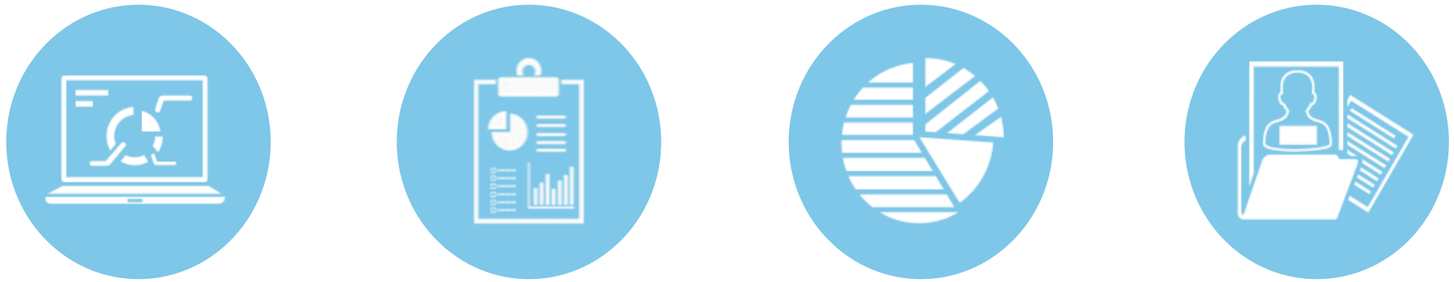
Machine Learning

Lesson 1—Introduction to Artificial Intelligence and Machine Learning



Learning Objectives

- Define Artificial Intelligence (AI) and understand its relationship with data
- Define Machine Learning (ML) and understand its relationship with Artificial Intelligence
- Understand Machine Learning approach and its relationship with data science
- Identify the applications of Machine Learning

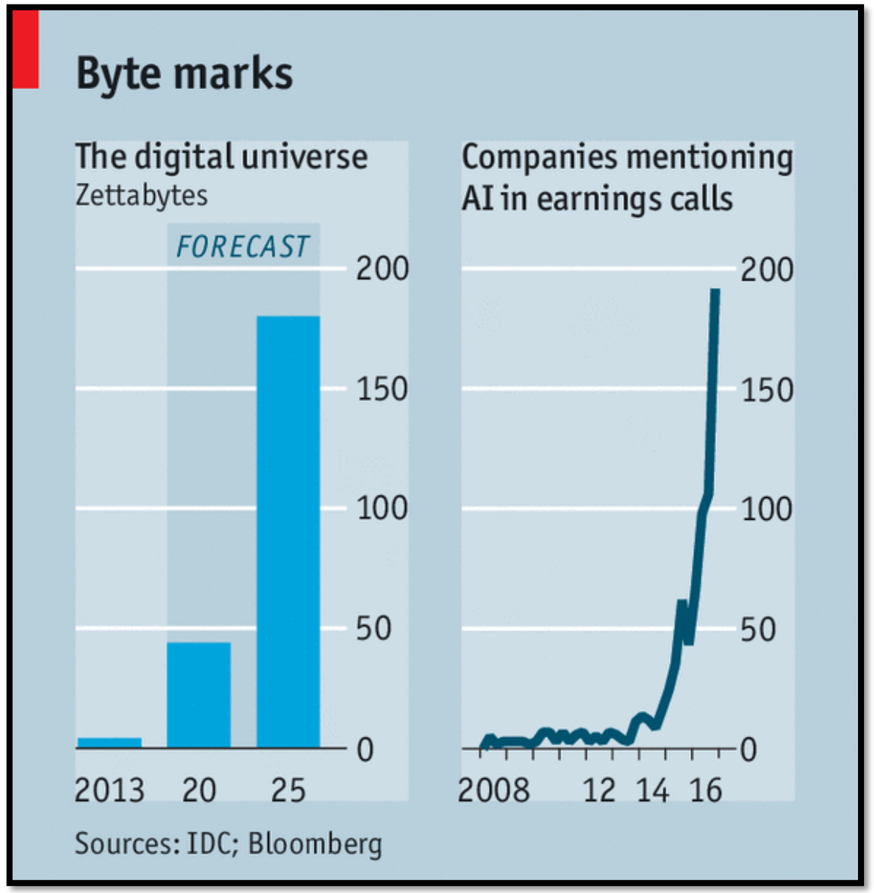
Introduction to Artificial Intelligence and Machine Learning

Topic 1: Definition of Artificial Intelligence

Data Economy

- World is witnessing real time flow of all types of structured and unstructured data from social media, communication, transportation, sensors, and devices.
- International Data Corporation (IDC) forecasts that 180 zettabytes of data will be generated by 2025.
- This explosion of data has given rise to a new economy known as the Data Economy.
- Data is the new oil that is precious but useful only when cleaned and processed.
- There is a constant battle for ownership of data between enterprises to derive benefits from it.

Data Economy



Source: Economist.com

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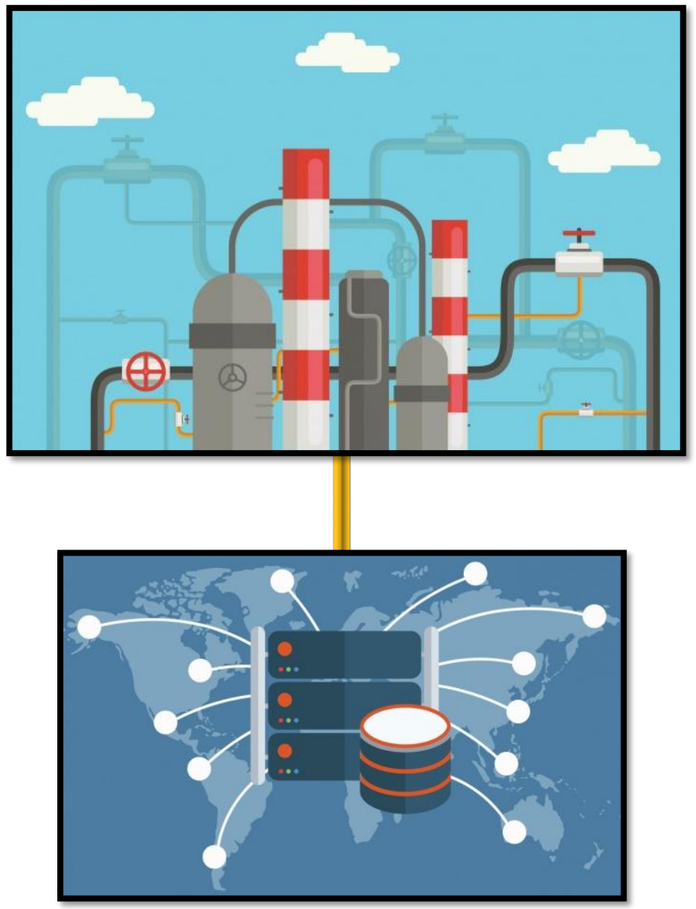

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Emergence of Artificial Intelligence

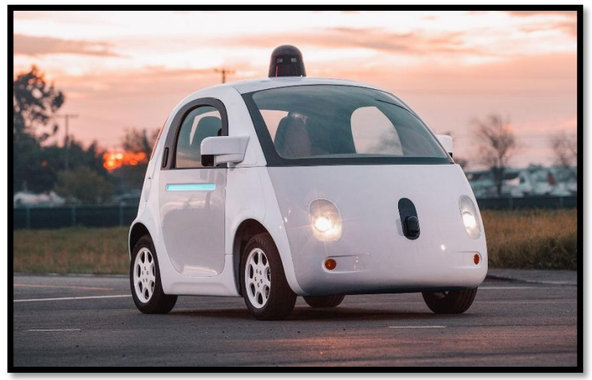
The data economy with its vast reservoir is enabling unprecedented innovation in data sciences, the field which deals with extracting useful information and insights from the available data.

Data science is going toward a new paradigm where one can teach machines to learn from data and derive a variety of useful insights. This is known as Artificial Intelligence.

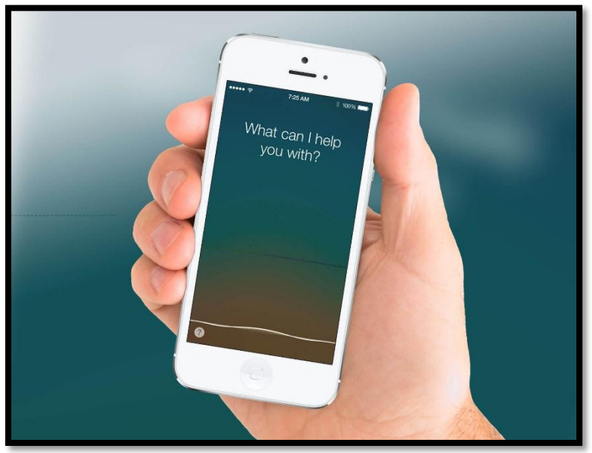
Definition of Artificial Intelligence

Artificial Intelligence refers to intelligence displayed by machines that simulates human and animal intelligence.

Artificial Intelligence in Practice

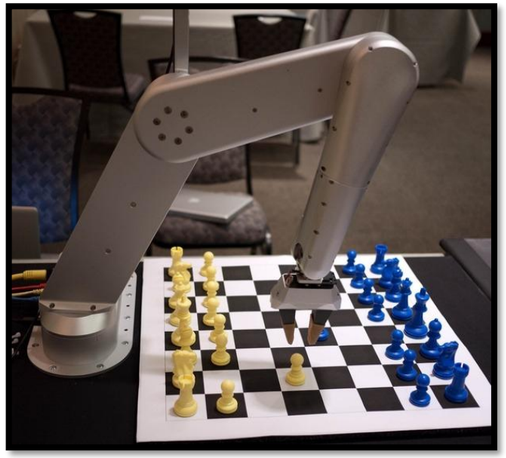


Self-driving cars



Applications like Siri that understand and respond to human speech

Google's AlphaGo AI has defeated many Go champions such as Ke Jie



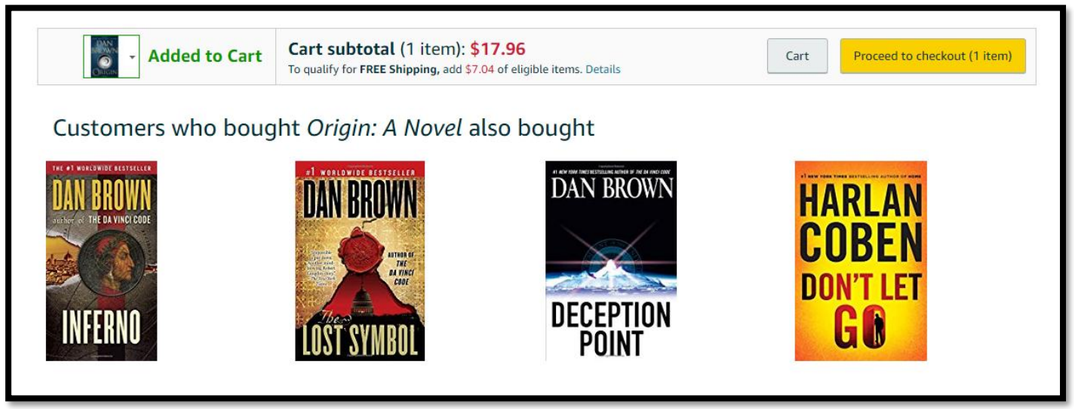
Implementing AI in chess

Amazon ECHO product (home control chatbot device)

Hilton using Connie – concierge robot from IBM Watson

Sources: documentarytube, wired, Quora

Data Facilitates Artificial Intelligence Products



Amazon pulls in data from its user database to recommend products to users.

This functionality helps bring in more users.

More users generate even more data that help enhance the recommendations even further.

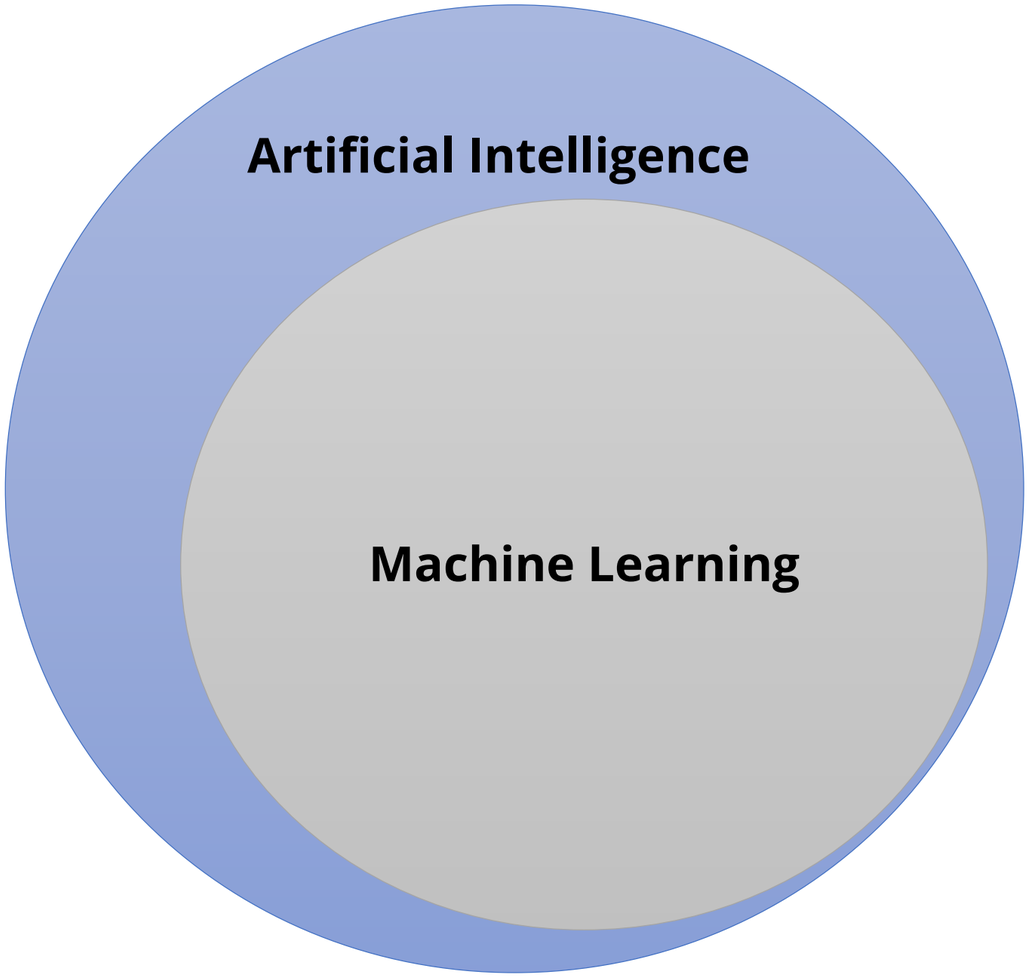
Sources: dbta, Futurism

Introduction to Artificial Intelligence and Machine Learning

Topic 2: Definition of Machine Learning

Relationship between Artificial Intelligence and Machine Learning

Machine Learning is an approach or subset of Artificial Intelligence that is based on the idea that machines can be given access to data along with the ability to learn from it.



Definition of Machine Learning

> The capability of Artificial Intelligence systems to learn by extracting patterns from data is known as Machine Learning.

Features of Machine Learning

- Machine Learning is computing-intensive and generally requires a large amount of training data.
- It involves repetitive training to improve the learning and decision making of algorithms.
- As more data gets added, Machine Learning training can be automated for learning new data patterns and adapting its algorithm.

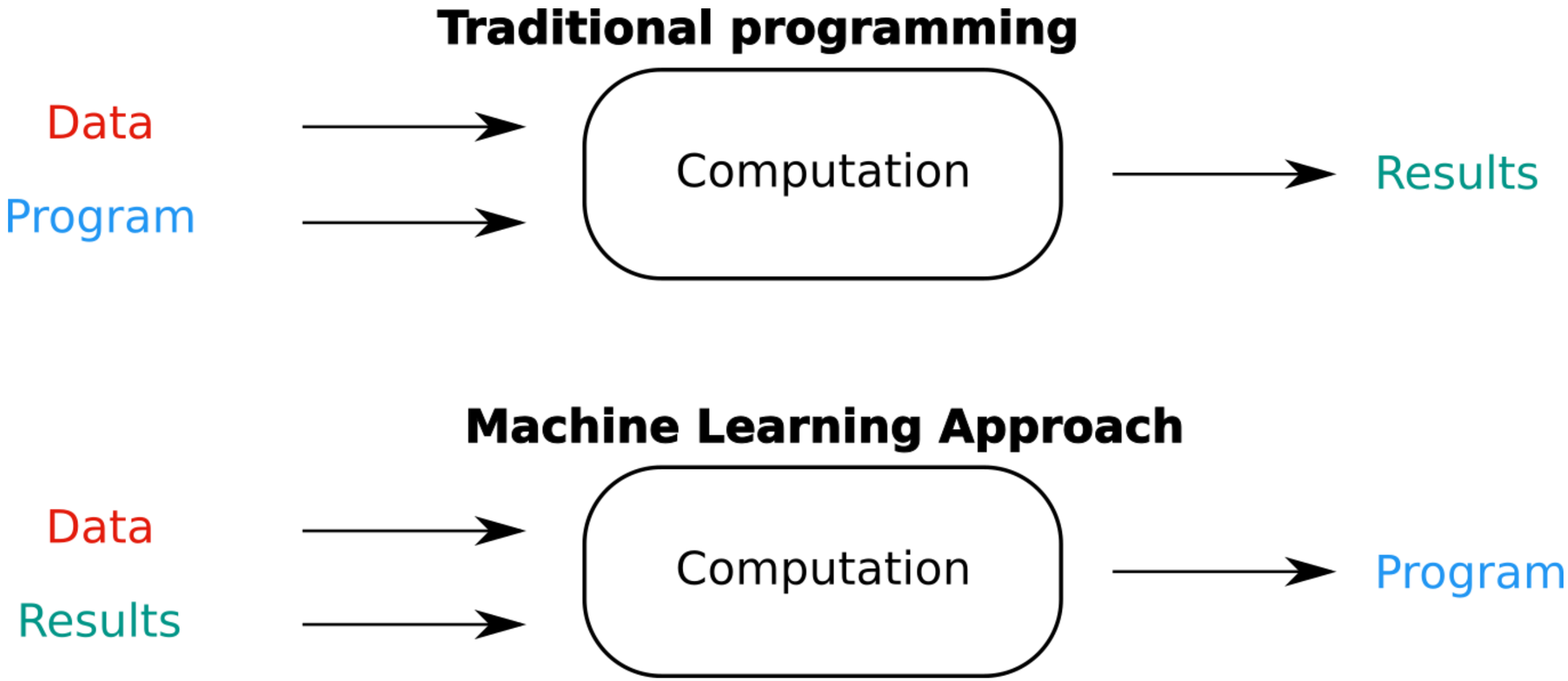
Example:

Learning from new spam words or new speech (also called as incremental learning)

Introduction to Artificial Intelligence and Machine Learning

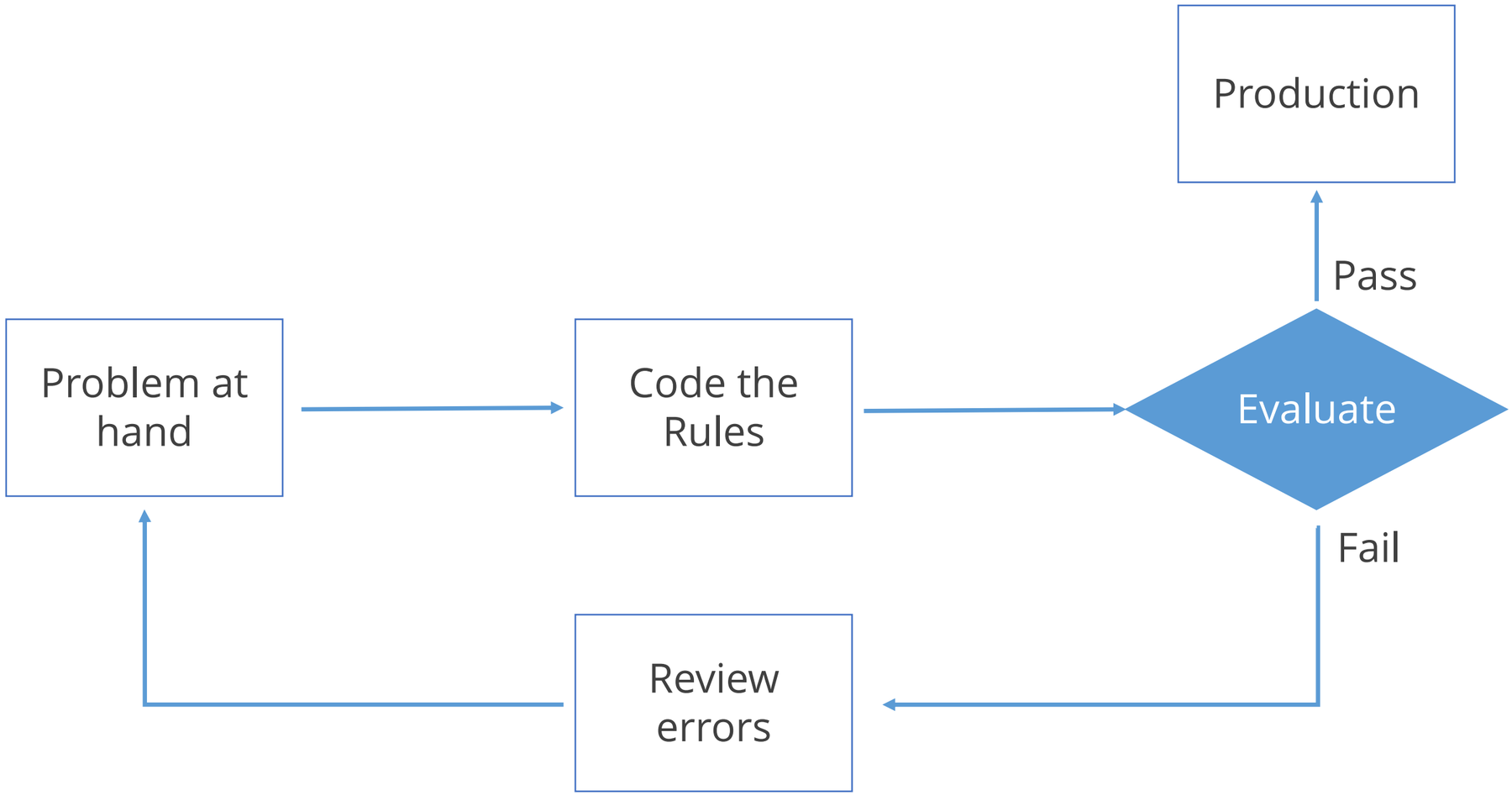
Topic 3: Machine Learning Algorithms

Traditional Programming vs. Machine Learning Approach



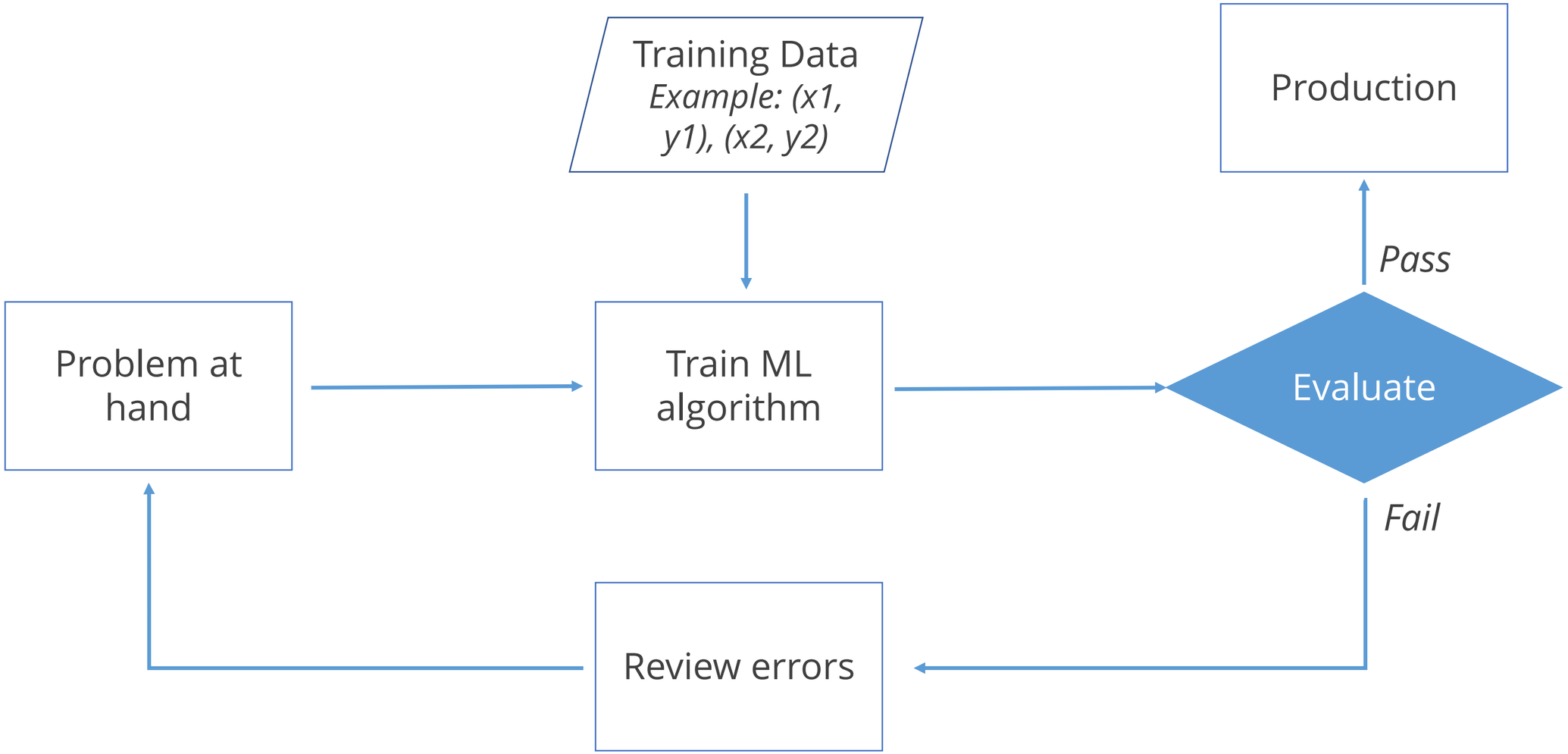
Traditional Approach

Traditional programming relies on hard-coded rules.



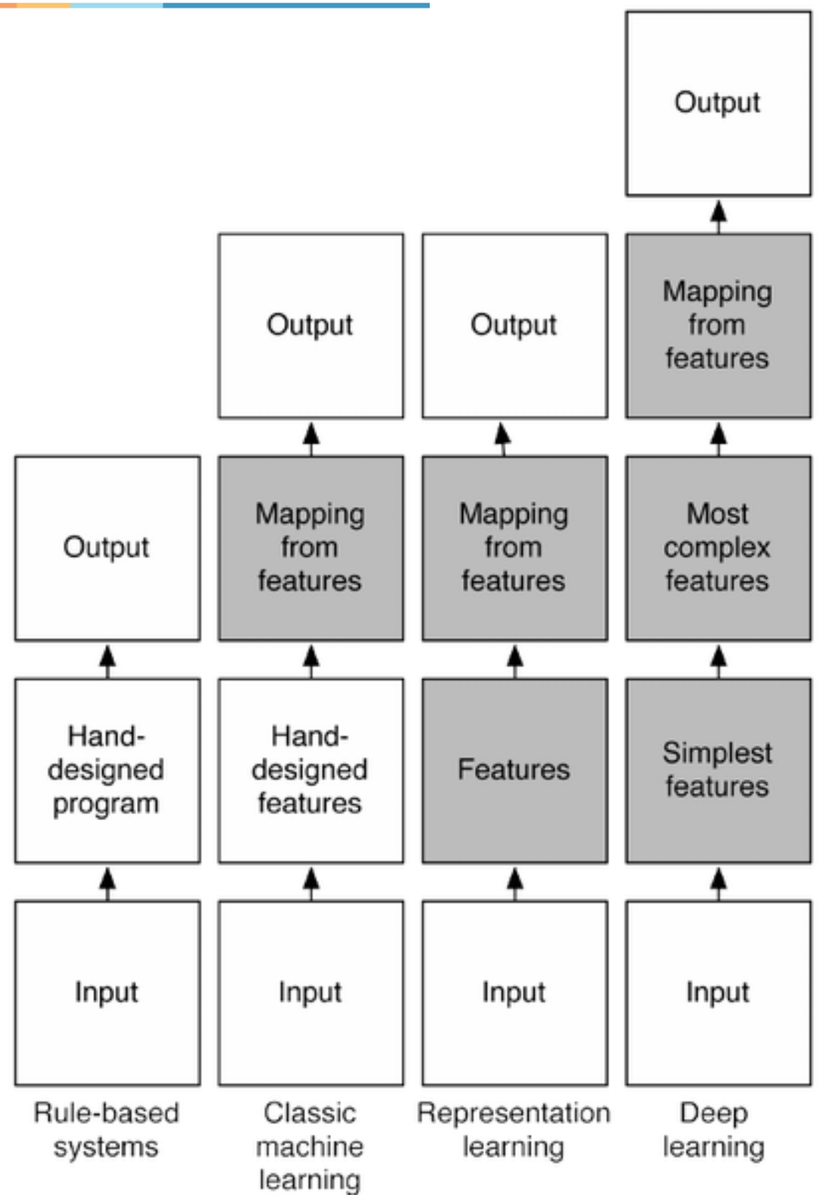
Machine Learning Approach

Machine Learning relies on learning patterns based on sample data.



Traditional to Machine Learning at a Glance

As you go from rule-based systems to the deep learning ones, more complex features and input-output relationships become learnable.



Source: "Deep learning" by Ian Goodfellow

Relationship between Data Science and Machine Learning

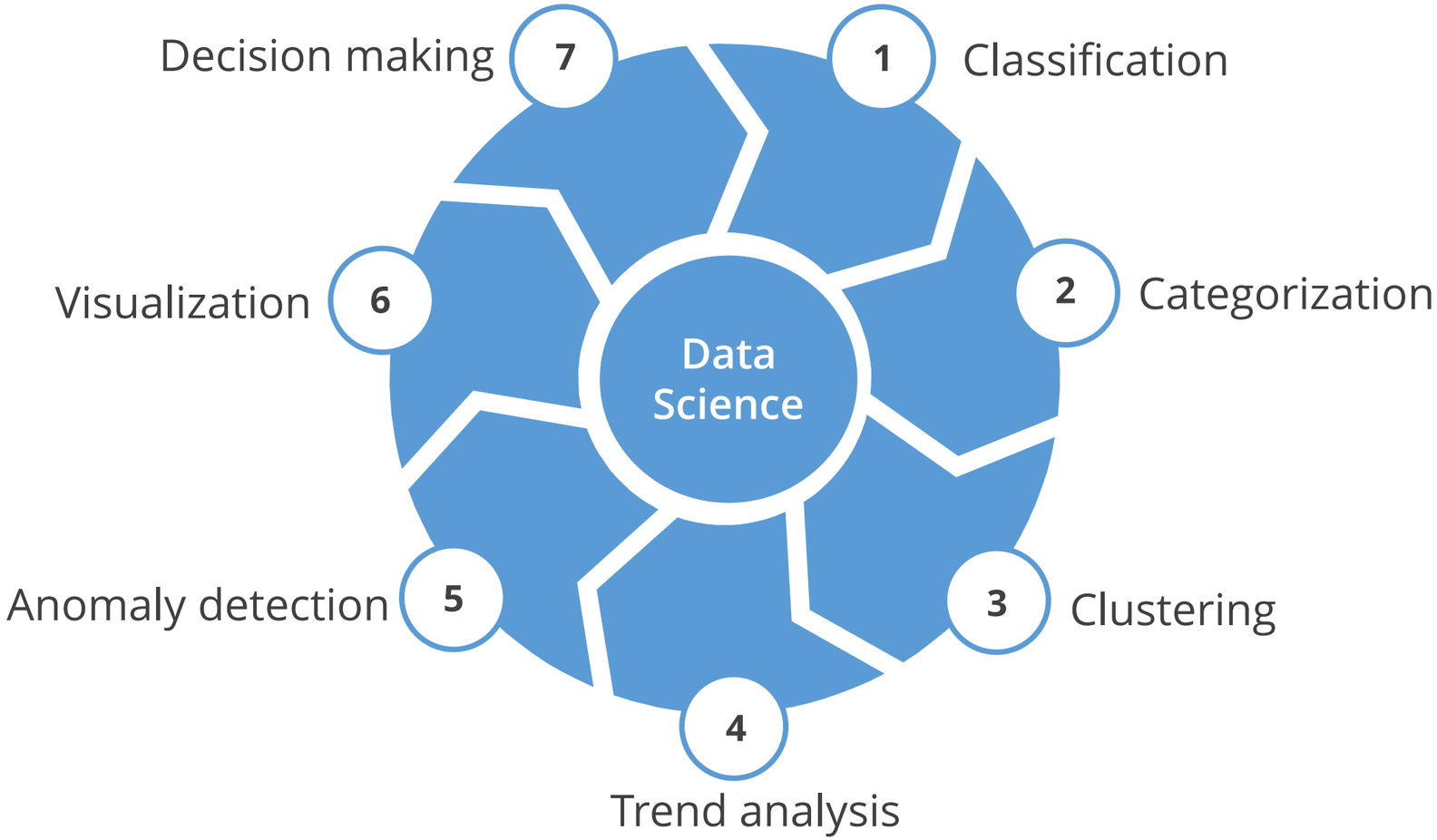
Data Science and Machine Learning go hand in hand. Data Science helps evaluate data for Machine Learning algorithms.

Relationship between Data Science and Machine Learning

- Data science is the use of statistical methods to find patterns in the data.
- Statistical machine learning uses the same math and techniques as data science.
- These techniques are integrated into algorithms that learn and improve on their own.
- Machine Learning facilitates Artificial Intelligence as it enables machines to learn from the patterns in data.

Machine Learning Techniques

Machine Learning uses a number of theories and techniques from Data Science:



Machine Learning Algorithms

- Machine Learning can learn from labelled data (known as supervised learning) or unlabelled data (known as unsupervised learning).
- Machine Learning algorithms involving unlabelled data, or unsupervised learning, are more complicated than those with the labelled data or supervised learning.
- Machine Learning algorithms can be used to make decisions in subjective areas as well.

  Examples:

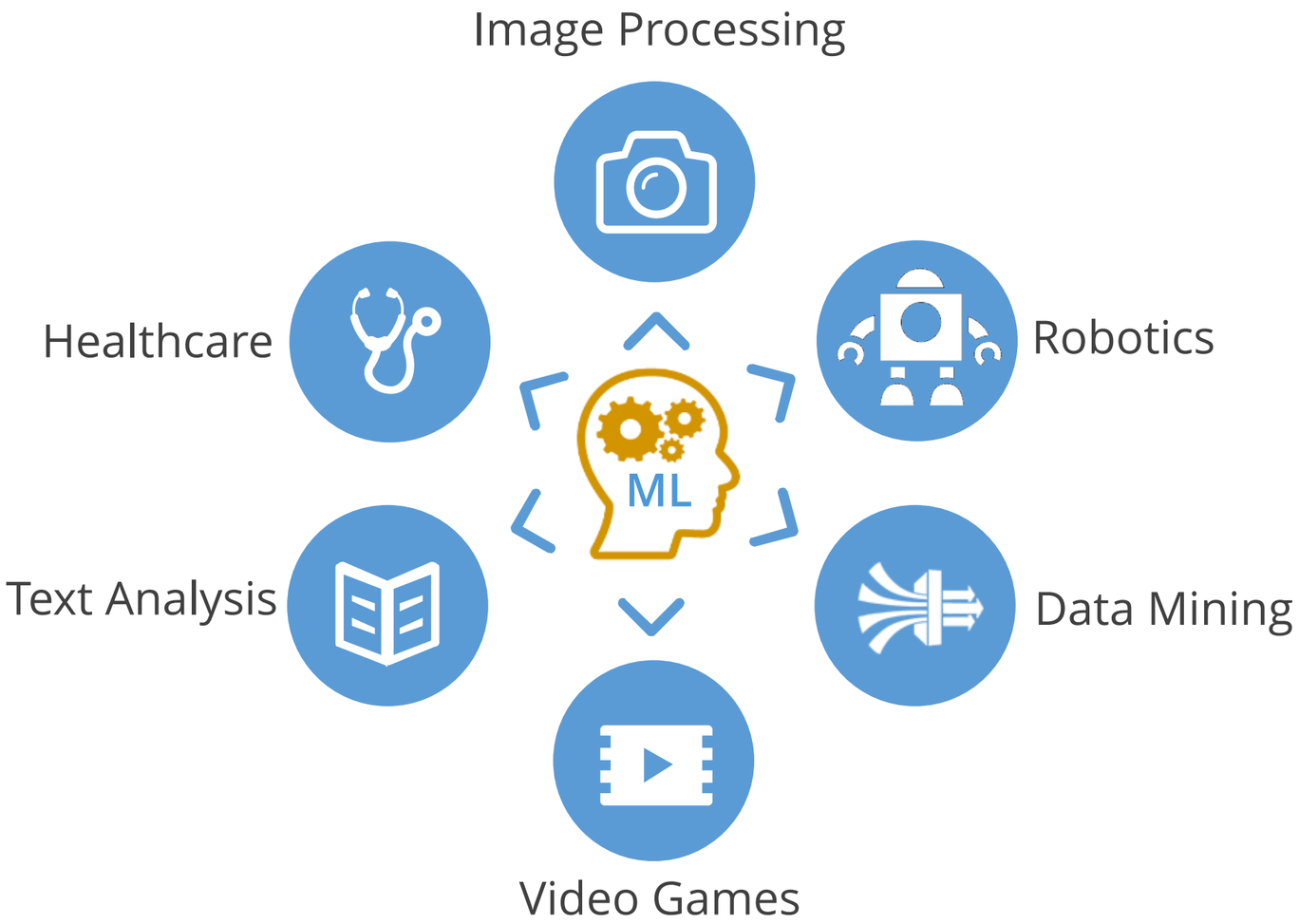
  - Logistic Regression can be used to predict which party will win at the ballots.
  - Naïve Bayes algorithm can separate valid emails from spam.

Introduction to Artificial Intelligence and Machine Learning

Topic 4: Applications of Machine Learning

Applications of Machine Learning

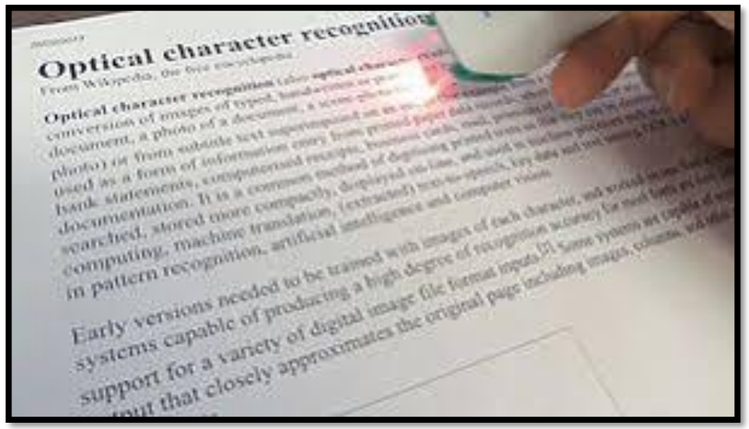
Artificial intelligence and Machine learning is being increasingly used in various functions such as:



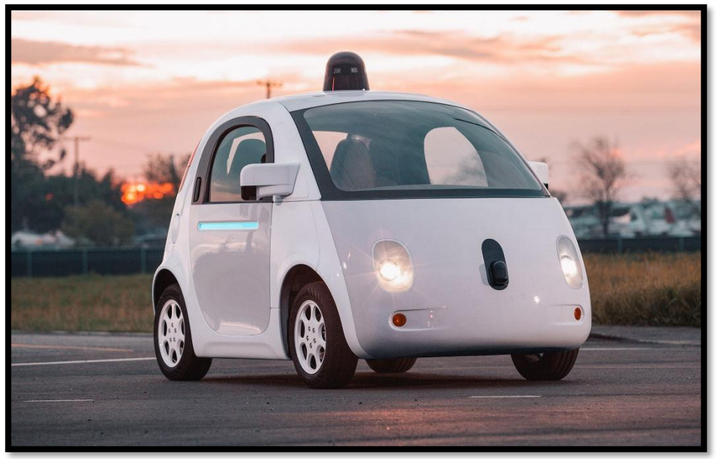
Applications of Machine Learning

Image Processing

Image tagging and recognition



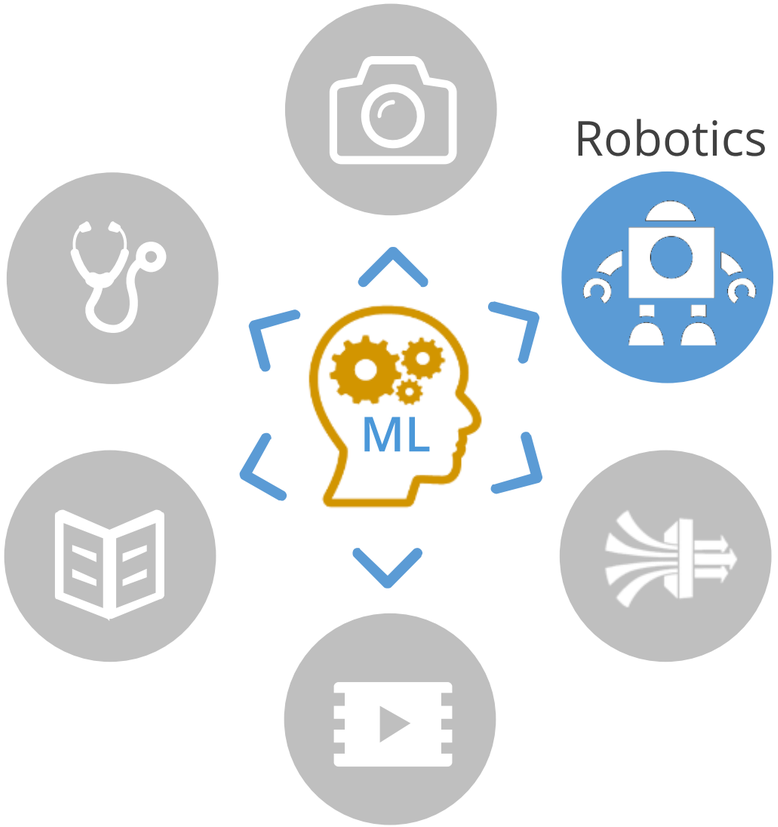
Optical Character Recognition (OCR)



Self-driving cars

Sources: Quora, documentarytube, Wikipedia

Applications of Machine Learning



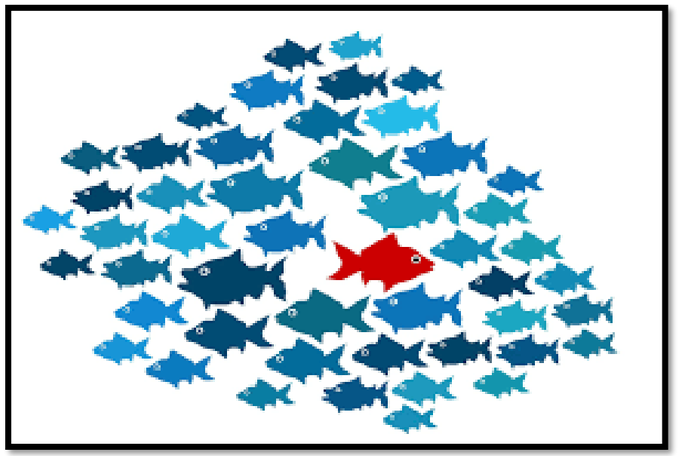
Human simulation

Industrial robotics

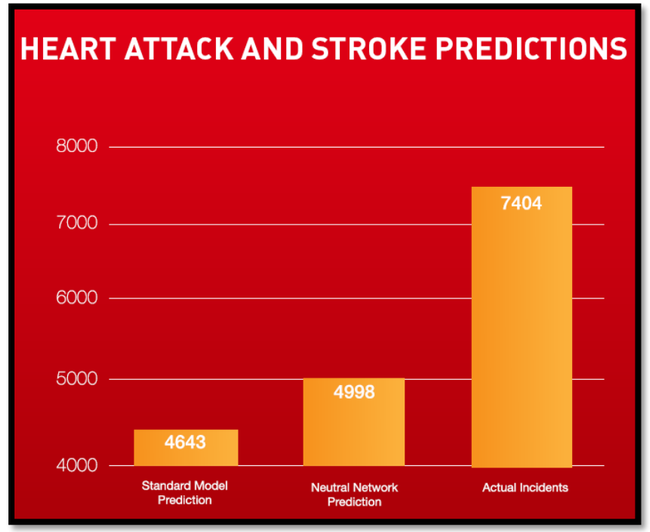
Sources: uiowa.edu, LinkedIn, Hilton

Applications of Machine Learning

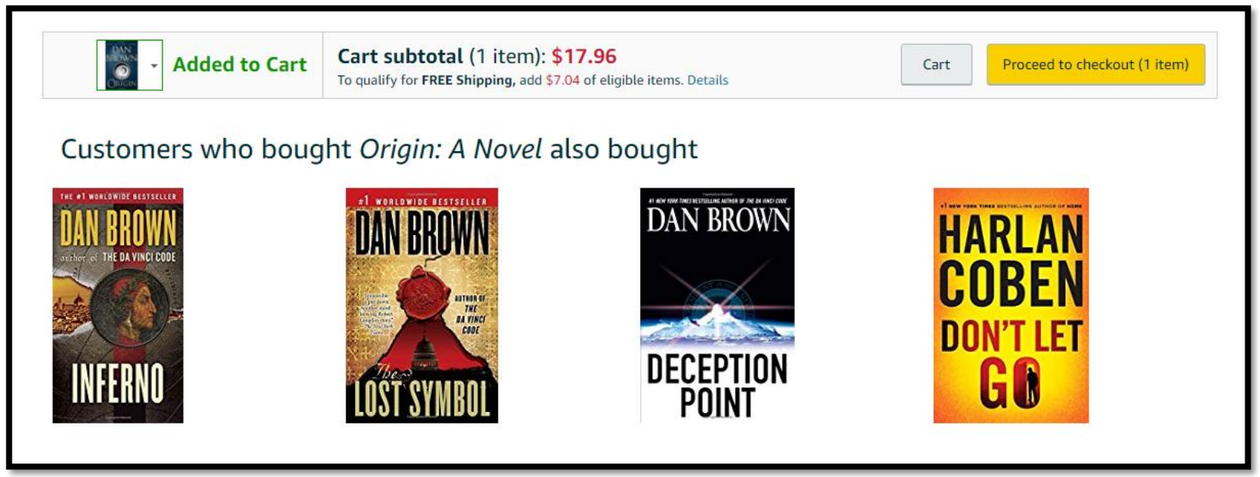
Data Mining



Anomaly detection



Grouping and Predictions



Association rules

Sources: dbta, Futurism

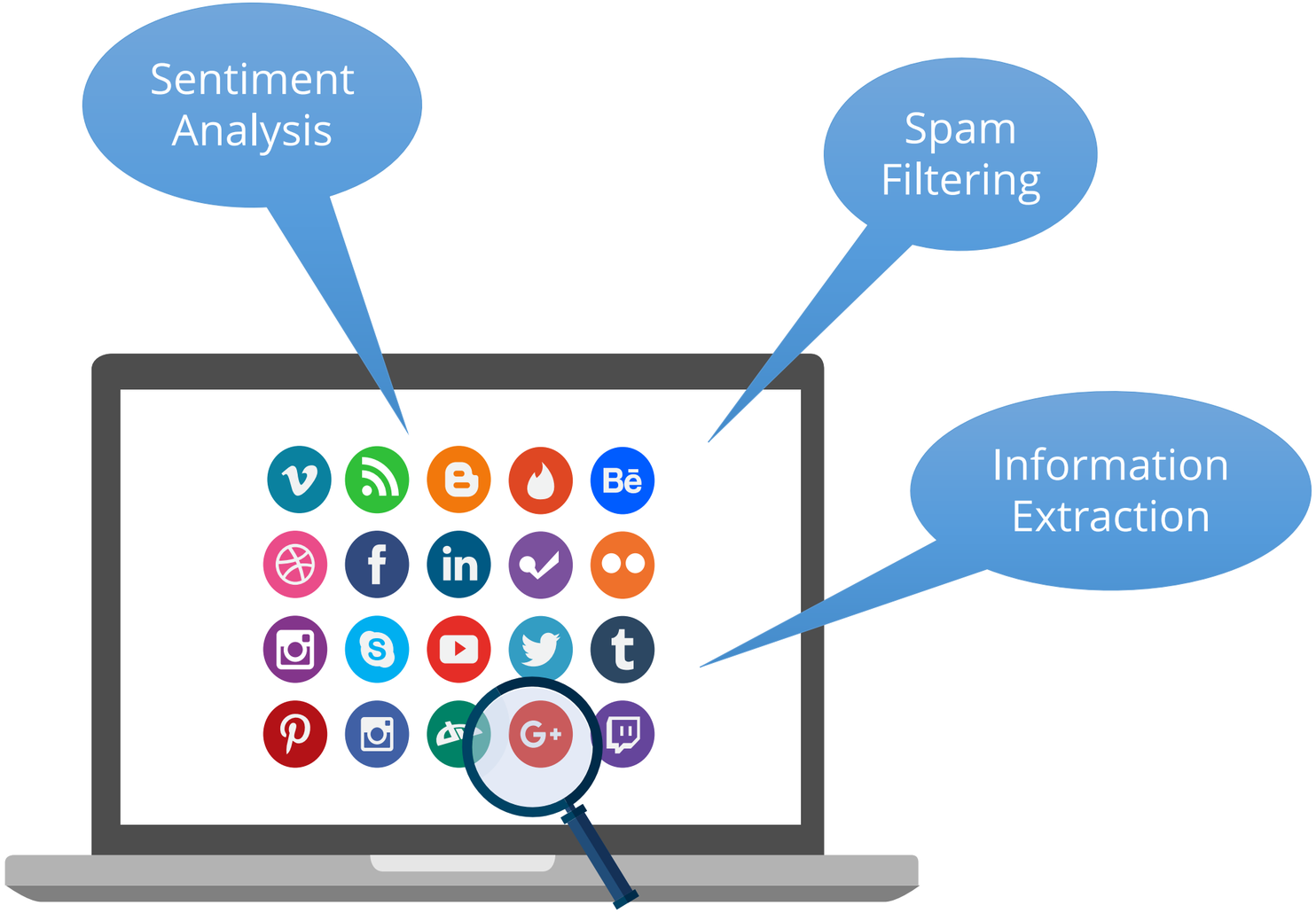
Applications of Machine Learning

Video Games

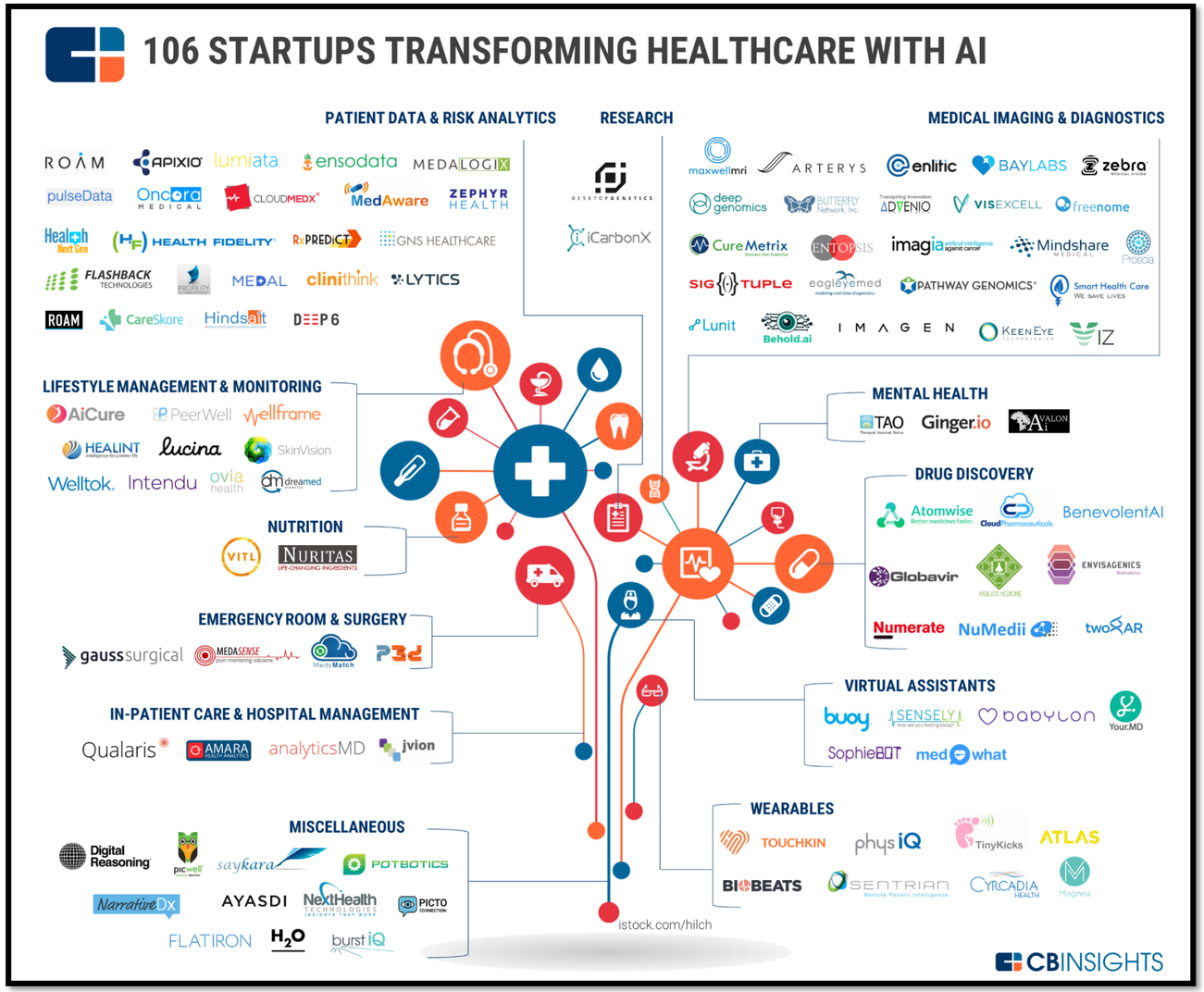
Some games implement reinforcement learning

Sources: Quora

Applications of Machine Learning



Applications of Machine Learning



Source: cbinsights

Key Takeaways

- The explosion of data has given rise to a new economy known as the Data Economy.
- AI refers to the intelligence in machines that simulates human intelligence.
- The capability of AI systems to learn by extracting patterns from data is known as Machine Learning.
- Statistical machine learning uses the same math and techniques as data science.
- Artificial intelligence and Machine learning are being increasingly used in various functions such as image processing, text analysis, healthcare, data mining, robotics, and video games.

Quiz

QUIZ 1

Machine Learning is _____.

a. An autonomous acquisition of knowledge through the use of algorithms

b. An autonomous acquisition of knowledge through the use of manual programs

c. A selective acquisition of knowledge through the use of computer programs

d. A selective acquisition of knowledge through the use of manual programs

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The correct answer is **a.**

Machine learning is an autonomous acquisition of knowledge through the use of algorithms and extraction of patterns from data.

QUIZ 2

What is the difference between traditional programming and Machine Learning?

a. Traditional programming was based on permutations and combinations.

b. Machine Learning is a branch of traditional analytics.

c. Traditional programming uses software programs, whereas Machine Learning uses hardware solutions.

d. Traditional programming uses hard-coded rules to make decisions, whereas Machine Learning learns from data.

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The correct answer is **d.**

Traditional programming uses hard-coded rules to make decisions, whereas Machine Learning learns from data by extracting patterns from it.

This concludes “Introduction to Artificial Intelligence and Machine Learning.”

The next lesson is “Techniques of Machine Learning.”