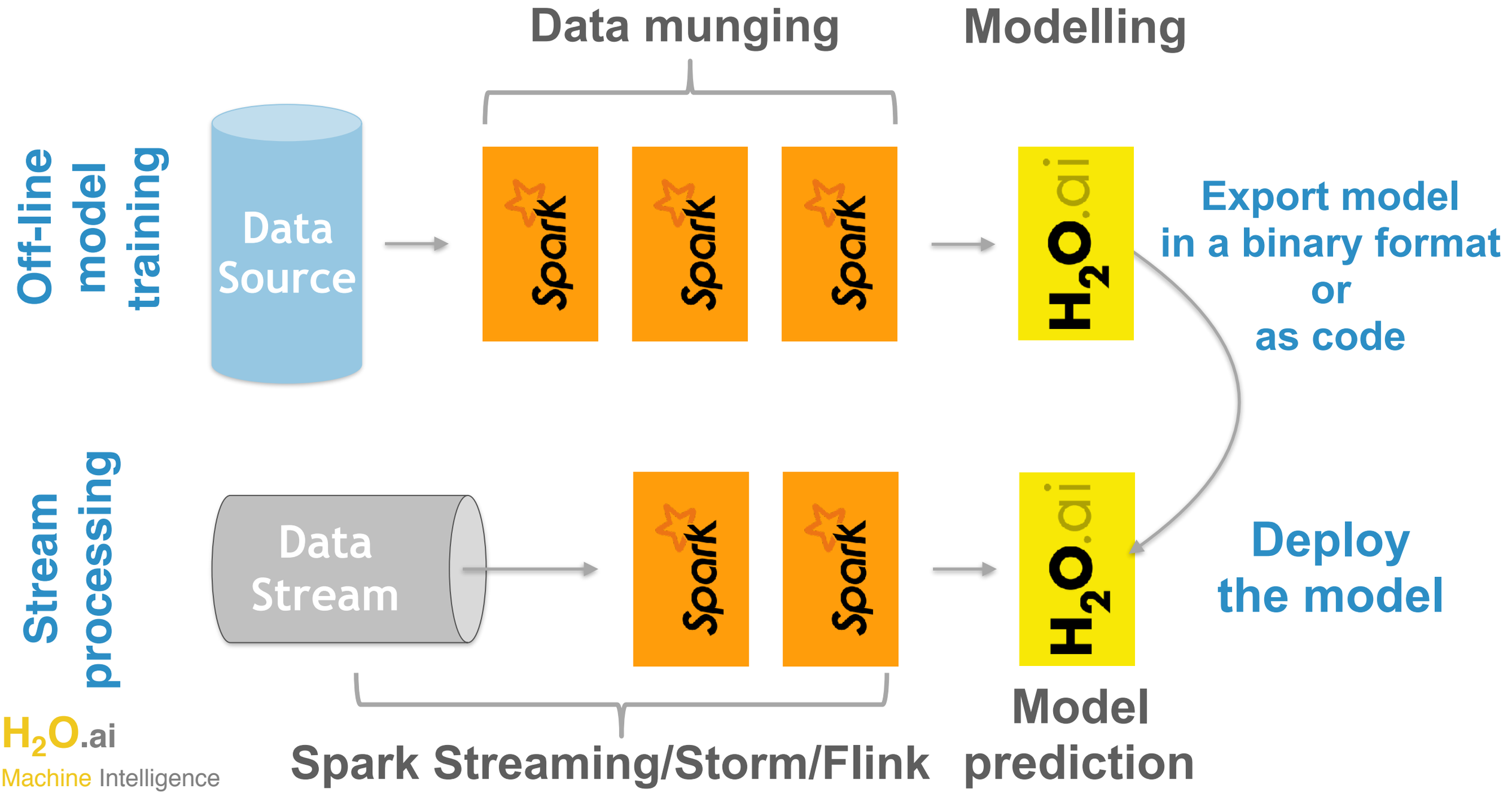
Data Munging

Data load/munging/ exploration

Modelling



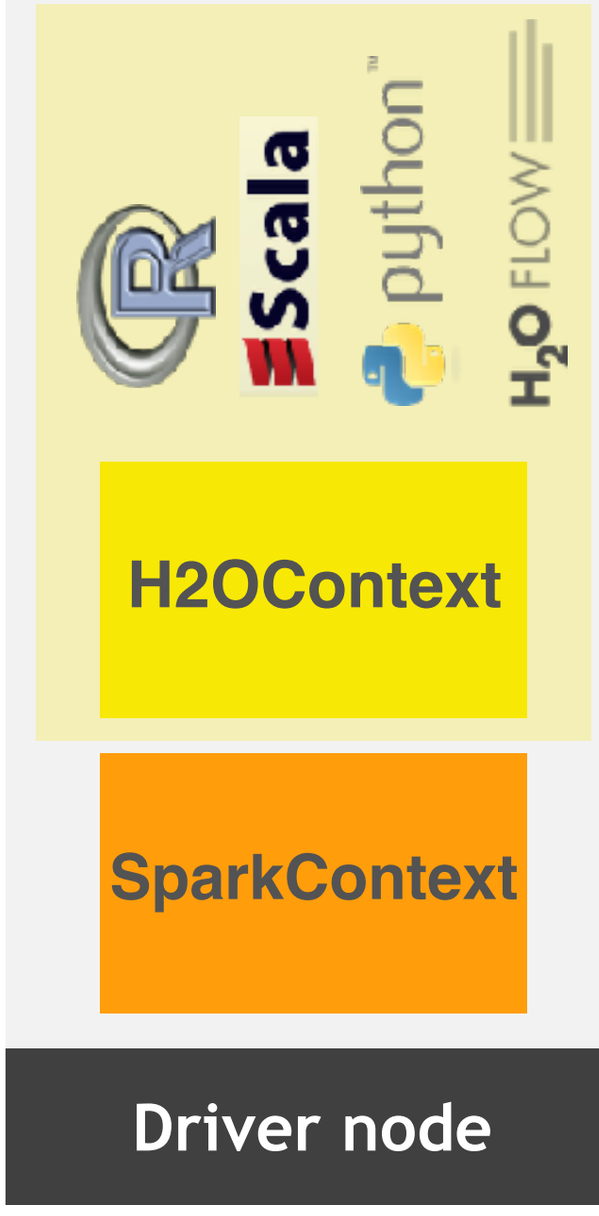
Stream processing



H2O.ai
Machine Intelligence

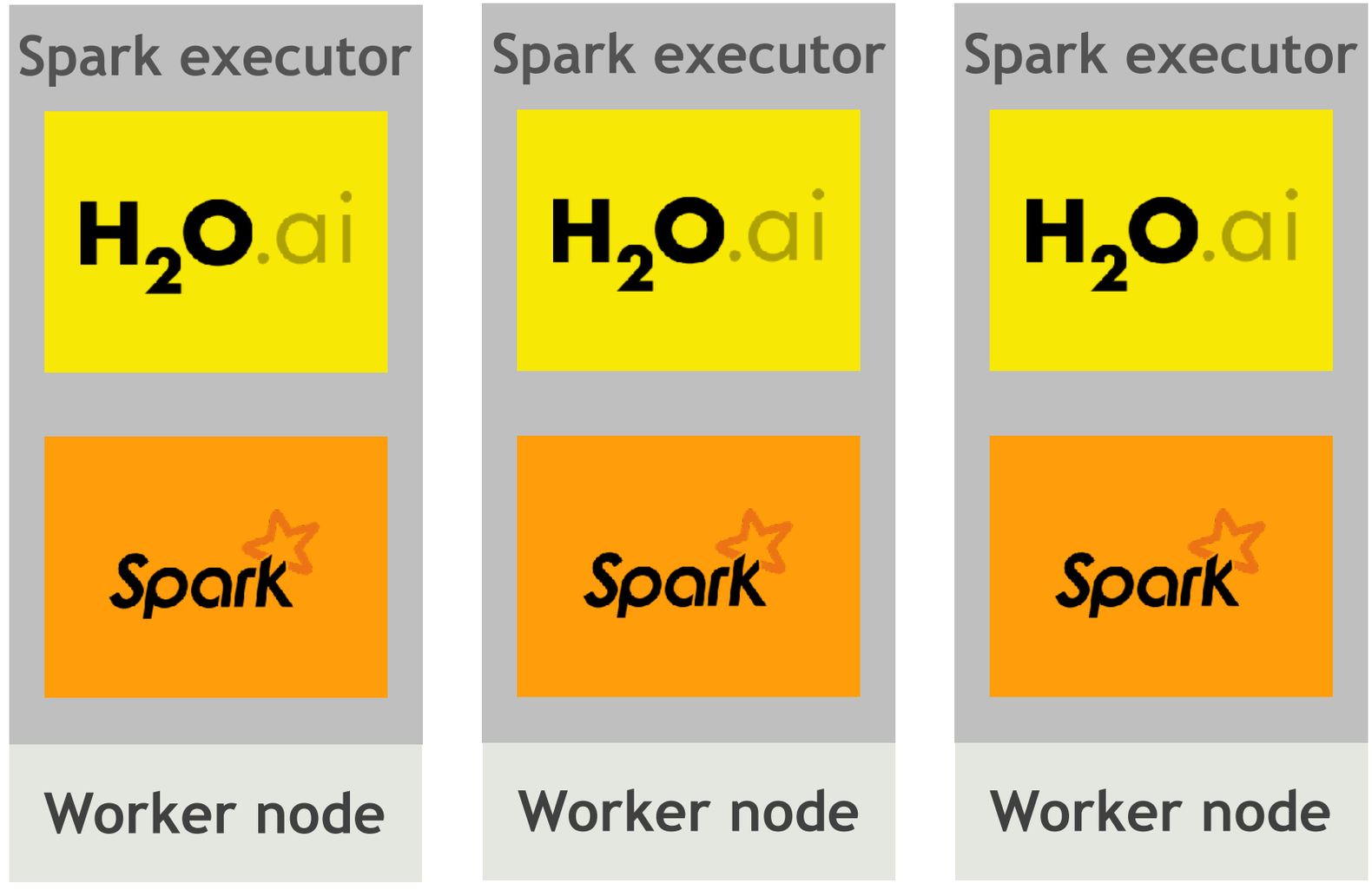
What is inside?

Scala/Py main program

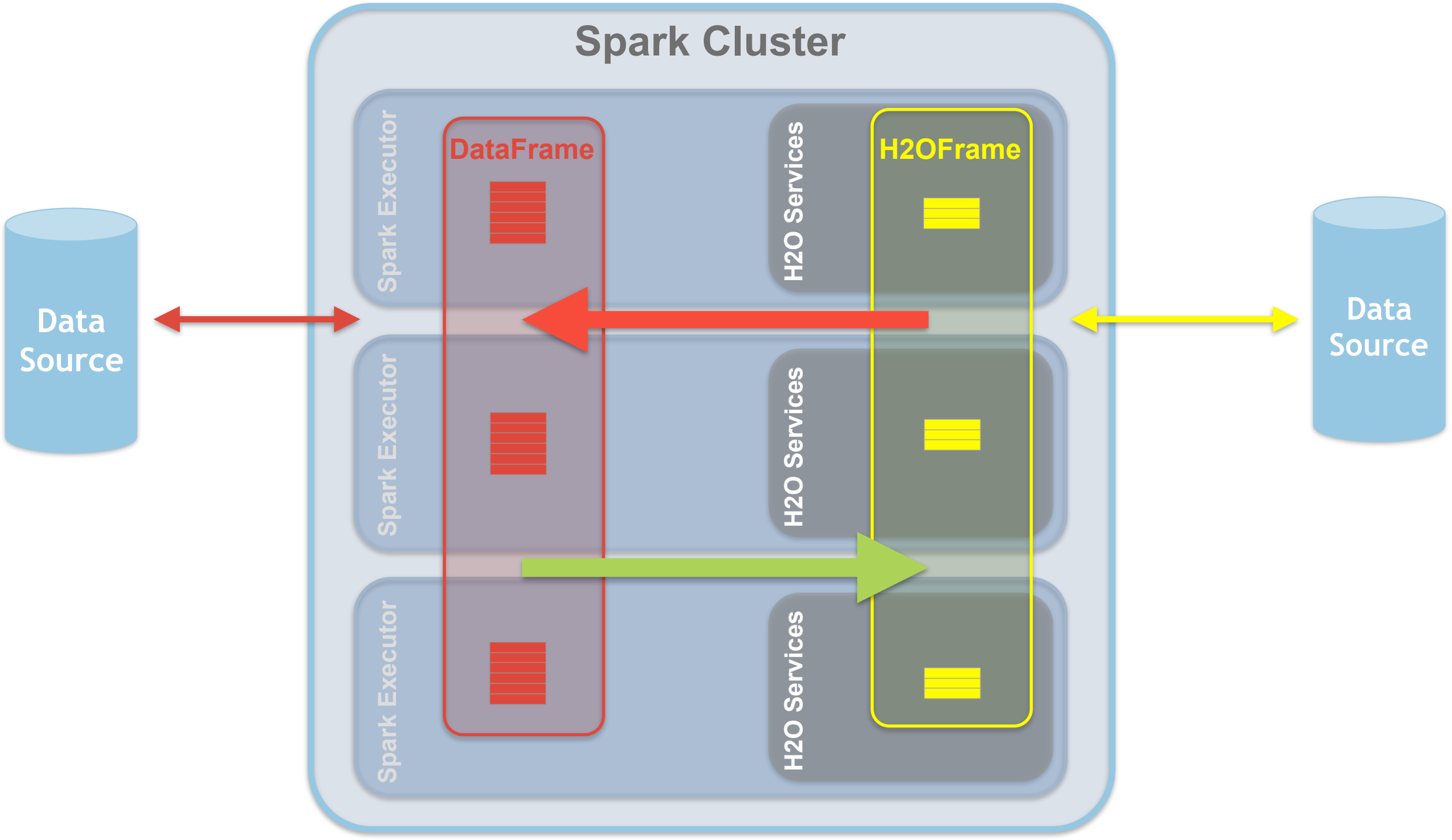


Spark + H2O

SPARKLING WATER



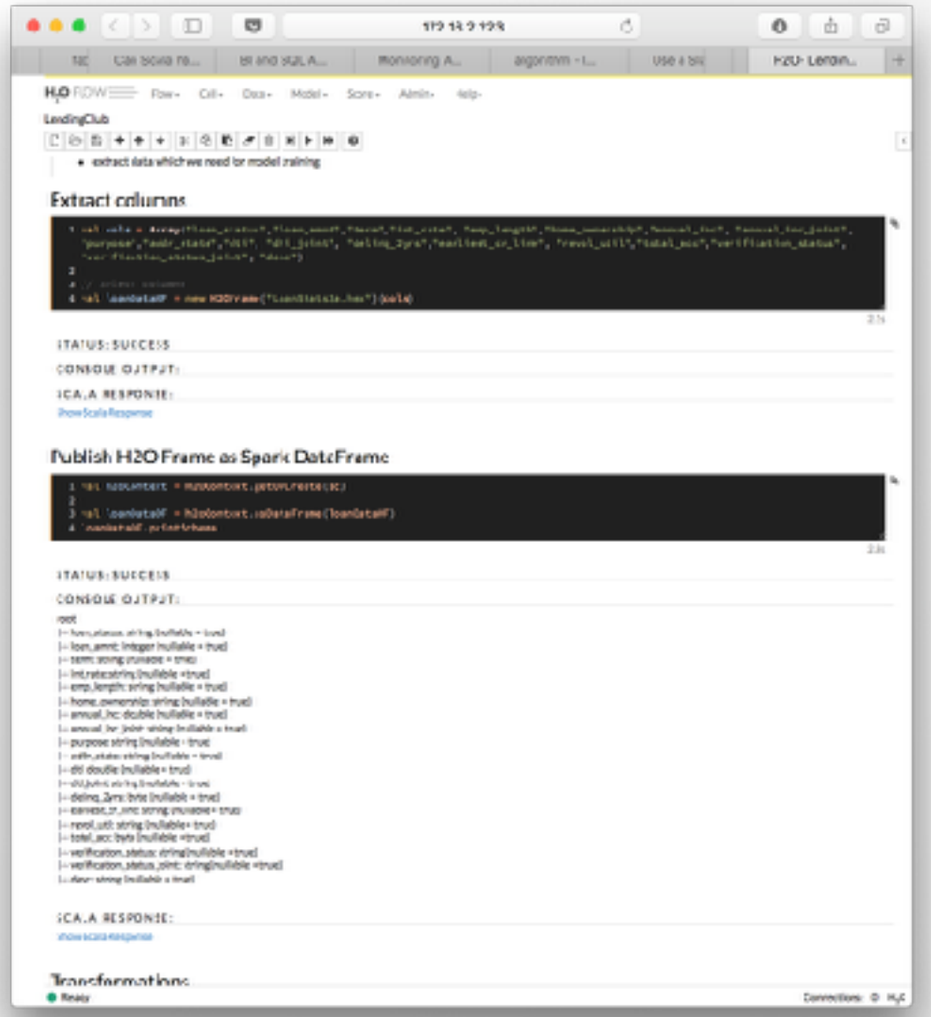
Cluster


Spark Cluster
Spark Executor
DataFrame
H2O Services
H2OFrame
Spark Executor
H2O Services
Spark Executor
H2O Services
Data Source
Data Source
h2oContext.asDataFrame
h2oContext.asH2OFrame

New features, finally!

Scala code in H2O Flow

- New type of cell
- Access Spark from Flow UI
- Experimenting made easy



H2O Frame as Spark's Datasource

- Use native Spark API to load and save data
- Spark can optimise the queries when loading data from H2O Frame
- Use of Spark query optimiser

Machine learning pipelines

- Wrap our algorithms as Transformers and Estimators
- Support for embedding them into Spark ML Pipelines
- Can serialise fitted/unfitted pipelines
- Unified API => Arguments are set in the same way for Spark and H2O Models

MLlib Algorithms in Flow UI

- Can examine them in H2O Flow
- Can generate POJO out of them
- For example: Support Vector Machines (SVM)

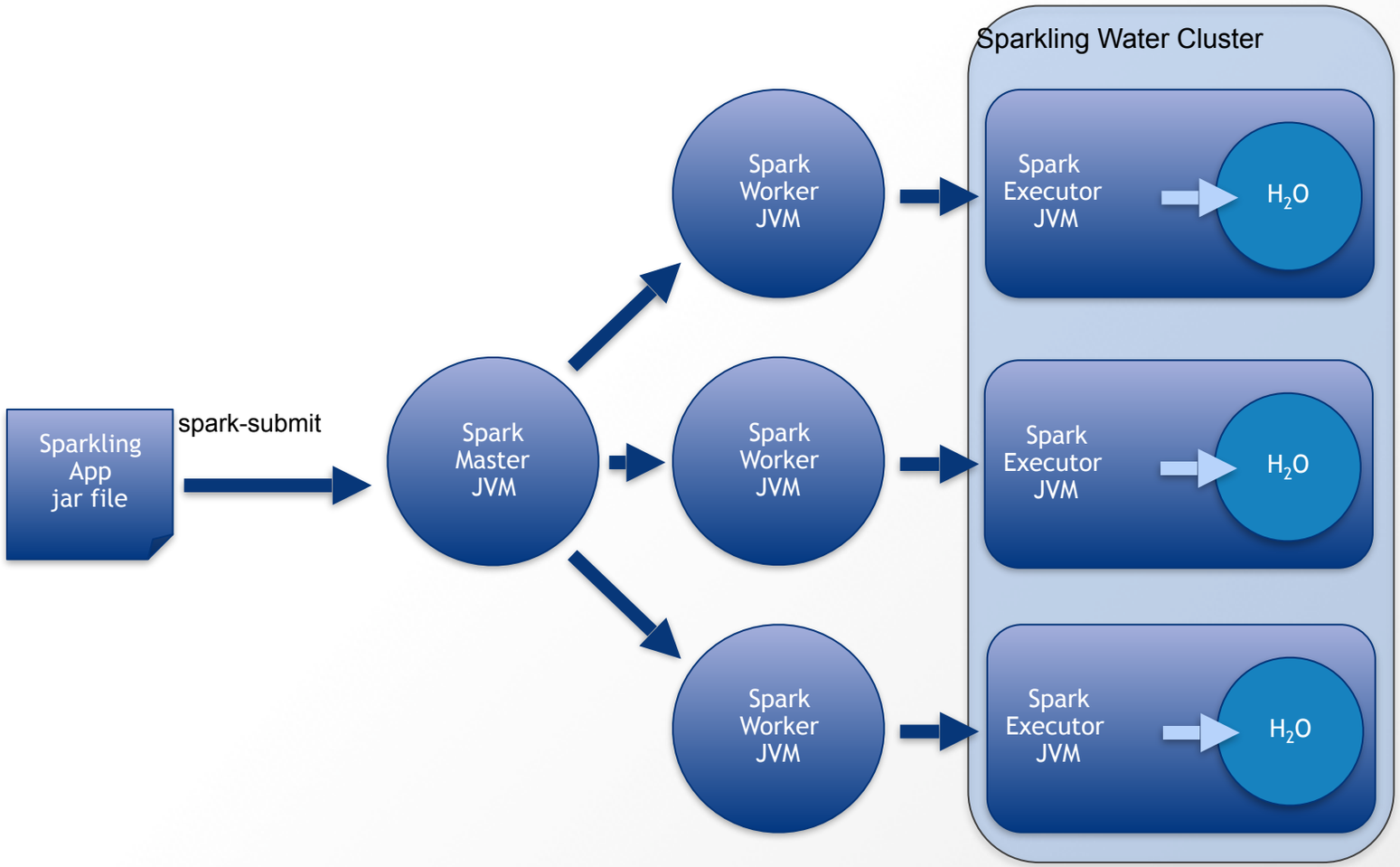
PySparkling made easy

- PySparkling now in PyPi
- Contains all H2O and Sparkling Water dependencies, no need to worry about them
- Just add in on your Python path and that's it

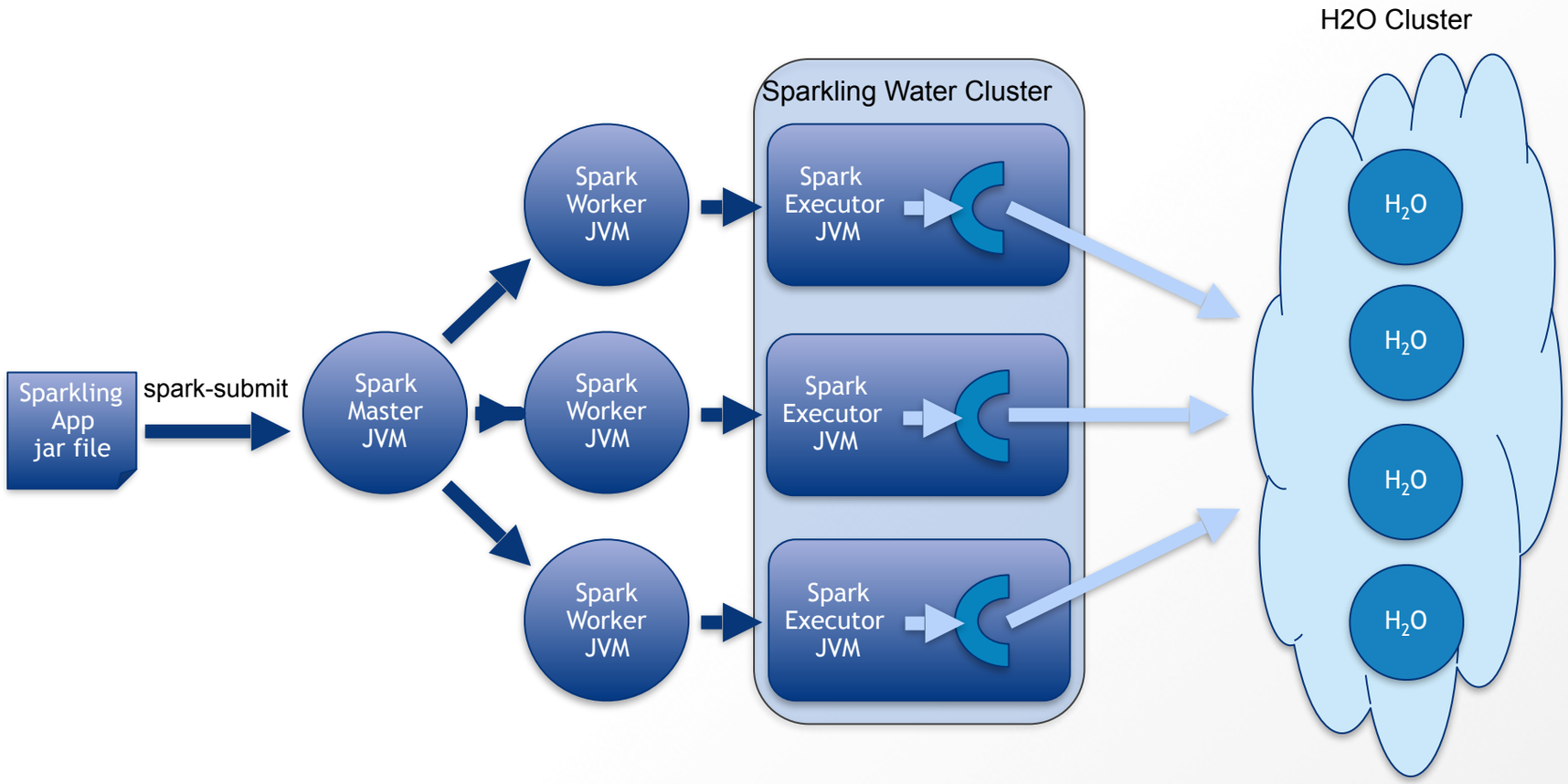
Sparkling Water high-availability

- New solution
- About to be integrated soon
- Sparkling Water is using external H2O cluster instead of starting H2O in each executor
- Spark executors can come and go and H2O won't be affected

Sparkling Water Internal Backend



Sparkling Water External Backend



And others!

- Support for Datasets
- RSparkling (Sparkling Water for R)
- Zeppelin notebook support
- Integration with TensorFlow, MXNet, Caffe (H2O DeepWater)
- Support for high cardinality (billions) joins
- A Lots of bug fixes..

Coming features

- Support for more MLlib algorithms in Flow
- Python cell in the H2O Flow
- Secure Communication - SSL
- Integration with H2O Steam
- …

More info

Checkout H2O.ai Training Books

http://h2o.ai/resources

Checkout H2O.ai Blog

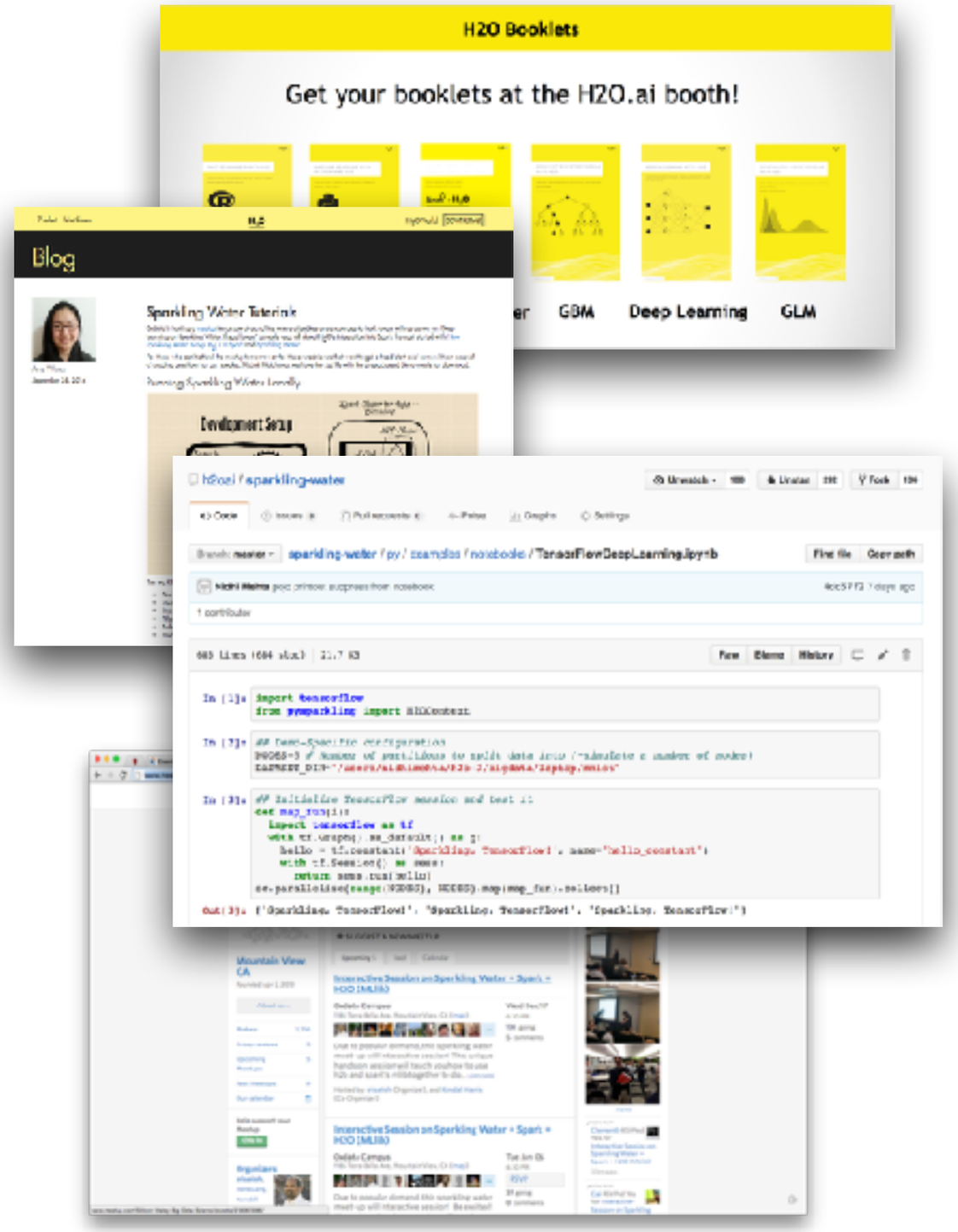
http://h2o.ai/blog/

Checkout H2O.ai Youtube Channel

https://www.youtube.com/user/0xdata

Checkout GitHub

https://github.com/h2oai/sparkling-water



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Thank you!

Sparkling Water is open-source ML application platform combining power of Spark and H2O

Learn more at h2o.ai
Follow us at @h2oai
Write me at jakub@h2o.ai