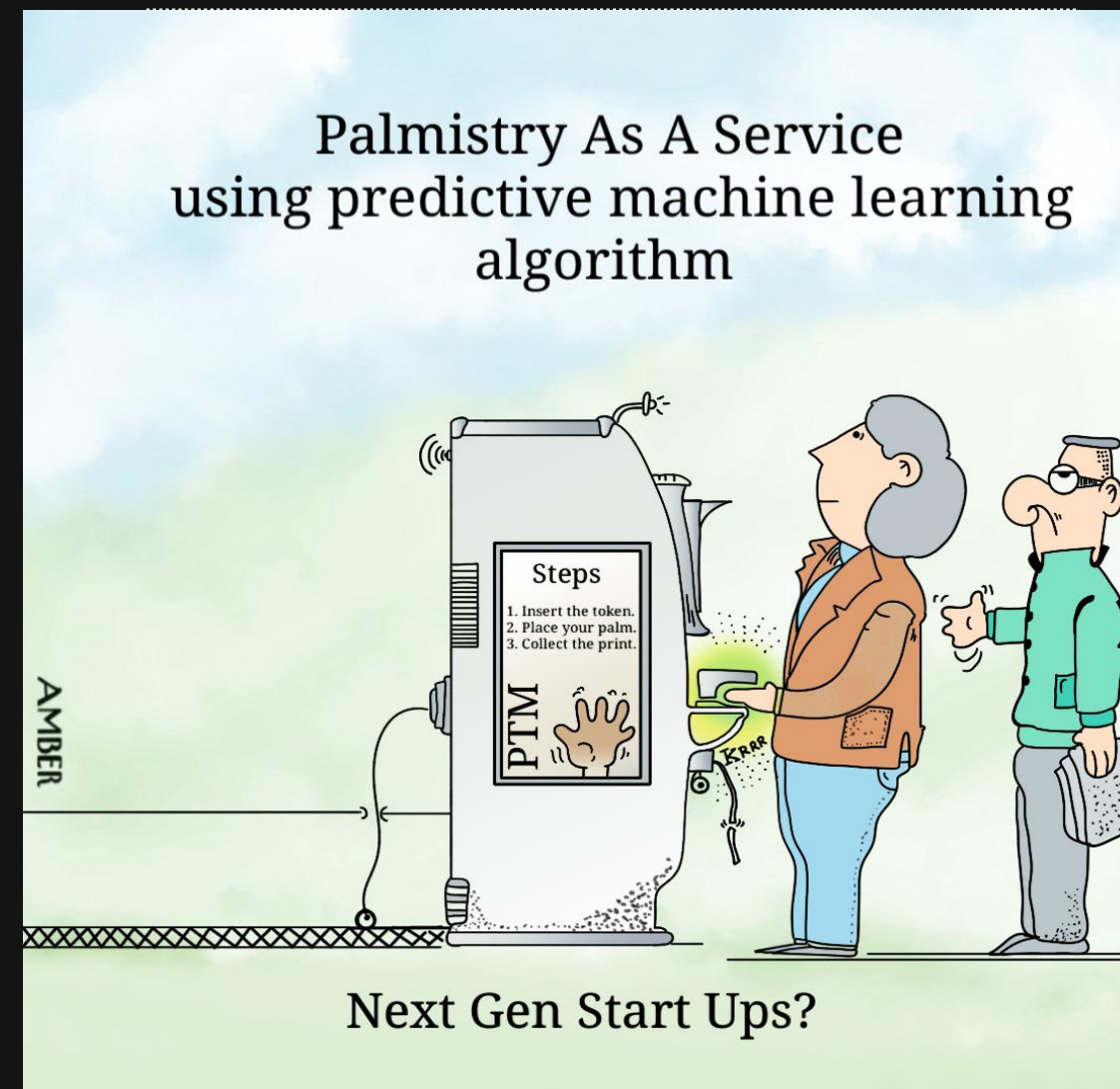


Machine Learning for Healthcare

Amber Marfatia,
Ganesh Subramaniam
(June 2018)

Agenda

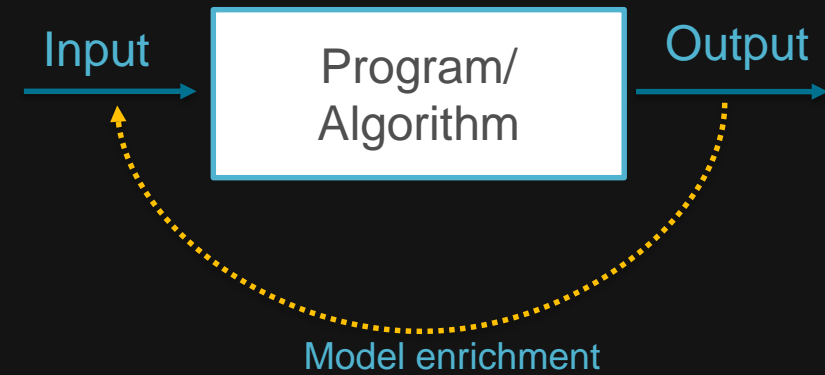
- **What:**
 - ML – A brief introduction
 - ML – Options & Type of models
- **Why:**
 - The focus on ML?
- **Where:**
 - Applications in HC (TZ and non-TZ examples)
- **How:**
 - Design – ML Approach
 - To determine which algorithm is right (cheat sheet & approach)
 - Doing it with Azure ML
 - Current trend – Machine Learning as a Service (MLaaS) platforms
 - Brief comparison of MLaaS platforms (1 or 2 slides)
 - Brief roundup of Cognizant's HC experience, platform
- Next steps
- Q&A



What?

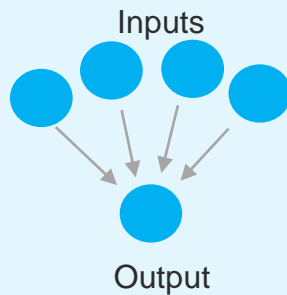
Algorithms which **detect patterns** in very large data sets, and **progressively learn and refine predictions and recommendations** through incremental data and experiences, rather than via explicit programming instruction.

The algorithms **adapt in response to new data and experiences** to improve efficacy over time.



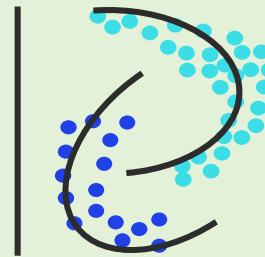
ML - Types

SUPERVISED



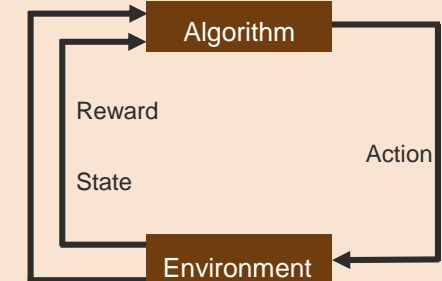
Algorithm uses training data and feedback from humans to learn the **relationship of given inputs to a given output**

UNSUPERVISED

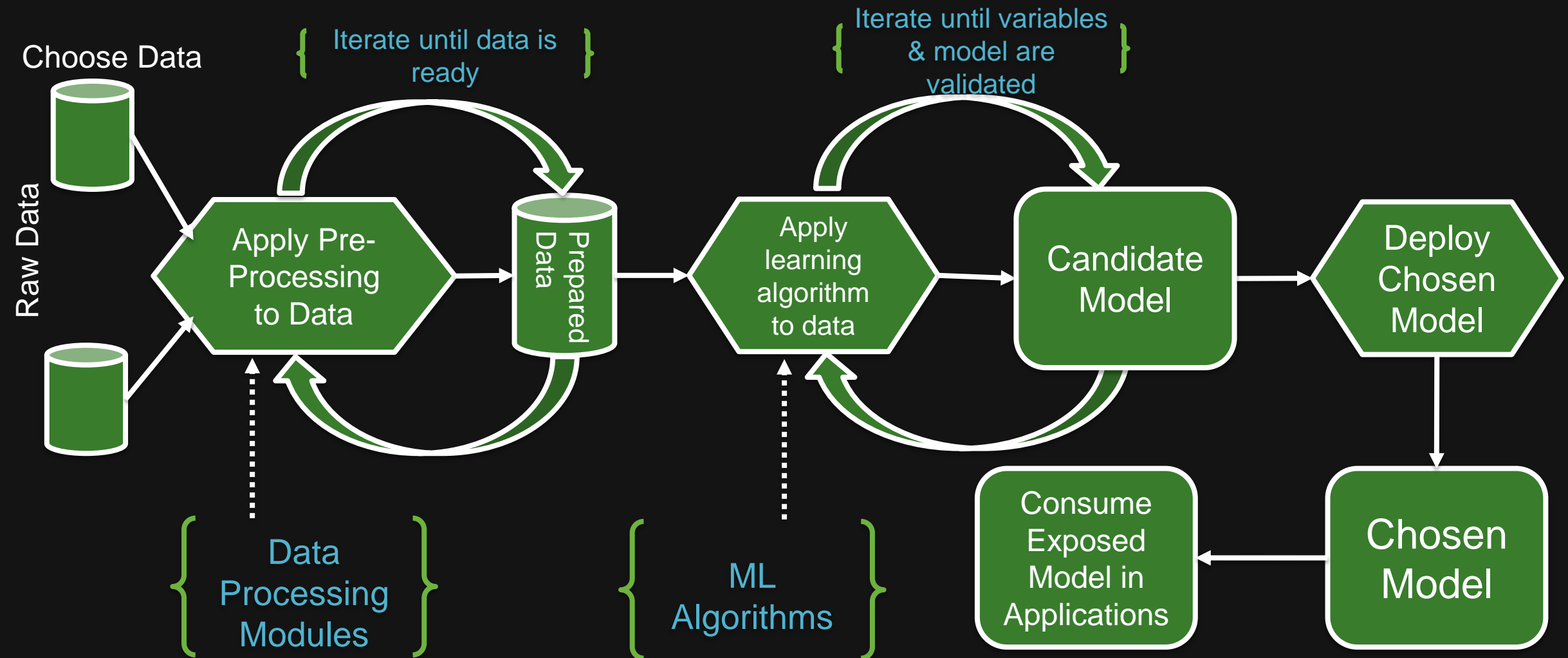


Algorithm **explores input data without being given an explicit output variable**

REINFORCEMENT



Algorithm learns to perform a task simply by trying to **maximize rewards it receives for its actions**



Member/Patient assistance

- Education (symptom checker, drug contra-indications, etc)
- Benefit, eligibility, claims inquiry
- Locating urgent care/emergency care facilities

Care Mgmt./PHM

- Predicting therapy adherence
- Personalized care interventions
- Disease propensity
- Re-admission propensity
- Predicting enrollment to CM/DM programs

Utilization/Rev. Leakage

- Predicting utilization (IP, ER, Rx,...)
- Predicting drug abuse behavior
- Predicting member churn
- Maximizing subrogation \$\$ recovery
- Detecting coding gaps (HCC)



Payer Operations

- Optimizing outreach channel (*self-serve propensity*)
- **Sentiment analysis** from call logs, web 2.0, etc.
- **Risk coding/adjustment**
- Fraud & abuse detection

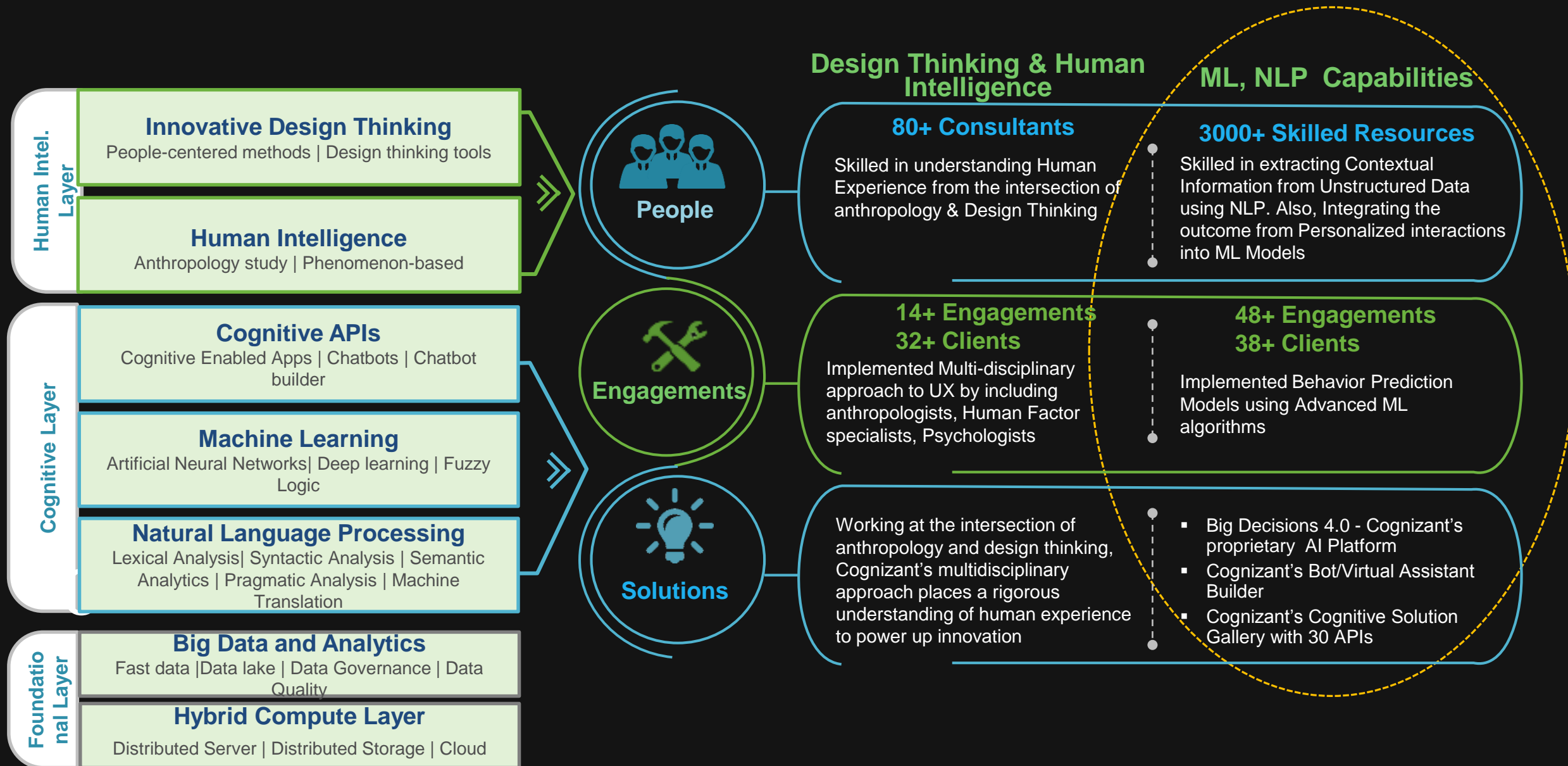
Clinical Operations

- **Diagnostic aid** (*diabetic retinopathy, tumor malignancy, etc.*)
- **Optimizing treatment regimes** (DTRs)
- Patient triaging
- Patient education (*chatbot*)
- Prior Auth requests
- Benefit, eligibility, claims inquiry

IT Operations

- **Predicting ticket volume** (*e.g., OE period*)
- Predicting server/network downtime

Cognizant capabilities (AIA)



Cognizant - Representative experience

Drug seeking behavior for an integrated managed care consortium

65% prediction accuracy. **\$12 MN** per **1000** correctly identified drug seekers



Likelihood of claim denial for a leading PBM



82% prediction accuracy, leading to reduction in denial volumes, worth **\$2.85M**

Identifying claims having high propensity for subrogation recovery at leading Payer

Potential recovery rate increase of **34%** leading to plug in revenue leakage of USD **\$4.3M**



Log analysis-based device Failure Prediction model for a pharmaceutical provider

~55% reduction in turnaround time. **~25%** reduction in device recall

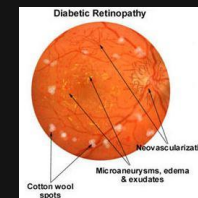


Therapy adherence prediction for leading PBM

66% prediction accuracy. Revenue improvement due to increased refills

Diabetic retinopathy detection for a leading India-based ophthalmology institute

80%+ prediction accuracy; reduction in diagnosis time from **4 hrs** to **45 mins**



Customer churn prediction model for a leading health plan

Member attrition down to **16%** from **21%**

Ticket analysis prediction model for a leading managed care organization

35% time saving in ticket alignment



Emerging trend: MLaaS platforms

Cloud-based systems that provide machine learning as a service for building, training, deploying and integrating ML models

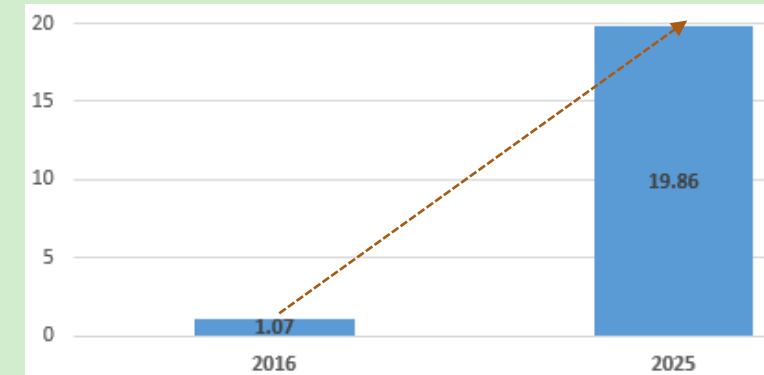
MLaaS Platform – Why?

To ease the **development, training and deployment** of machine learning models for **solving business-specific problems in any domain**, along with **scalable computational and storage infrastructure** (faster GTM)

Influencing trends & drivers

- **Increased adoption of cloud-based technologies** (private over public as of 2016)
- **Use case explosion** across verticals, especially HC and LS
- **Proliferation of structured & unstructured data** (incl. IoT streams, from increased connectivity)
- **Consumerism** - need to recognize & predict consumer behavior, and **personalize intervention**
- Technology – **decrease in computational and storage costs**

Market Size* (\$Bn)



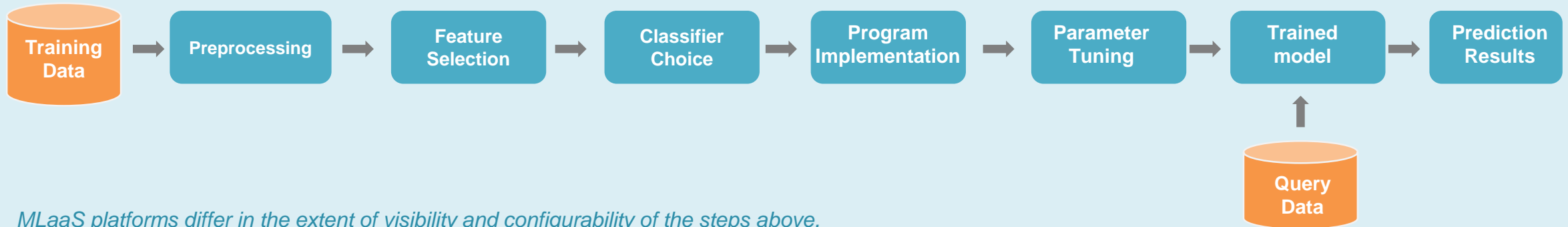
- US market size \$497Mn (2017)
- Bulk of the market share – prof. services to manage infra scaling and security
- HC & LS leading verticals – key growth contributors, from increased digitalization

Major Players



> 70% of market share (2016)

Machine Learning – Typical steps:



E2E services for ML as part of cloud computing services

- Ingestion, transformation, analytics and visualization of structured and unstructured data (including IoT streams)
- Development, training, testing, validation, tuning and deployment of analytical models
- Library of time-saving sample experiments, **pre-trained models**, R and Python packages, SDKs, and **best-in-class algorithms**
- In-built Natural language processing, predictive analytics and deep learning models and frameworks.
- Integration aids to mesh models with current application infrastructure.

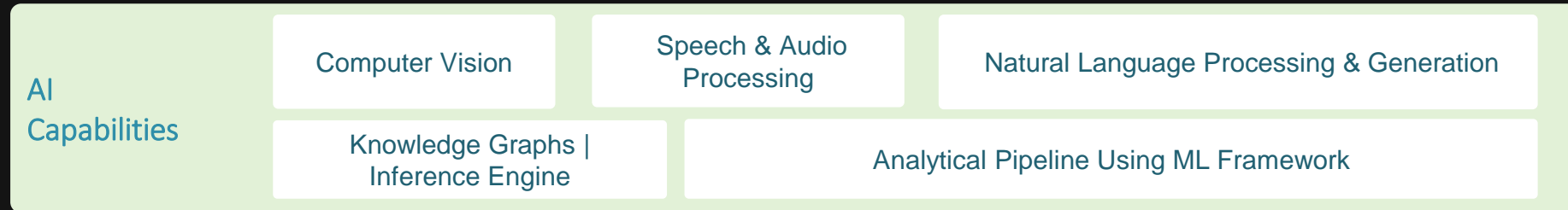
Cloud Machine Learning Services for Predictive Analytics - Comparison

	Amazon SageMaker	Azure ML Studio	Google ML Engine
Classification	✓	✓	✓
Regression	✓	✓	✓
Clustering	✓	✓	✓
Anomaly detection	✓	✓	✓
Recommendation	✓	✓	✓
Algorithms	10 built-in + custom available	100+ algorithms and modules	Tensor-Flow-based
Graphical interface	✗	✓	✗
Configuration level*	medium	high	low

**Refers to extent of customization (feature engg., classifier selection, etc.,) versus a black box*

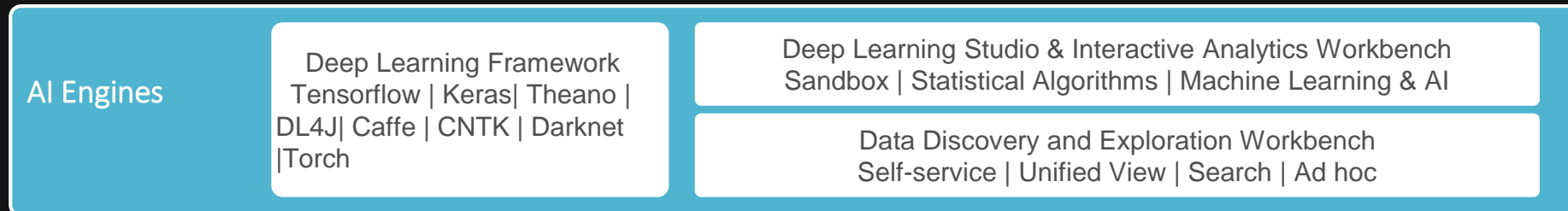
Leveraging Cognitive

Making the platform support itself – totally hands-off



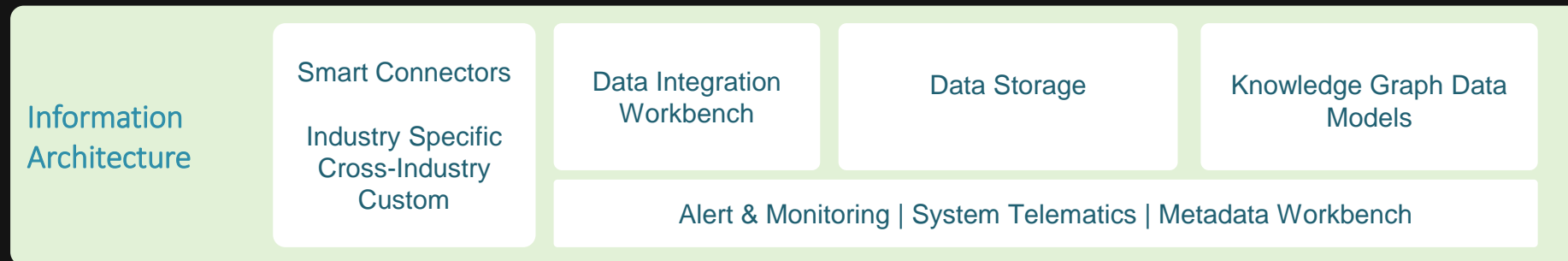
Insights for All

Enabling analytical democracy across the organization.
For business users, analysts and data scientists.



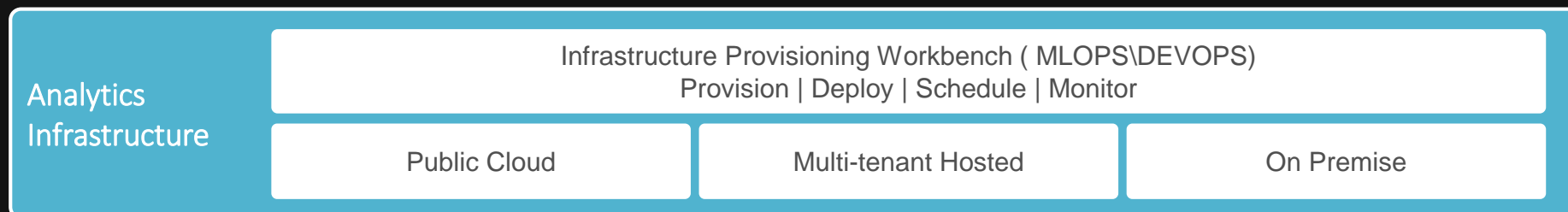
Leverage Universal Data

From structured data to complex, fast digital data.
Robust Information Architecture to support all analytics needs.



Scalability & Flexibility

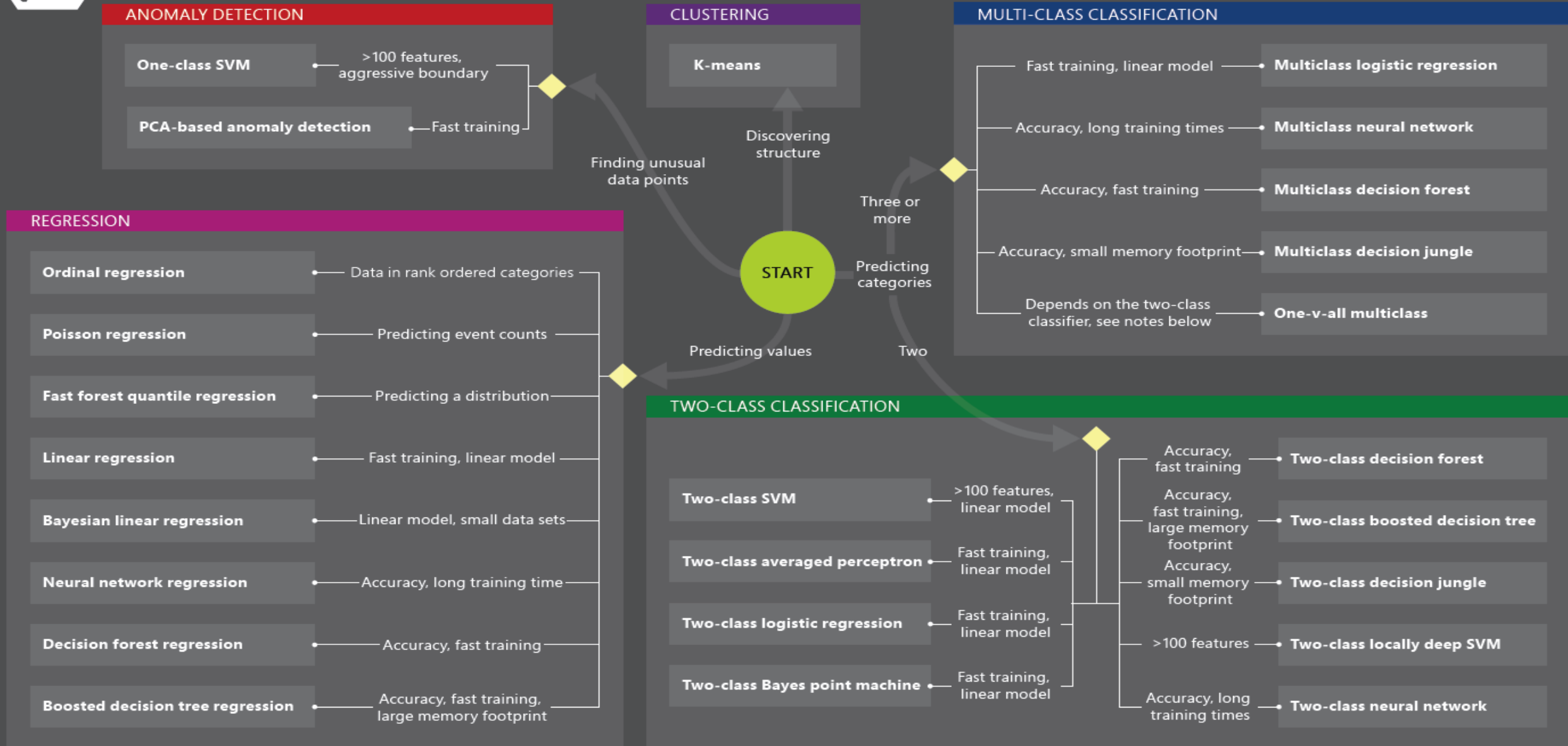
Harness the power of Cloud.
Or deploy on premise.

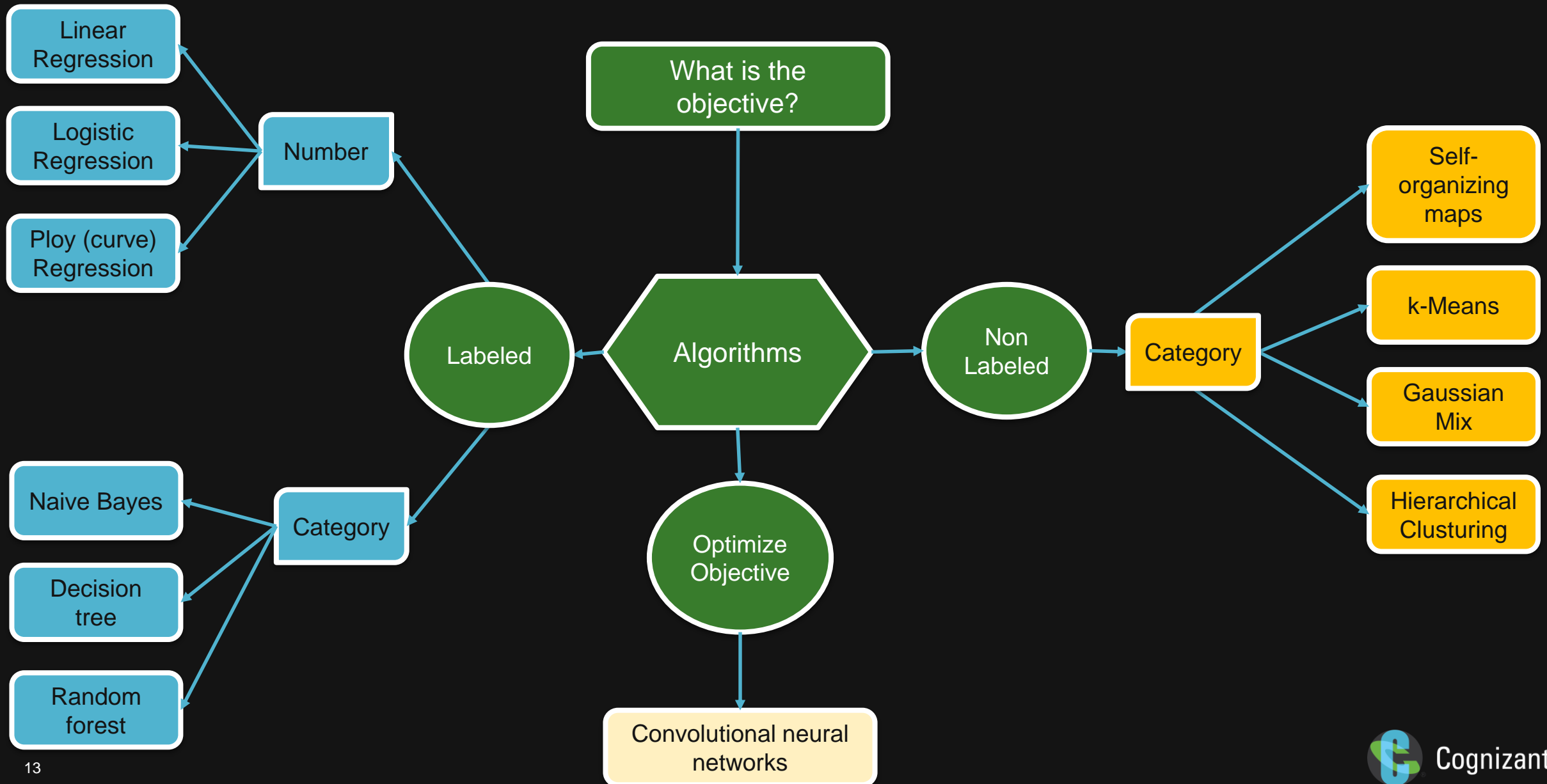


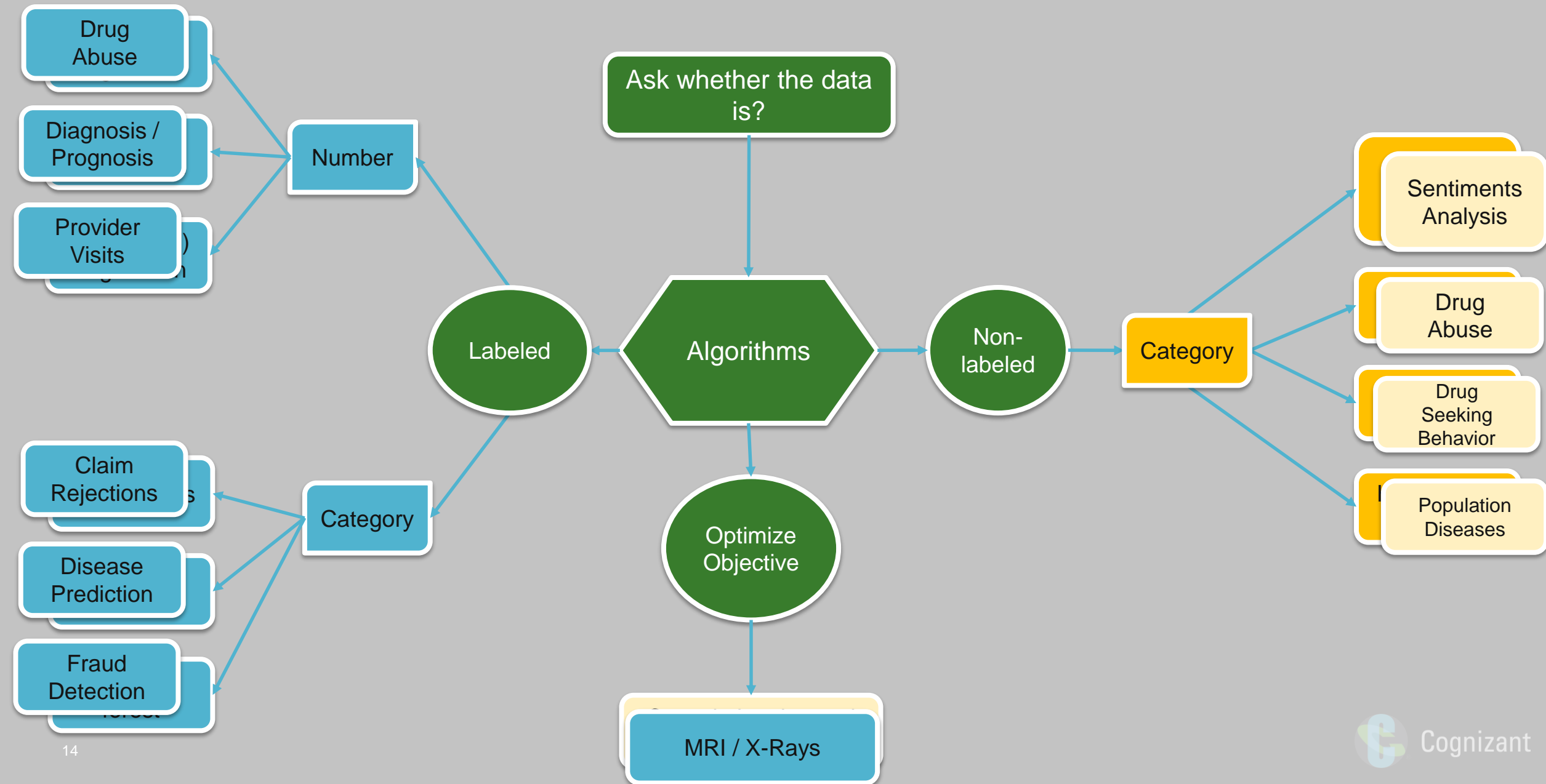


Microsoft Azure Machine Learning: Algorithm Cheat Sheet

This cheat sheet helps you choose the best Azure Machine Learning Studio algorithm for your predictive analytics solution. Your decision is driven by both the nature of your data and the question you're trying to answer.







Demo

Questions?

Thank you

Healthcare Technology Office.

Email us at: healthcareTechnology@cognizant.com