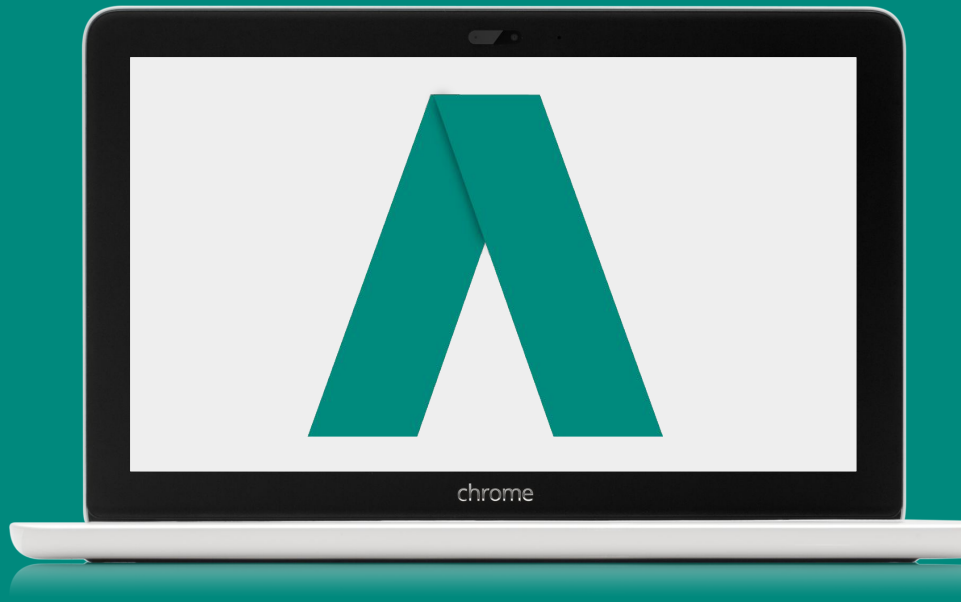
Introduction to Machine Learning



What is **Machine Learning?**

Our emphasis so far in the course has been on the domain of descriptive data analysis, where historical data is used to answer the question:
"What has happened?"

In contrast, Machine Learning is used for predictive and prescriptive analytics.

It uses past data to predict and forecast future outcomes.

Put simply, it tries to answer the question, **“What could happen?”**

Definition of **Machine Learning**

So, what is Machine Learning?

Machine Learning (ML) is a subfield of Artificial Intelligence (AI).

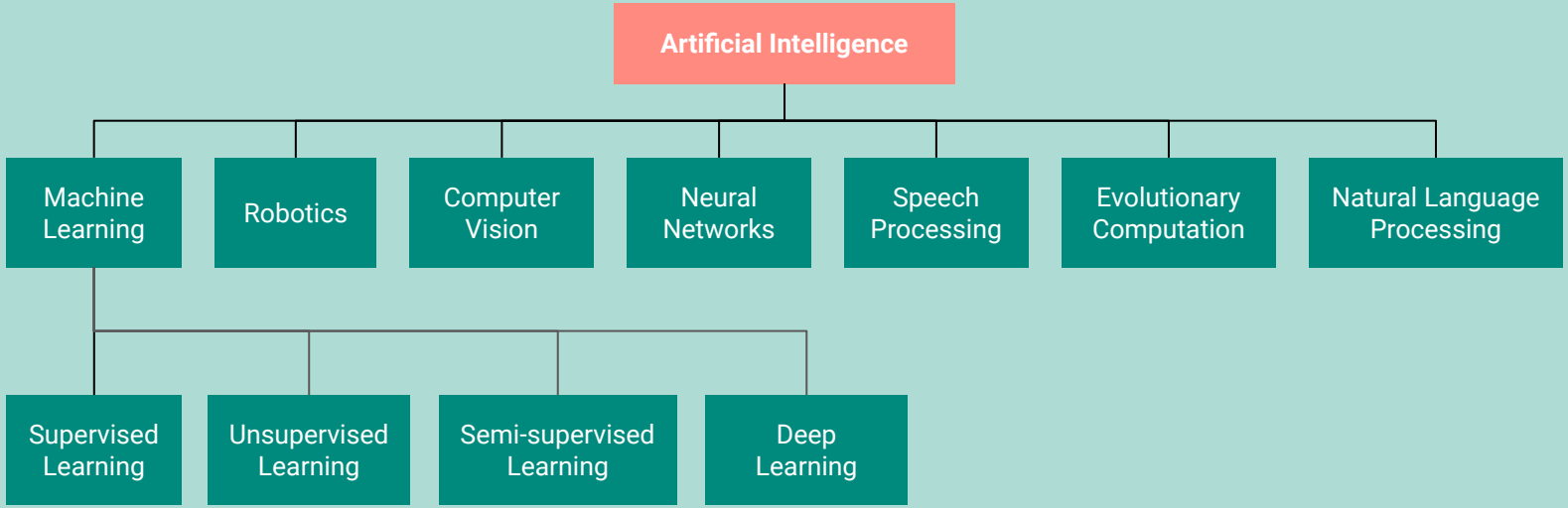
The fundamental idea is that machines process extensive datasets, autonomously "learn" using algorithms, and when confronted with new data, they can make decisions.

In simple terms: ML allows programs to **learn to recognize patterns on its own and make predictions.**

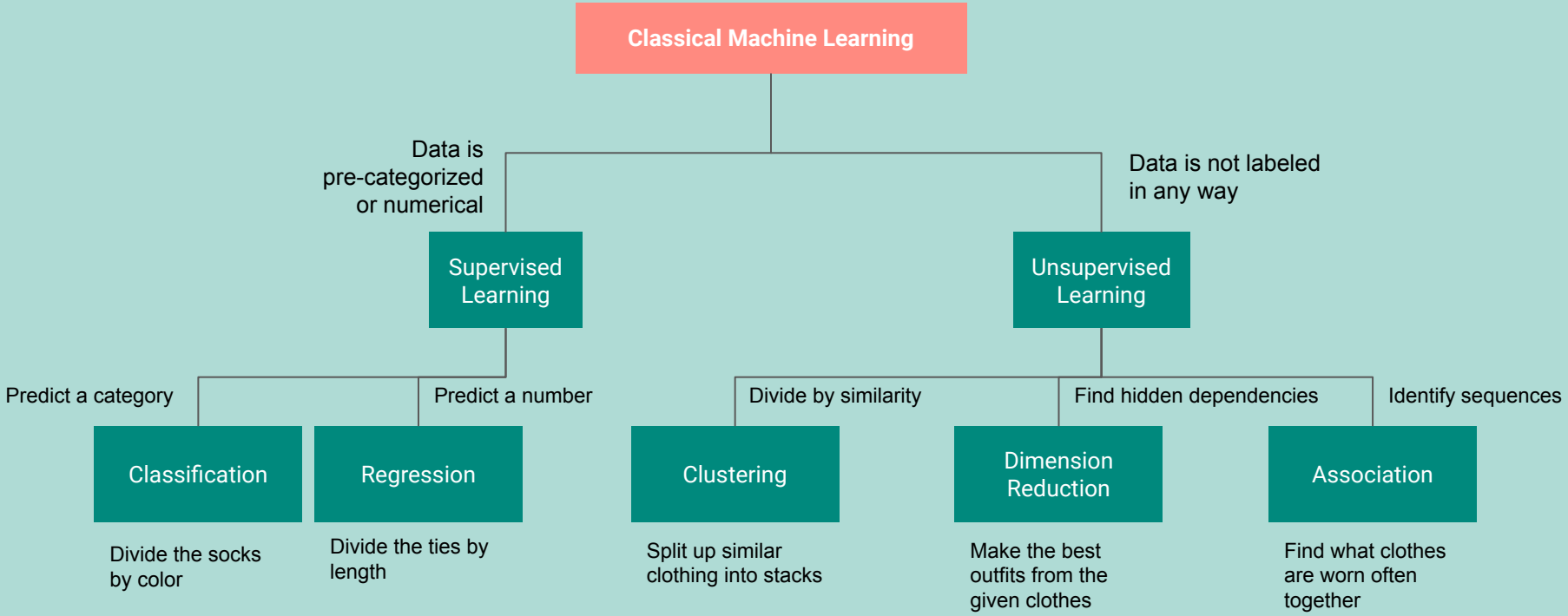
Artificial Intelligence vs Machine Learning

Artificial Intelligence	Machine Learning
Overarching field	Subset of AI
The goal is to simulate human intelligence to solve complex problems	The goal is to learn from data and be able to predict results when new data is presented
Leads to intelligence or wisdom	Leads to knowledge
Tries to find the optimal solution	Tries to find the only solution whether it is optimal or not

Subfields of Artificial Intelligence



General models of Machine Learning

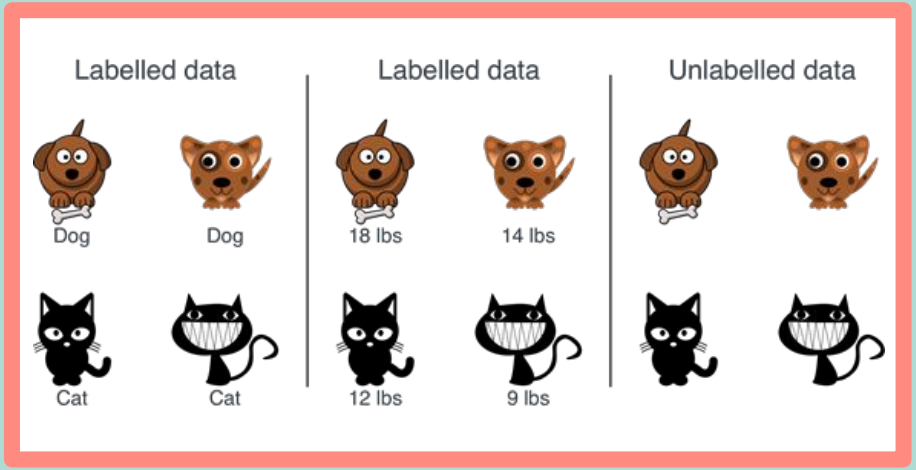


Labeled and unlabeled data

A label refers to the **prediction we're trying to achieve based on other features** in the data set. A label can then be something as simple as a Yes/No answer, the predicted price of a car, or recognising a dog's breed.

Labeled data is a data point that has **one or numerous informative, meaningful tags.**

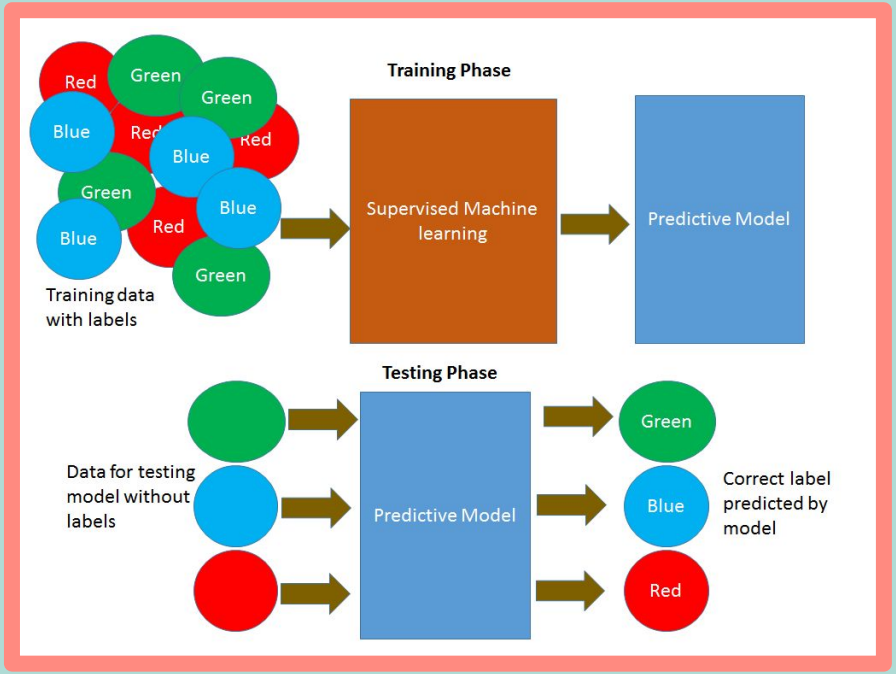
Unlabeled data, on the other hand, refers to data that comes **without those information tags.**



Different types of ML

1. Supervised learning:

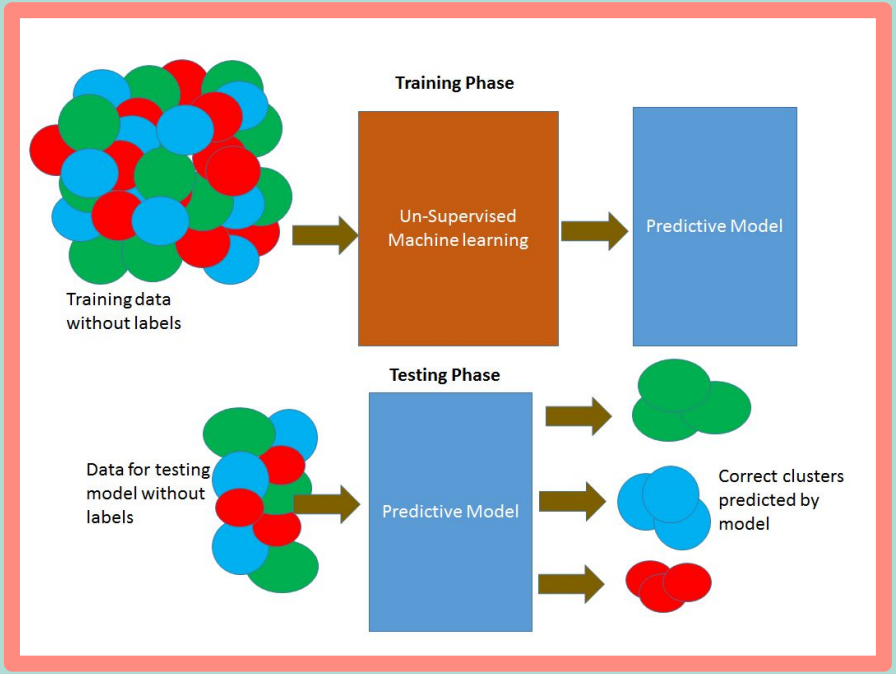
- The ML algorithm is provided with a known **labeled dataset** that includes **desired inputs and outputs;**
- The algorithm **identifies patterns in data, learns from observations and makes predictions**;
- The operator **corrects the algorithm**;
- The **process continues** until a high level of accuracy/performance is achieved.



Different types of ML

2. Unsupervised learning:

- The ML algorithm is fed a **dataset with no tags and no instructions**. The algorithm is left to identify patterns and relationships **by itself**;
- The algorithm **creates a structure to organise the data**;
- The decision-making process repeats itself with new data and becomes more refined.



Different types of ML

3. Semi-supervised learning: Similar to supervised learning, but instead uses both labelled and unlabelled data.

4. Reinforcement learning:

- The ML is provided with a set of actions, parameters and end values;
- The algorithm uses the rules provided and explores different possibilities to achieve the end results and picks the optimal one;
- The algorithm repeats the process, learning from past experience, and adapts its approach accordingly (trial and error)