Recommender Workshop

Part 1: Introduction

Customers Running Machine Learning On AWS Today

Aloud · Mobilink · SmugMug · GoAnimate · WOLFRAM · butterfleye · influicity · HubSpot · CLAIRE

Openinfluence · gumgum · SIGOPT · witlee · NVIDIA · twilio · Sturdy · realtimes

duolingo · Vonage · OpenAI · Carnegie Mellon · mapbox · Fraud.net · Capital One · FINRA · Kaliber

zendesk

THETAKE · intel · slack · Zillow · Kelley Blue Book THE TRUSTED RESOURCE · NASA · clarifai · SAMSUNG SmartThings

move · Liberty Mutual · C-SPAN · TRD TOYOTA RACING DEVELOPMENT · Pinterest · STITCH FIX · UCLA · infor · realtimes

MOTOROLA SOLUTIONS · zmags · yelp · OpenAI · iTranslate · Instacart · inhealthcare · RNIB · SOCIAL SOUP

GO GIRL apps · SCDM · BeeLiked SOCIAL POLLINATION · OhioHealth · 图森 tu Simple · freshdesk · Mapillary · UNIVERSITY of WASHINGTON · BUILD FAX PROPERTY HISTORY

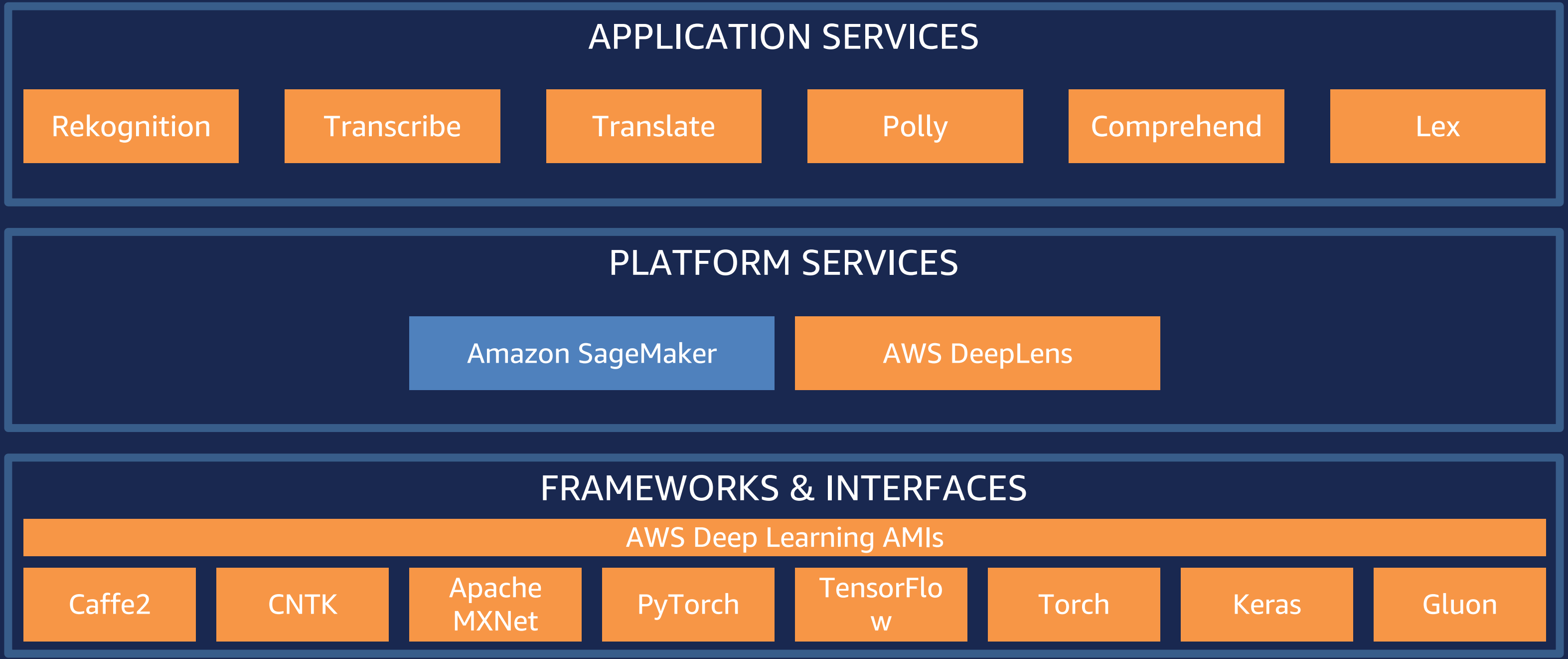
HYPR · JAM CITY · amazon RAPIDS · Wizkids · Artfinder · Zocdoc · American Heart Association Learn and Live · Storybulbs · aculabcloud

Machine Learning at AWS

Our mission:

Put machine learning in the hands of every developer and data scientist

The Amazon Machine Learning Stack



APPLICATION SERVICES

Rekognition

Transcribe

Translate

Polly

Comprehend

Lex

PLATFORM SERVICES

Amazon SageMaker

AWS DeepLens

FRAMEWORKS & INTERFACES

AWS Deep Learning AMIs

Caffe2

CNTK

Apache
MXNet

PyTorch

TensorFlo
w

Torch

Keras

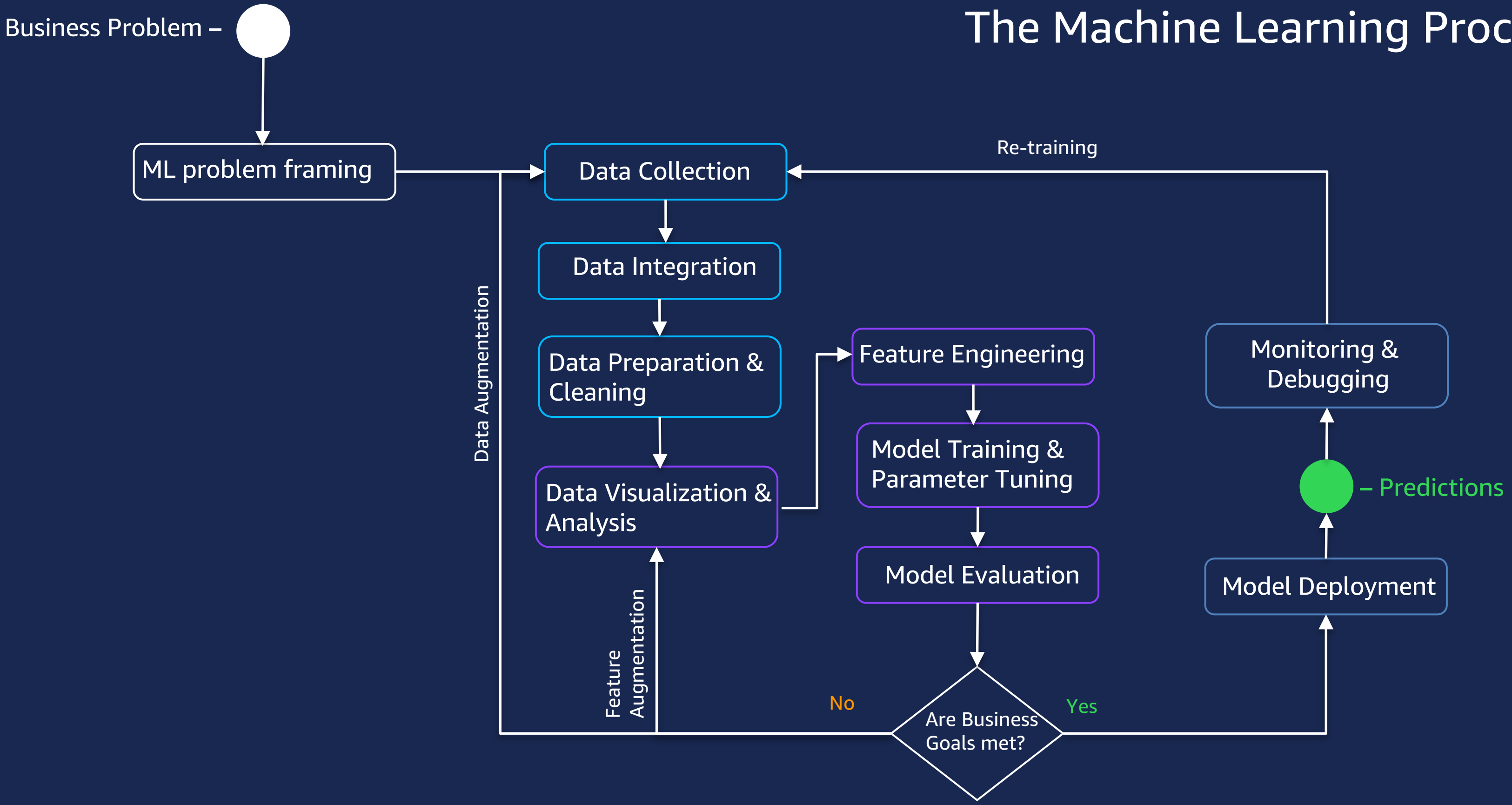
Gluon

Recommender Workshop Agenda

- Part 1: Introduction (You Are Here)
  - Overview of Machine Learning Process, Amazon SageMaker
  - Hands-on: Data Exploration
- Part 2: Collaborative Filtering
  - Core Concepts for Recommendations
  - Hands-on: K-Means Clustering
- Part 3: Matrix Factorization
  - Refining Recommendations
  - Hands-on: Factorization Machine
- Part 4: Hyperparameter Tuning
  - Key Concepts
  - Hands-on: Hyperparameter Tuning

Let’s Review the ML Process

The Machine Learning Process



Business Problem –

ML problem framing

Data Collection

Data Integration

Data Preparation & Cleaning

Data Visualization & Analysis

Feature Engineering

Model Training & Parameter Tuning

Model Evaluation

Are Business Goals met?

No

Yes

Model Deployment

– Predictions

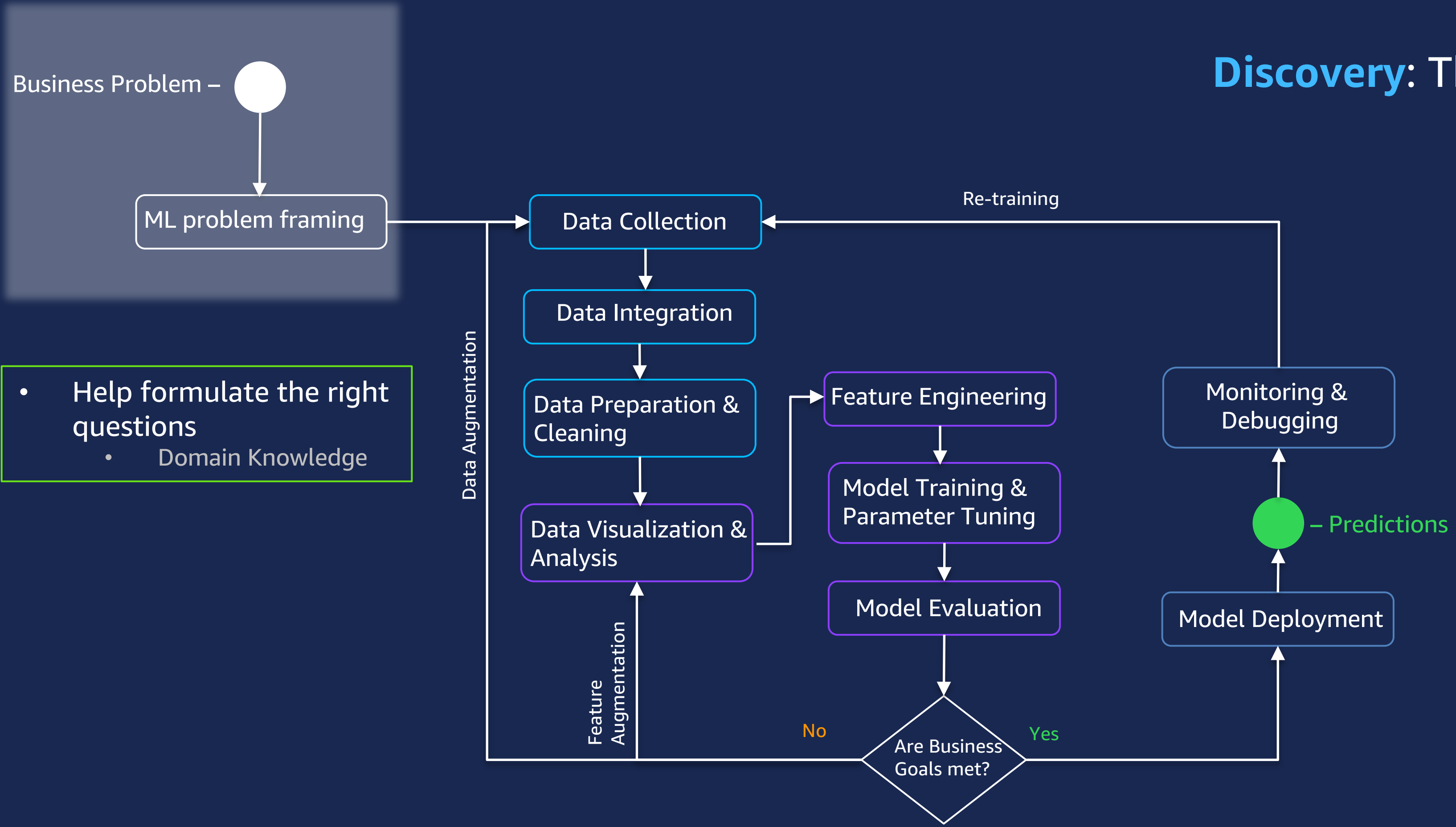
Monitoring & Debugging

Re-training

Data Augmentation

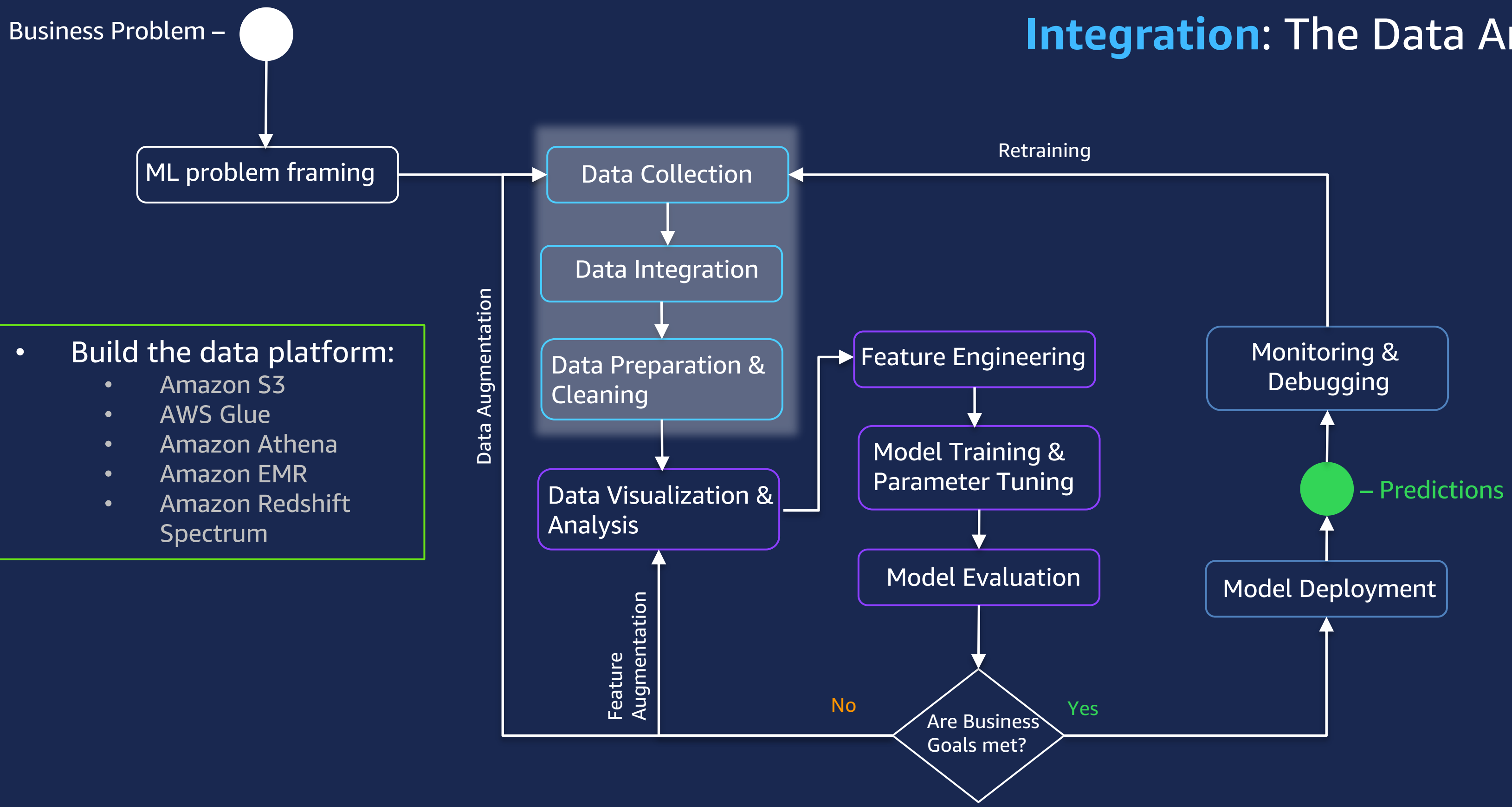
Feature Augmentation

Discovery: The Analysts



- Help formulate the right questions
  - Domain Knowledge

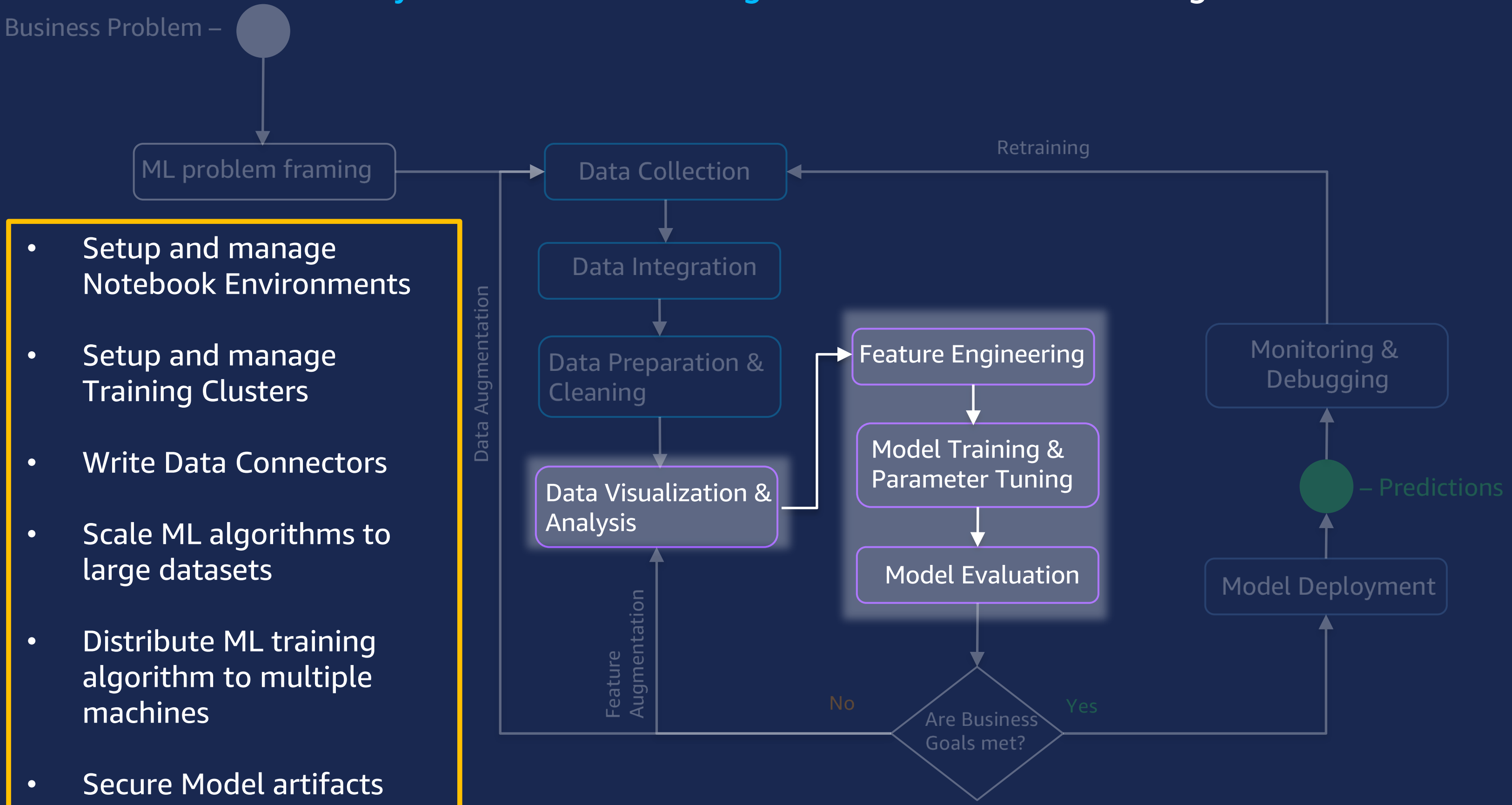
Integration: The Data Architecture



- Build the data platform:
  - Amazon S3
  - AWS Glue
  - Amazon Athena
  - Amazon EMR
  - Amazon Redshift Spectrum

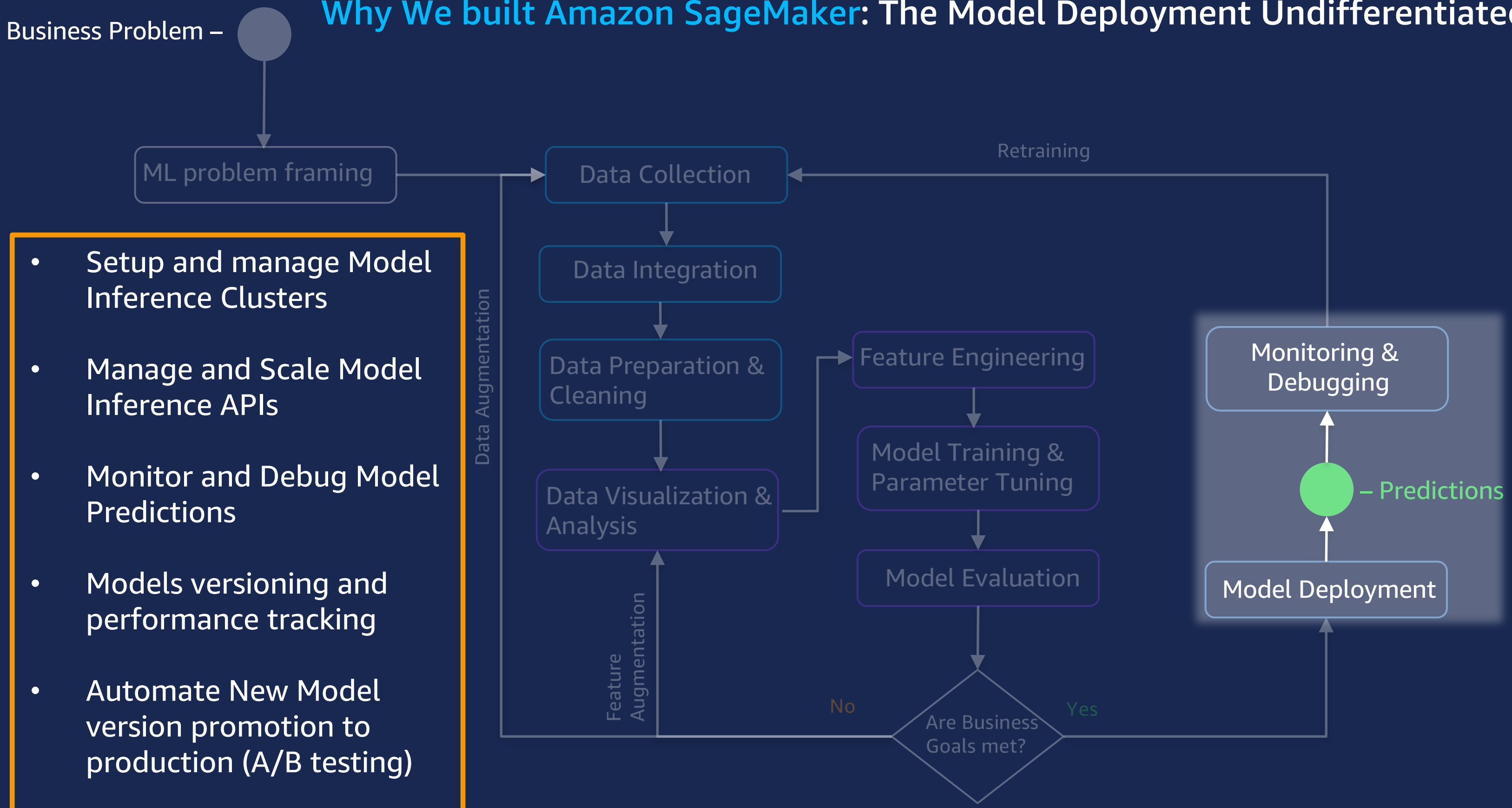
Why We built Amazon SageMaker: The Model Training Undifferentiated Heavy Lifting

- Setup and manage Notebook Environments
- Setup and manage Training Clusters
- Write Data Connectors
- Scale ML algorithms to large datasets
- Distribute ML training algorithm to multiple machines
- Secure Model artifacts



Why We built Amazon SageMaker: The Model Deployment Undifferentiated Heavy Lifting

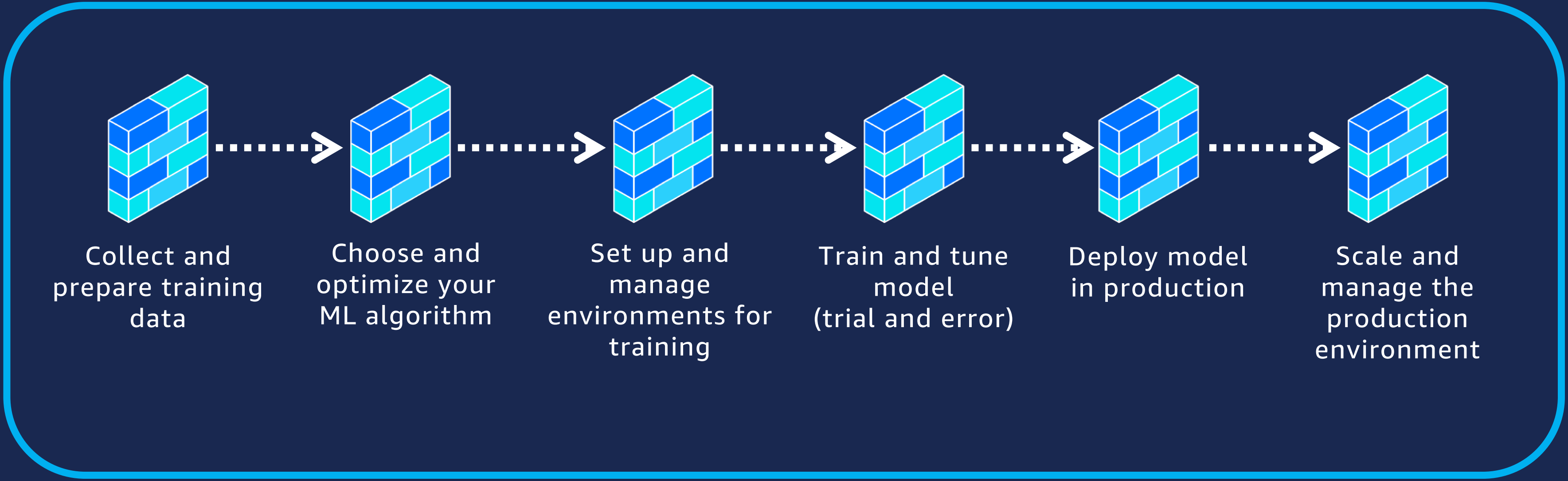
- Setup and manage Model Inference Clusters
- Manage and Scale Model Inference APIs
- Monitor and Debug Model Predictions
- Models versioning and performance tracking
- Automate New Model version promotion to production (A/B testing)



Amazon SageMaker

Amazon SageMaker

Easily build, train, and deploy machine learning models



Collect and prepare training data

Choose and optimize your ML algorithm

Set up and manage environments for training

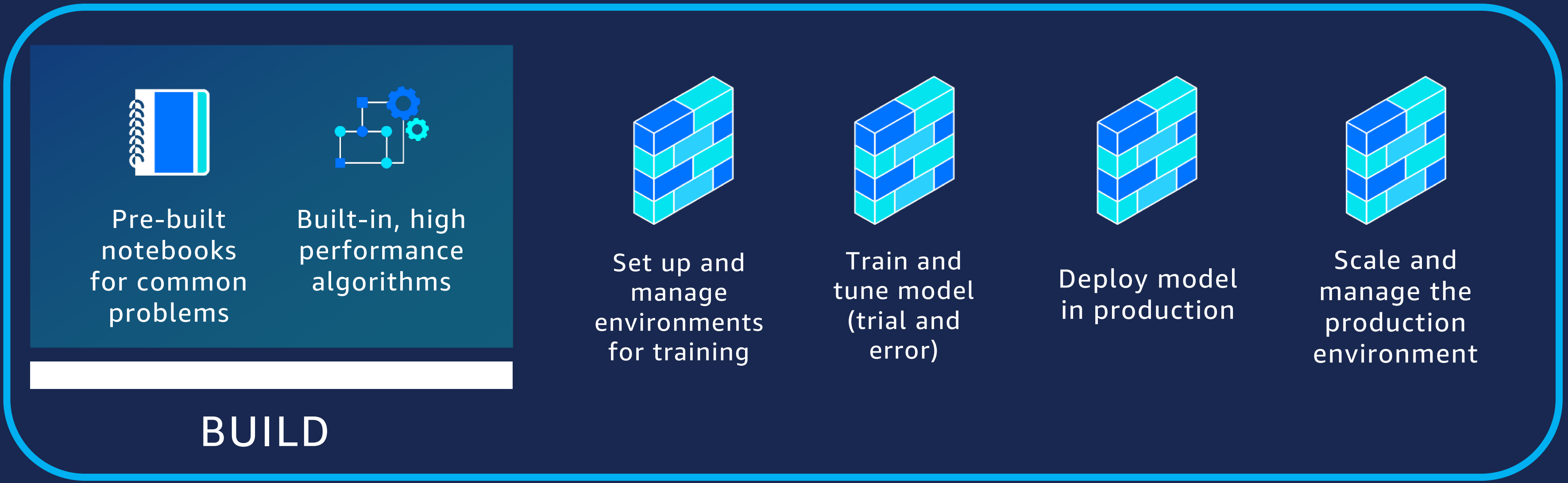
Train and tune model (trial and error)

Deploy model in production

Scale and manage the production environment

Amazon SageMaker

Easily build, train, and deploy machine learning models



Pre-built notebooks for common problems

Built-in, high performance algorithms

BUILD

Set up and manage environments for training

Train and tune model (trial and error)

Deploy model in production

Scale and manage the production environment

Training ML Models Using Amazon SageMaker

SageMaker Built-in Algorithms

K-means Clustering
PCA
Neural Topic Modelling
Factorisation Machines
Linear Learner
XGBoost
Latent Dirichlet Allocation
Image Classification
Seq2Seq
DeepAR Forecasting
BlazingText (word2vec)
Random Cut Forest
kNN
Object Detection

Training ML Models Using Amazon SageMaker

SageMaker Built-in Algorithms

K-means Clustering
PCA
Neural Topic Modelling
Factorisation Machines
Linear Learner – Regression
XGBoost
Latent Dirichlet Allocation
Image Classification
Seq2Seq
Linear Learner – Classification
DeepAR Forecasting

Bring Your Own Algorithms

ML Algorithms
R
MXNet
TensorFlow
Caffe
PyTorch
Keras
CNTK
…

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SageMaker Built-in Algorithms

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Bring Your Own Algorithms

ML Algorithms
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CNTK
…

DNN SDKs

TensorFlow SDK
MXNet (Gluon) SDK
Chainer SDK
PyTorch SDK

Training ML Models Using Amazon SageMaker

SageMaker Built-in Algorithms

K-means Clustering
PCA
Neural Topic Modelling
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Bring Your Own Algorithms

ML Algorithms
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PyTorch
Keras
CNTK
…

MXNet & TensorFlow SDK

TensorFlow SDK
MXNet (Gluon) SDK

Apache Spark Estimator

Apache Spark Python library
Apache Spark Scala library

Amazon EMR

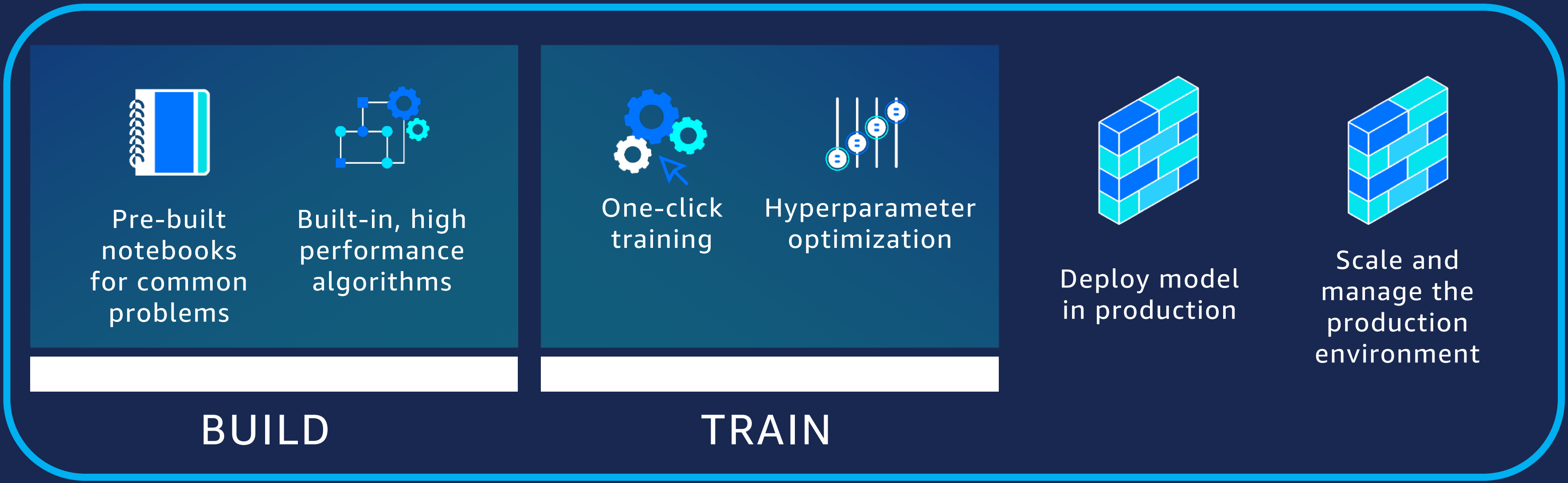
Apache Spark

PySpark

Scala

Amazon SageMaker

Easily build, train, and deploy machine learning models



Pre-built notebooks for common problems

Built-in, high performance algorithms

BUILD

One-click training

Hyperparameter optimization

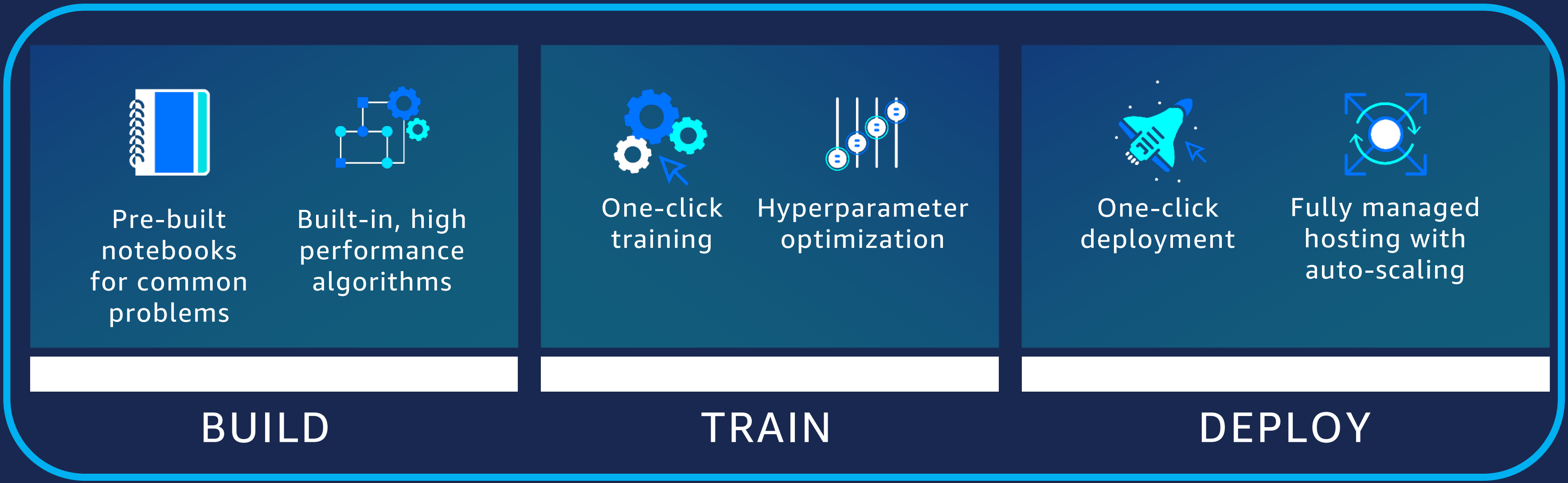
TRAIN

Deploy model in production

Scale and manage the production environment

Amazon SageMaker

Easily build, train, and deploy machine learning models



Pre-built notebooks for common problems

Built-in, high performance algorithms

BUILD

One-click training

Hyperparameter optimization

TRAIN

One-click deployment

Fully managed hosting with auto-scaling

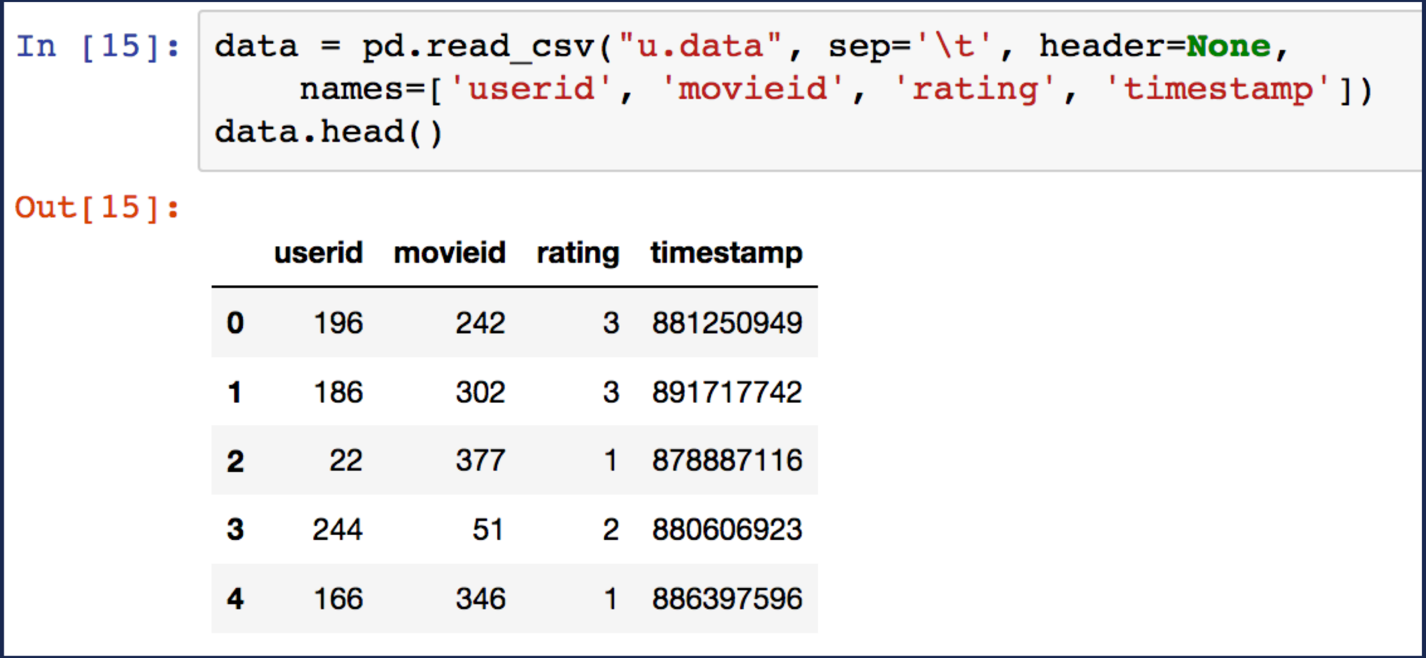
DEPLOY

Recommender Workshop Repository

http://bit.ly/2wkaV0N

Our Data Set: Movielens

- Public Data Set produced by GroupLens Research
- https://grouplens.org/datasets/movielens/



```
In [15]: data = pd.read_csv("u.data", sep='\t', header=None,
              names=['userid', 'movieid', 'rating', 'timestamp'])
         data.head()
```

Out[15]:

	userid	movieid	rating	timestamp
0	196	242	3	881250949
1	186	302	3	891717742
2	22	377	1	878887116
3	244	51	2	880606923
4	166	346	1	886397596

Recommender Workshop Activity

- ~~Log into https://bootrun.awsapps.com/start~~
- ~~Change to us-east-1 region~~
- Find the Amazon SageMaker service, then find Notebooks
- Spin up new notebook instance
  - Recommended: **ml.m4.xlarge** type
- Within notebook instance, open Terminal
  - `cd SageMaker`
  - `git clone https://github.com/shirkeyaws/sagemaker-recommender-workshop (aka http://bit.ly/2wkaV0N)`
- In Jupyter, within the repo path, find: 01_exploring_data.ipynb

NEXT: Part 2