Machine Learning

Machine Learning (ML) is a field of study that gives computers the ability to learn without being explicitly programmed.

Detecting Spam Emails

An email:

- Spam
- Not spam

Depends on the user

There's no implementation

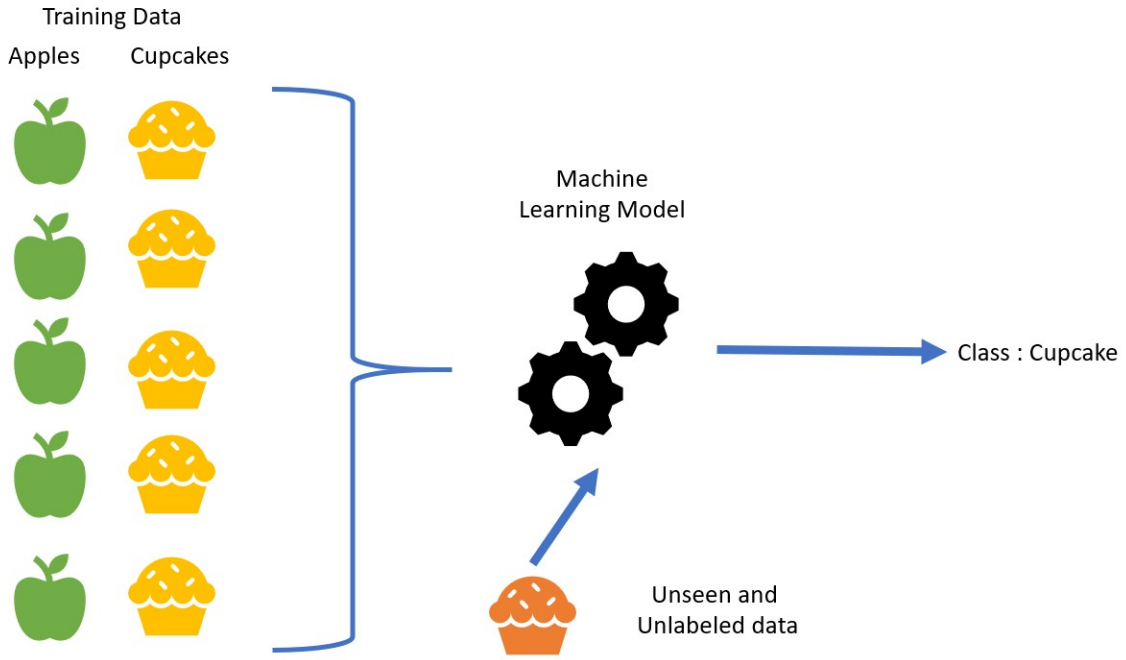
Spam Email Detection

- 10,000 emails
  - Spam emails
  - Not spam emails
- 10,001th email
  - Spam or not spam?

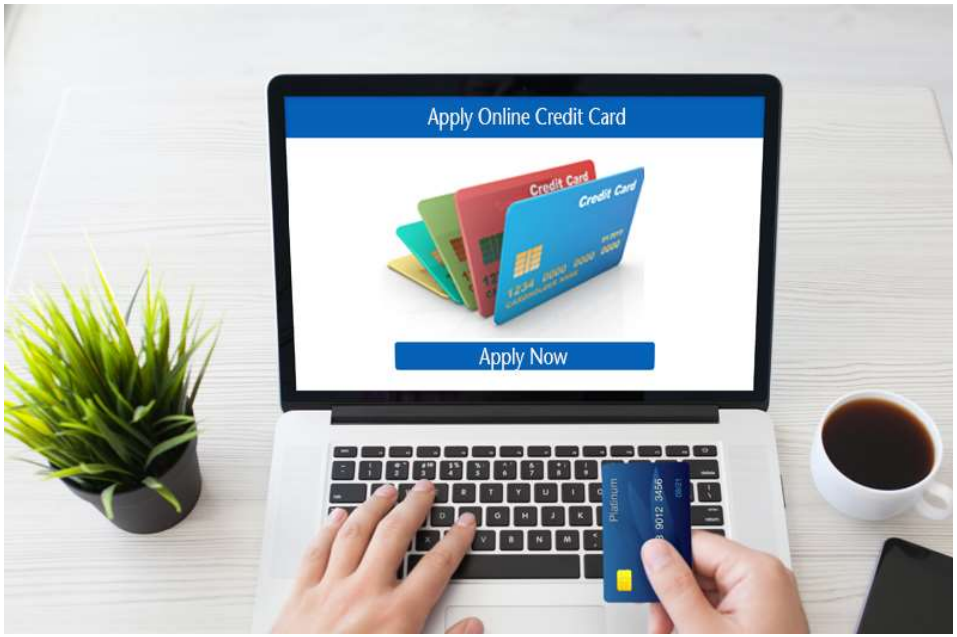
- ML algorithms use historical data as input to predict new output values

Supervised Learning

- Supervised Learning is a type of ML, where machines are trained using labeled data, and based on the labeled data, machines predict the output.



Supervised Learning Example



Age	Income	Occupation	Credit Score	Approve?
35	$80K	Engineer	731	Yes
54	$50K	Teacher	740	Yes
21	$20K	Student	658	No
23	$100K	Data Scientist	690	Yes
…	…	…	…	…
25	$40K	Sales Rep.	695	???

- Labels: Yes/No

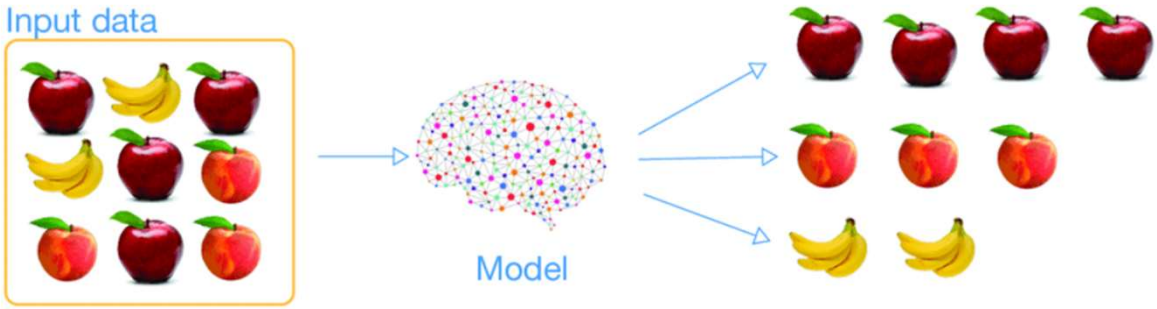
Supervised Learning Types

1) Classification
    - Binary Classification: Dividing data into two categories
        - Ex: Credit card application
            - Approve or Deny
    - Multi-class Classification: Classifying into multiple categories
        - Ex: Weather prediction
            - Sunny, Rainy, Snowing, etc.

2) Regression: Predicting continuous values
    - Ex: House price prediction
        - $500K, $750K, $1M, etc.

Unsupervised Learning

- Unsupervised Learning uses ML algorithms to analyze and cluster unlabeled data.
- The algorithms discover patterns in data without human help.



Unsupervised Learning Example

Supermarkets use unsupervised learning algorithms

- Basket analysis via association rule algorithm

Machine Learning

- To design a learning system, we must know the TPE factors:
  - **T**ask
  - **P**erformance Measure
  - **E**xperience (Training)
- Spam email detection learning problem:
  - Task T: To recognize and classify emails into 'spam' or 'not spam'.
  - Performance measure P: Total percent of emails being correctly classified as 'spam' (or 'not spam') by the program.
  - Experience E: A set of emails with given labels ('spam' / 'not spam')