INNOVATE

ONLINE CONFERENCE

MACHINE LEARNING
AND AI EDITION

aws | intel

INNOVATE
ONLINE CONFERENCE | MACHINE LEARNING AND AI EDITION

aws | intel

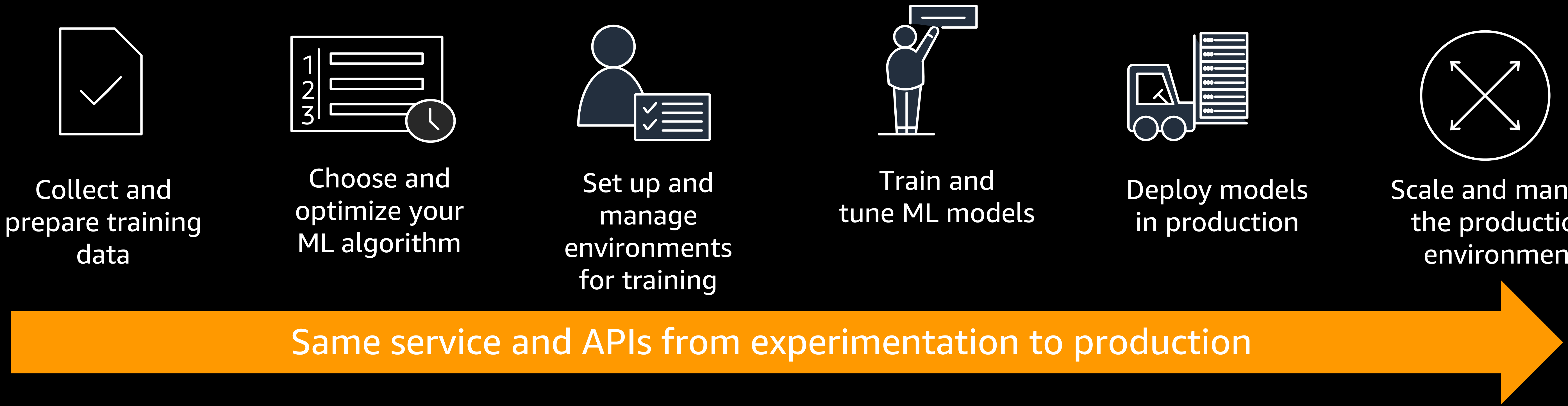
Build, train, and deploy machine learning models with Amazon SageMaker

Julien Simon
Global Evangelist, AI & Machine Learning
Amazon Web Services

@julsimon

https://medium.com/@julsimon

Amazon SageMaker



Collect and prepare training data

Choose and optimize your ML algorithm

Set up and manage environments for training

Train and tune ML models

Deploy models in production

Scale and manage the production environment

Same service and APIs from experimentation to production

intuit

NFL

tinder

KIA

Liberty Mutual

CONVOY

SIEMENS

DOW JONES

Celgene

SONY

GE Healthcare

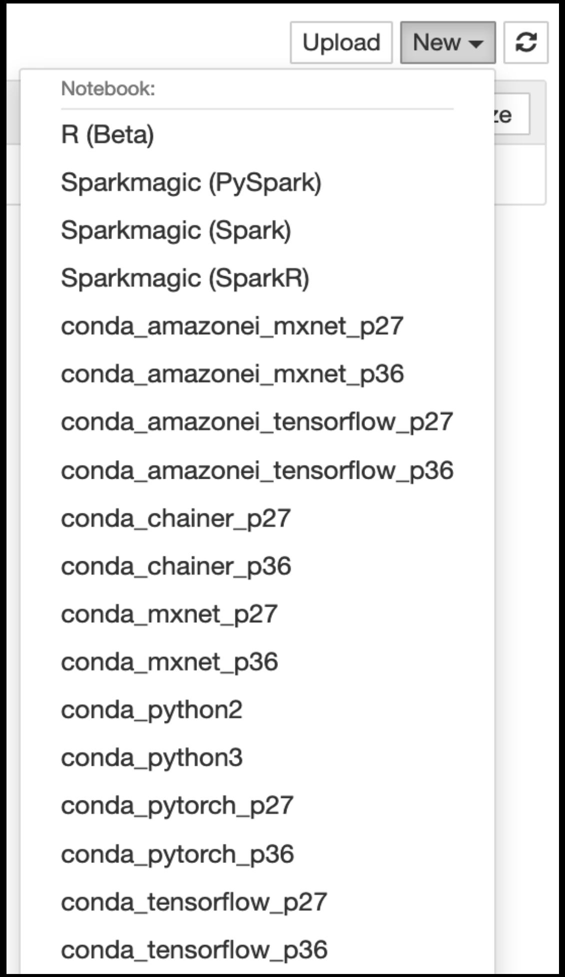
Building models

INNOVATE
ONLINE CONFERENCE

MACHINE LEARNING
AND AI EDITION

Notebook instances

- Fully managed instances, from *ml.t2.medium* to *p3.16xlarge*
- Pre-installed with Jupyter and Conda environments
  - Python 2.7 & 3.6
  - Open-source libraries (TensorFlow, Apache MXNet, etc.)
  - Beta support for R – NEW!
  - Amazon Elastic Inference for cost-effective GPU acceleration
- Lifecycle configurations
- VPC, encryption, etc.
- Get to work in minutes, zero setup



Demo: Simple R notebook

https://github.com/awslabs/amazon-sagemaker-examples/blob/master/advanced_functionality/r_kernel/example_r_notebook.ipynb

Using Amazon SageMaker APIs from R: https://github.com/awslabs/amazon-sagemaker-examples/blob/master/advanced_functionality/r_kernel/using_r_with_amazon_sagemaker.ipynb

Model options

Training code

Factorization Machines
Linear Learner
Principal Component Analysis
K-Means Clustering
XGBoost
And more

Built-in Algorithms (17)

No ML coding required
No infrastructure work required
Distributed training
Pipe mode

Chainer
TensorFlow
PyTorch
scikit learn
dmlc XGBoost
NEW!

Built-in Frameworks

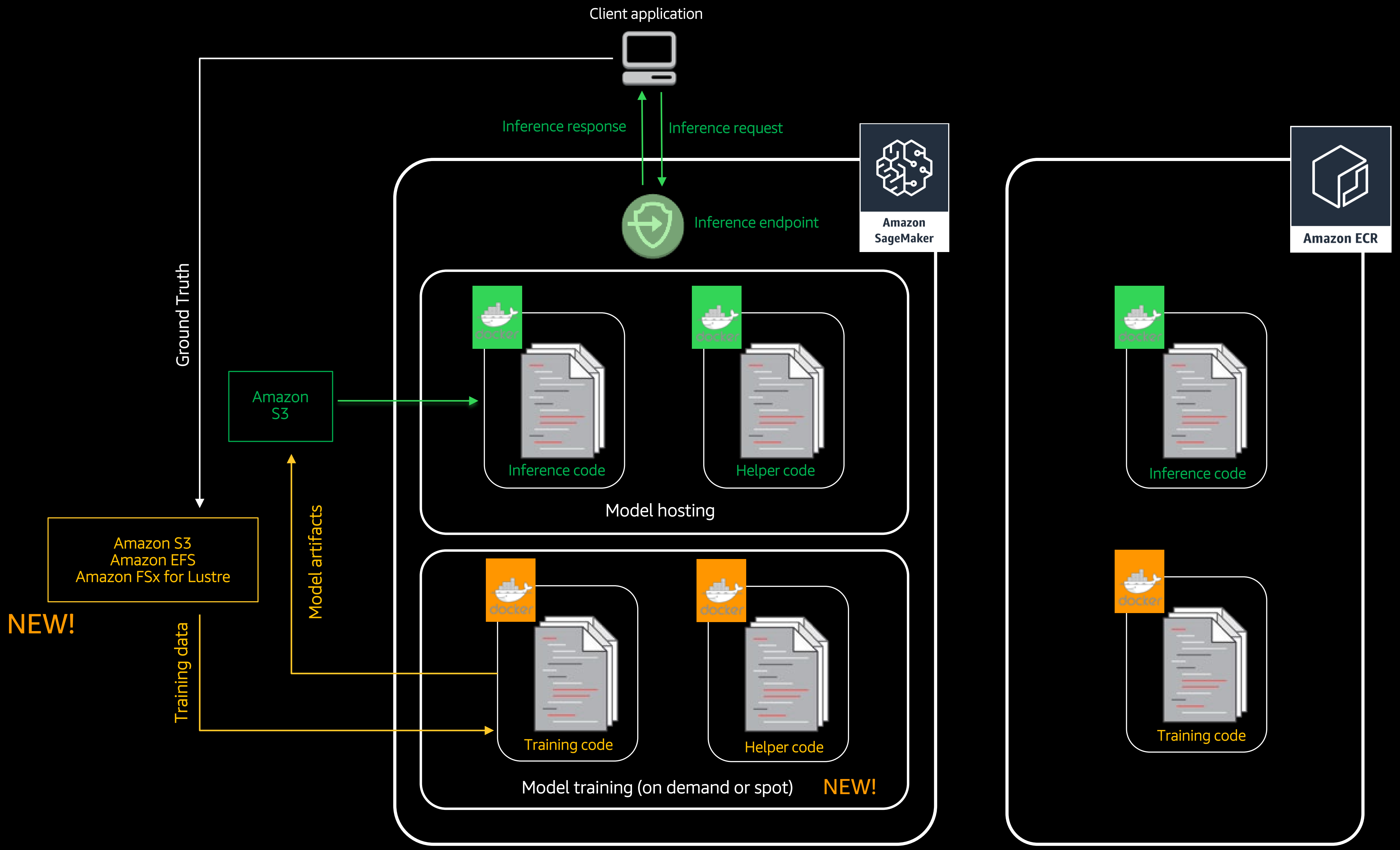
Bring your own code: Script mode
Open-source containers
No infrastructure work required
Distributed training
Pipe mode

Bring Your Own Container

Full control, run anything!
R, C++, etc.
No infrastructure work required

The Amazon SageMaker API

- Python SDK orchestrating all Amazon SageMaker activity
  - High-level objects for algorithm selection, training, deploying, automatic model tuning, etc. https://github.com/aws/sagemaker-python-sdk
  - Spark SDK (Python & Scala)
    https://github.com/aws/sagemaker-spark/tree/master/sagemaker-spark-sdk
- AWS SDK
  - Service-level APIs for scripting and automation
  - CLI: '*aws sagemaker*'
  - Language SDKs: boto3, etc.


Client application
Inference response
Inference request
Amazon SageMaker
Inference endpoint
Amazon ECR
Ground Truth
Amazon S3
Inference code
Helper code
Inference code
Model hosting
Amazon S3
Amazon EFS
Amazon FSx for Lustre
NEW!
Model artifacts
Training data
Training code
Helper code
Training code
Model training (on demand or spot)
NEW!

Built-in algorithms

INNOVATE
ONLINE CONFERENCE

MACHINE LEARNING
AND AI EDITION

Built-in algorithms

Orange: supervised; Yellow: unsupervised

Linear Learner: Regression, classification	**Image Classification**: Deep learning (ResNet)
Factorization Machines: Regression, classification, recommendation	**Object Detection (SSD)**: Deep learning (VGG or ResNet)
K-Nearest Neighbors: Non-parametric regression and classification	**Neural Topic Model**: Topic modeling
XGBoost: Regression, classification, ranking https://github.com/dmlc/xgboost	**Latent Dirichlet Allocation**: Topic modeling (mostly)
K-Means: Clustering	**BlazingText**: GPU-based Word2Vec, and text classification
Principal Component Analysis: Dimensionality reduction	**Sequence to Sequence**: Machine translation, speech to text and more
Random Cut Forest: Anomaly detection	**DeepAR**: Time-series forecasting (RNN)
Object2Vec: General-purpose embedding	**IP Insights**: Usage patterns for IP addresses
Semantic Segmentation: Deep learning	

Demo: Sentence classification with BlazingText

https://github.com/awslabs/amazon-sagemaker-examples/tree/master/introduction_to_amazon_algorithms/blazingtext_text_classification_dbpedia

Demo: Built-in image classification with transfer learning

https://gitlab.com/juliensimon/dlnotebooks/blob/master/sagemaker/06-Image-classification-deeplens.ipynb

INNOVATE
ONLINE CONFERENCE | MACHINE LEARNING AND AI EDITION

Built-in frameworks

INNOVATE
ONLINE CONFERENCE

MACHINE LEARNING
AND AI EDITION

Built-in frameworks: Just add your code

TensorFlow mxnet PYTORCH

Keras GLUON Chainer dmlc XGBoost

- Built-in containers for training and prediction
  - Open-source, e.g., https://github.com/aws/sagemaker-tensorflow-containers
  - Build them, run them on your own machine, customize them, etc.
- Local mode: Train and predict on your notebook instance, or on your local machine
- Script mode: Reuse existing code with minimal changes

TensorFlow on AWS

C5 instances (Intel Skylake)

Training ResNet-50 with the ImageNet dataset using our optimized build of TensorFlow 1.11 on a c5.18xlarge instance type is designed to be 11x faster than training on the stock binaries

P3 instances (NVIDIA V100)

TensorFlow scaling efficiency with 256 GPUs

65% Stock version

⬇

90% AWS-optimized version

aws | intel

Apache MXNet: Deep learning for enterprise developers

SAMSUNG SAMSUNG SDS · ByteDance · NTT docomo · Celgene

cimpress · SK telecom · NVIDIA · intel

EAGLEVIEW · WOLFRAM · 图森 tu Simple · gumgum

CURALATE · pixm · Finn AI · Georgian Partners

SIGOPT · LOHIKA · comet · TEAMWORK

Start with off-the-shelf models

- Gluon CV, Gluon NLP, Gluon TS
- ONNX compatibility

Fast and scalable training

- Keras-MXNet up to 2x faster than Keras-TensorFlow
- Near-linear scalability up to 256 GPUs
- Dynamic training

Easy deployment

- Java and Scala APIs
- Model Server

Demo: Fashion-MNIST classification with Keras/TensorFlow

+ Script Mode
(+ Managed Spot Training)
(+ Elastic Inference)

https://aws.amazon.com/blogs/machine-learning/train-and-deploy-keras-models-with-tensorflow-and-apache-mxnet-on-amazon-sagemaker/
https://gitlab.com/juliensimon/dlnotebooks/tree/master/keras/05-keras-blog-post

Getting started

http://aws.amazon.com/free

https://ml.aws
https://aws.amazon.com/sagemaker

https://github.com/aws/sagemaker-python-sdk
https://github.com/aws/sagemaker-spark
https://github.com/awslabs/amazon-sagemaker-examples

https://gitlab.com/juliensimon/dlnotebooks

Thank you!

Julien Simon
Global Evangelist, AI & Machine Learning
Amazon Web Services

@julsimon

https://medium.com/@julsimon

INNOVATE ONLINE CONFERENCE | MACHINE LEARNING AND AI EDITION