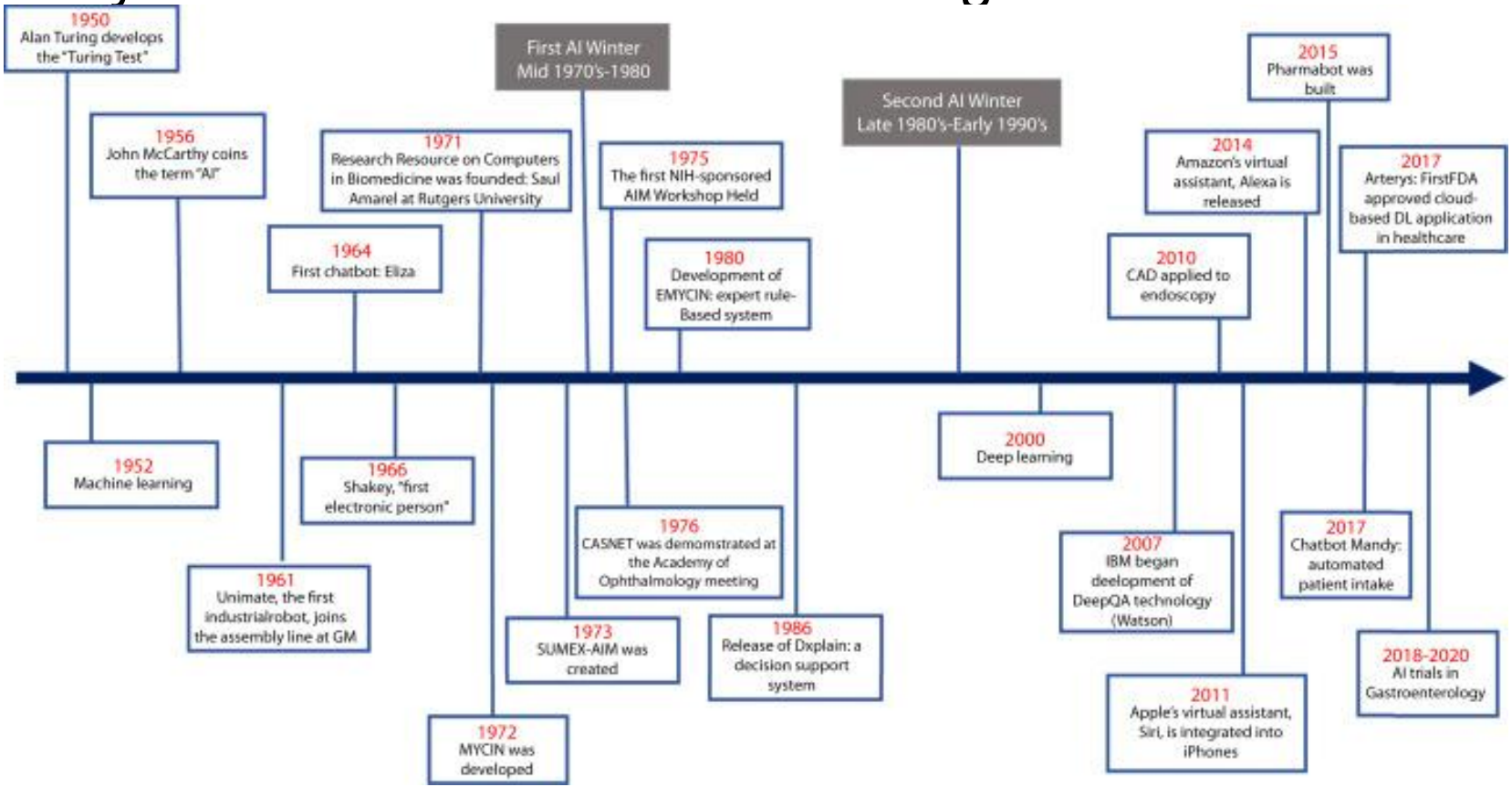
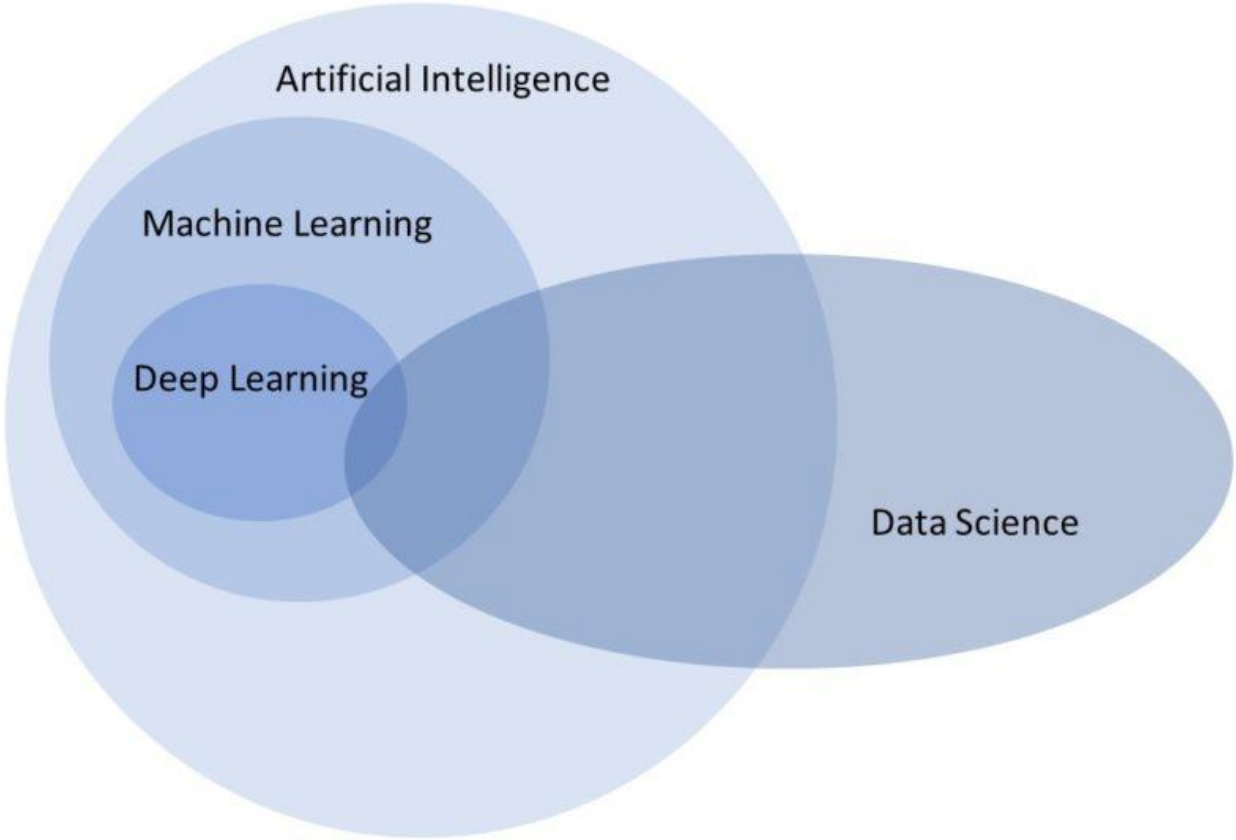
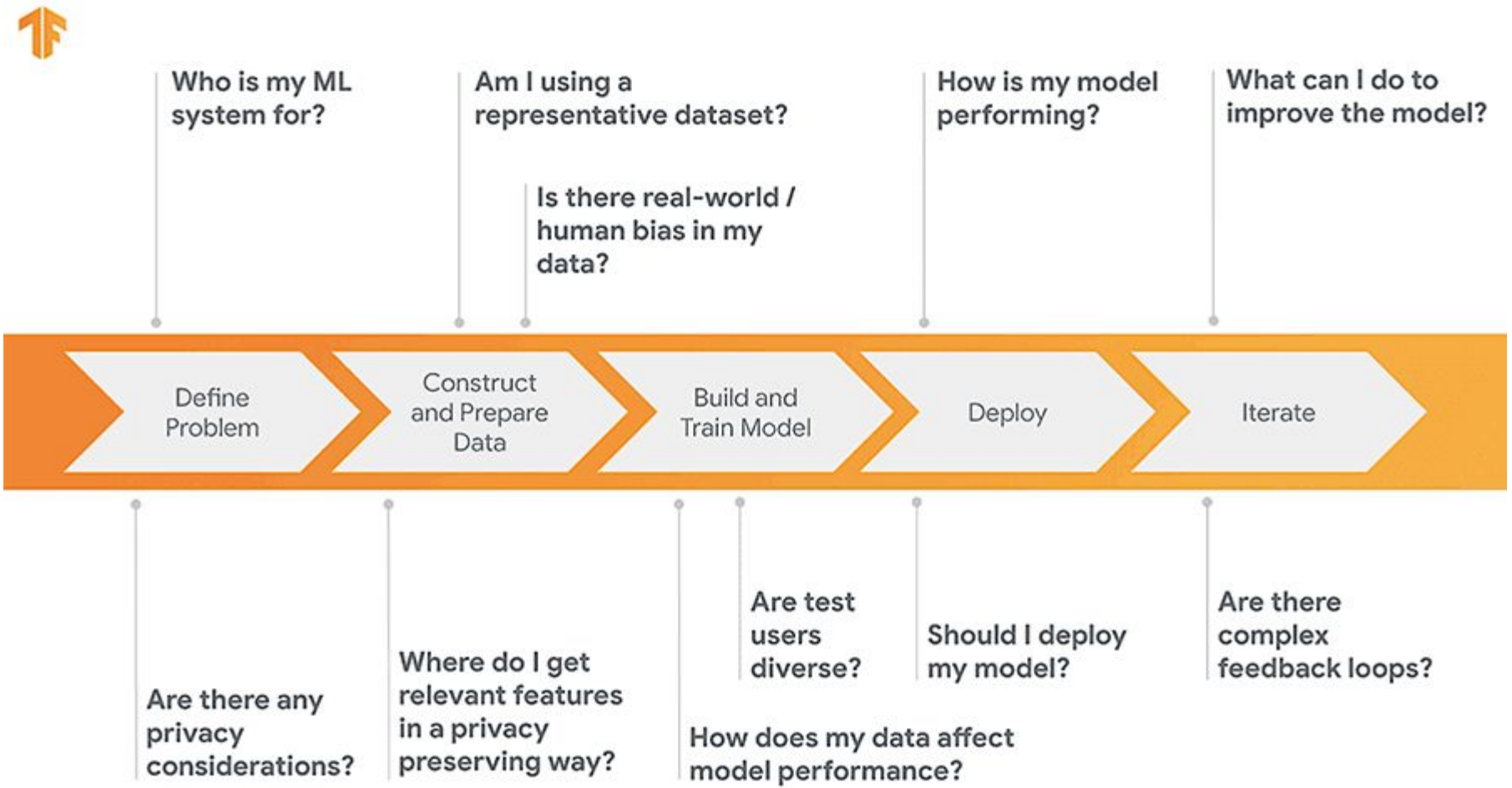
MIDS W207
Applied Machine Learning

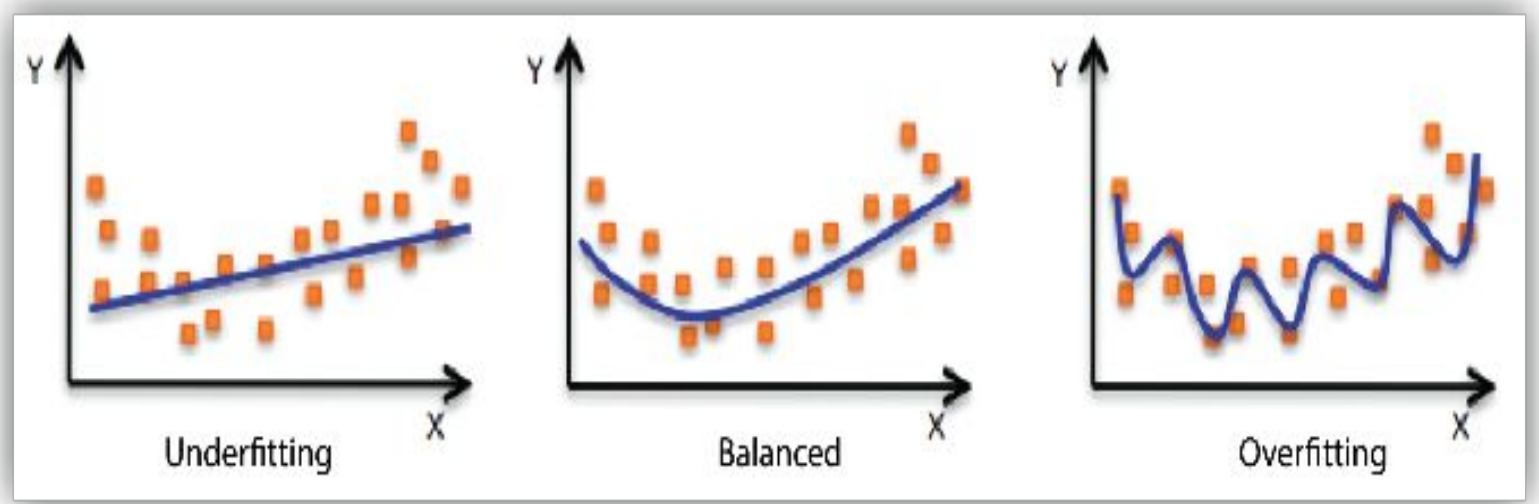
Summer 2023
Week 01

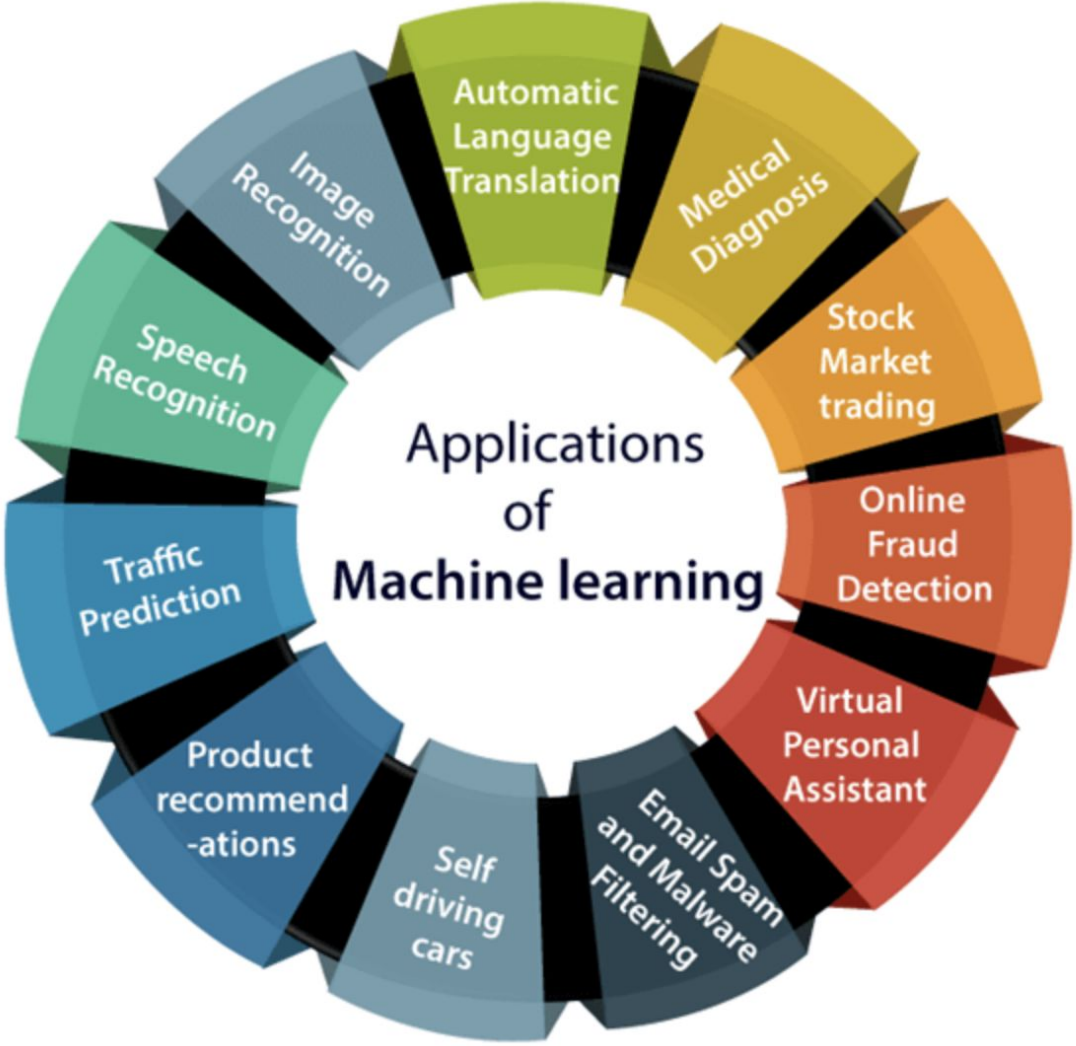
History and Timeline of Artificial Intelligence

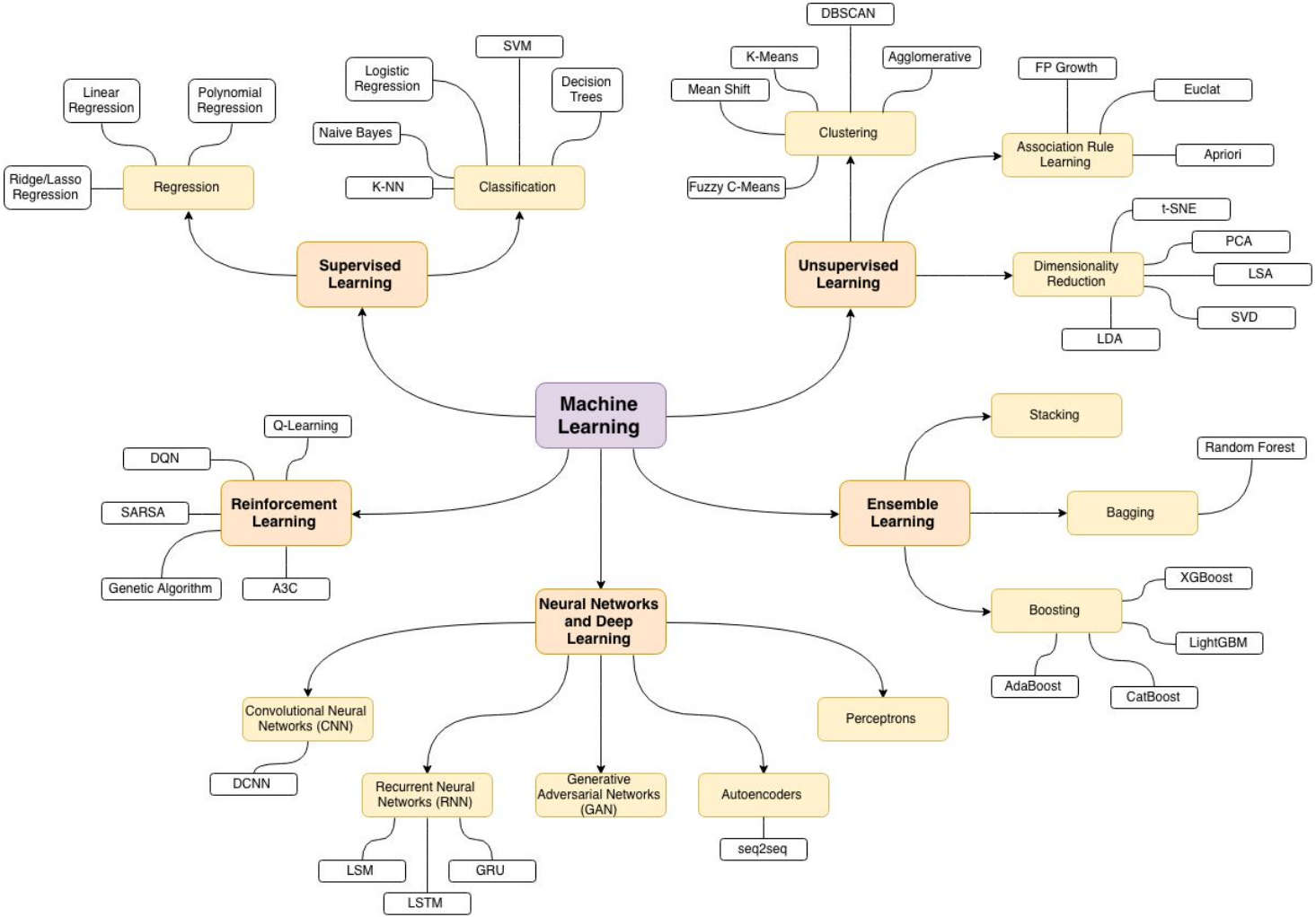



Artificial Intelligence
Machine Learning
Deep Learning
Data Science


Who is my ML system for?
Am I using a representative dataset?
Is there real-world / human bias in my data?
How is my model performing?
What can I do to improve the model?
Define Problem
Construct and Prepare Data
Build and Train Model
Deploy
Iterate
Are there any privacy considerations?
Where do I get relevant features in a privacy preserving way?
How does my data affect model performance?
Are test users diverse?
Should I deploy my model?
Are there complex feedback loops?


Y
X
Underfitting
Y
X
Balanced
Y
X
Overfitting


Applications
of
Machine learning
Automatic Language Translation
Medical Diagnosis
Stock Market trading
Online Fraud Detection
Virtual Personal Assistant
Email Spam and Malware Filtering
Self driving cars
Product recommend -ations
Traffic Prediction
Speech Recognition
Image Recognition


Machine Learning
Supervised Learning
Regression
Linear Regression
Polynomial Regression
Ridge/Lasso Regression
Classification
Logistic Regression
SVM
Decision Trees
Naive Bayes
K-NN
Unsupervised Learning
Clustering
DBSCAN
K-Means
Agglomerative
Mean Shift
Fuzzy C-Means
Association Rule Learning
FP Growth
Euclat
Apriori
Dimensionality Reduction
t-SNE
PCA
LSA
SVD
LDA
Reinforcement Learning
Q-Learning
DQN
SARSA
Genetic Algorithm
A3C
Neural Networks and Deep Learning
Convolutional Neural Networks (CNN)
DCNN
Recurrent Neural Networks (RNN)
LSM
GRU
LSTM
Generative Adversarial Networks (GAN)
Autoencoders
seq2seq
Perceptrons
Ensemble Learning
Stacking
Bagging
Random Forest
Boosting
XGBoost
LightGBM
AdaBoost
CatBoost

Fundamentals

Supervised Learning

- Makes machine Learn explicitly
- Data with clearly defined output is given
- Direct feedback is given
- Predicts outcome/future
- Resolves classification and regression problems

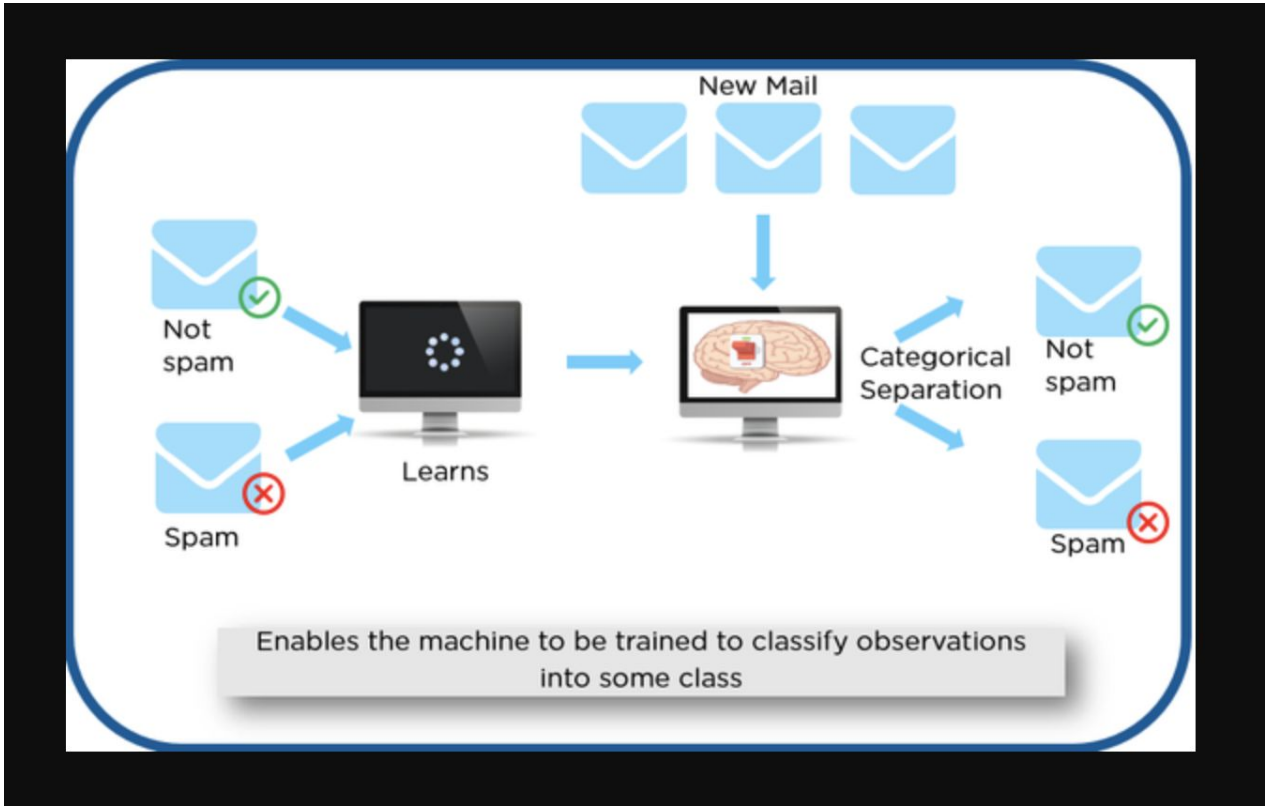
Unsupervised Learning

- Machine understands the data (Identifies patterns/structures)
- Evaluation is qualitative or indirect
- Does not predict/find anything specific

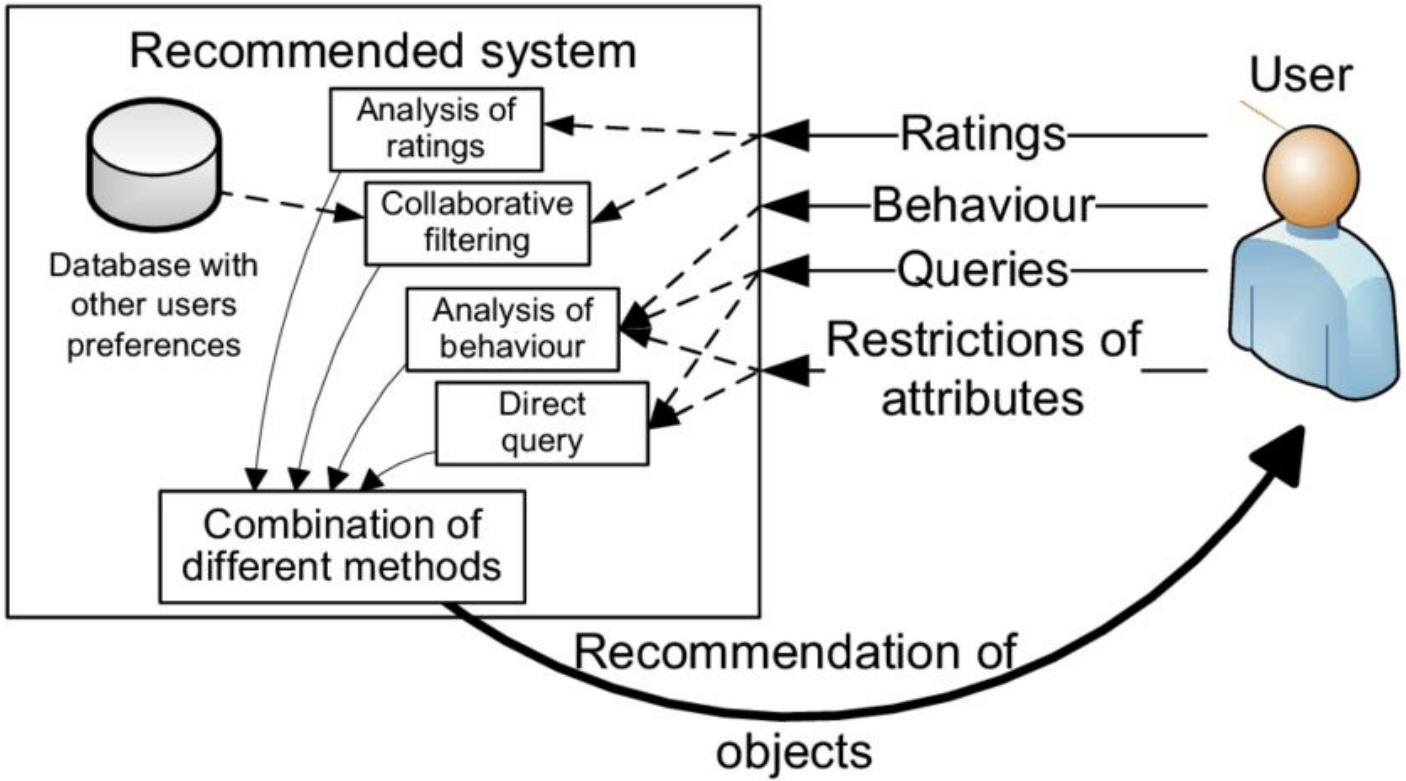
Reinforcement Learning

- An approach to AI
- Reward based learning
- Learning form +ve & +ve reinforcement
- Machine Learns how to act in a certain environment
- To maximize rewards

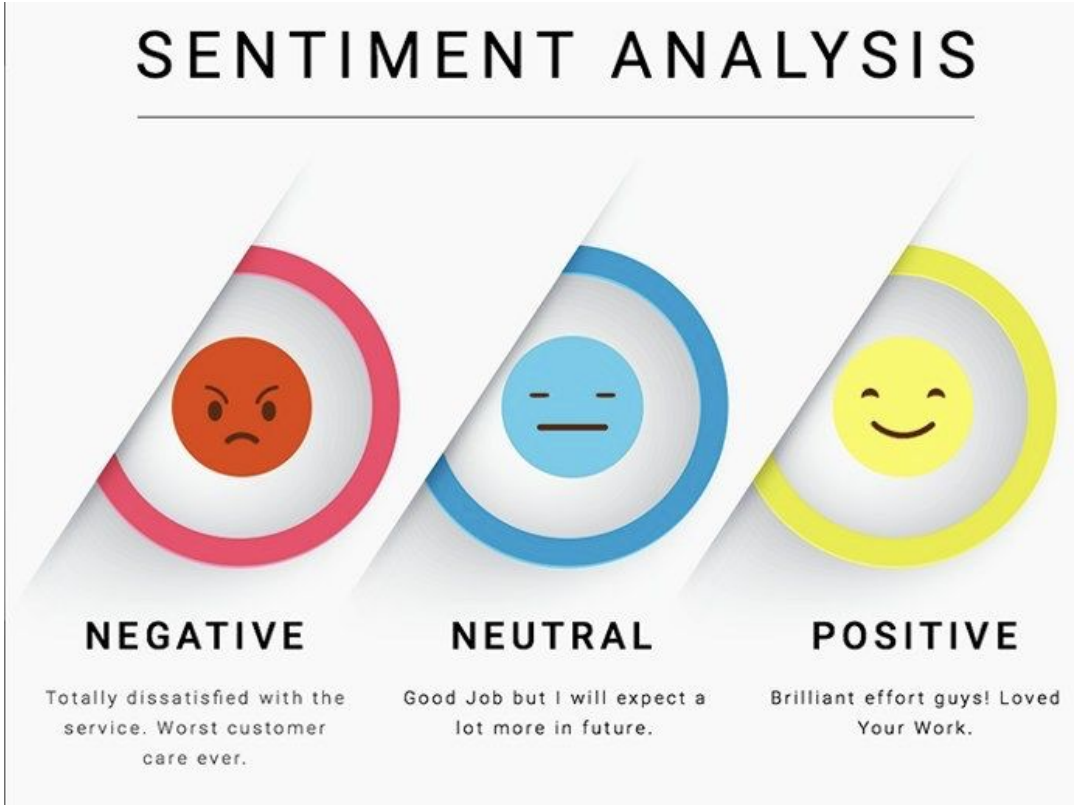
Applications: Spam and Non Spam



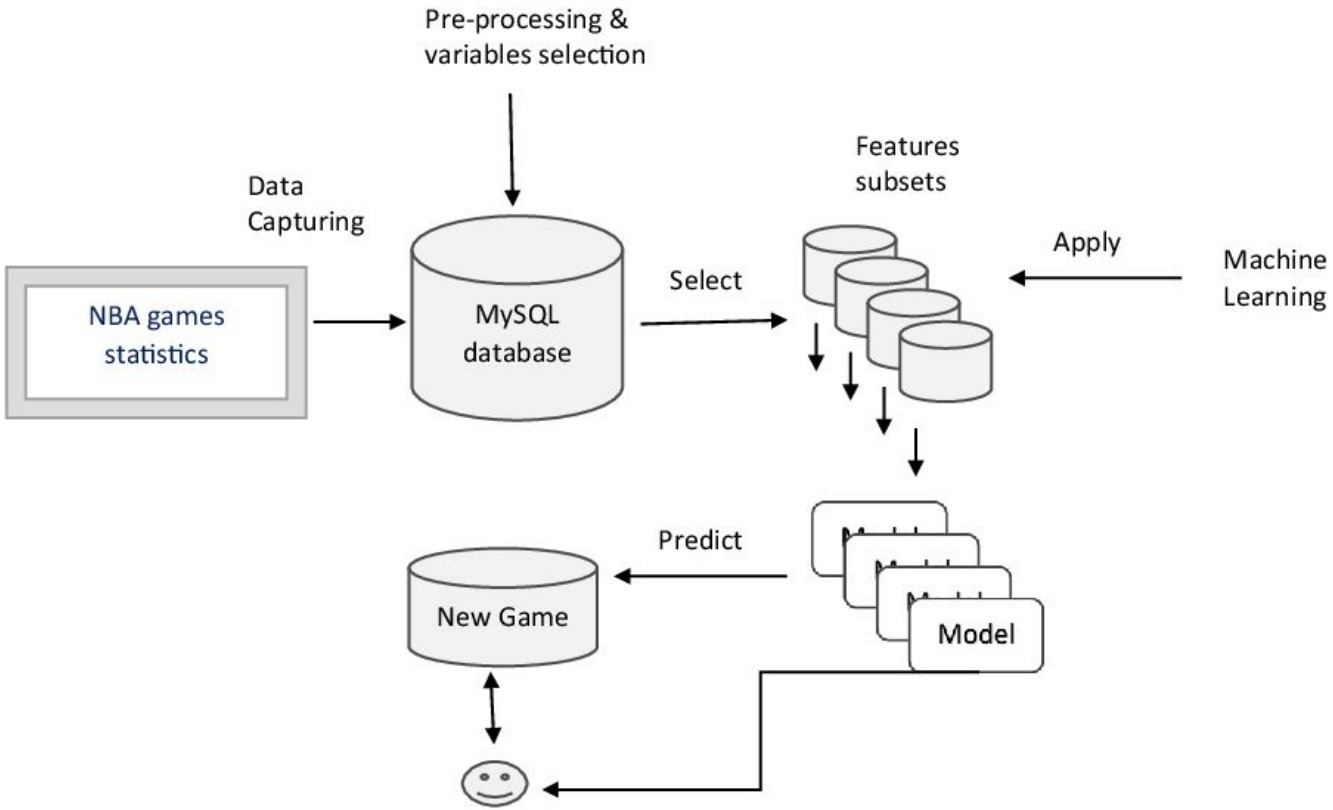
Applications: Recommendation Systems



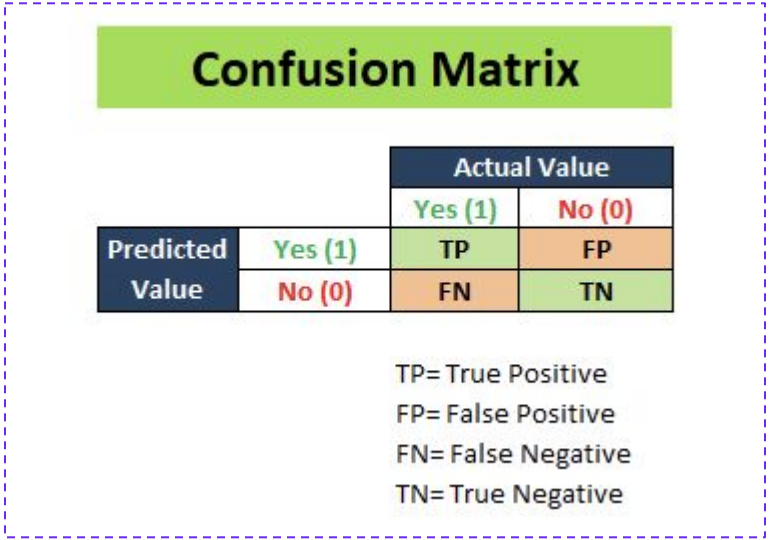
Applications: Sentiment Analysis



Applications: Sports Prediction



Evaluating the Models



- If you have supervised data, you will want to maximize an objective function.
  - **Precision**: $TP \div (TP + FP)$ % positives correctly identifed
  - **Recall**: $TP \div (TP + FN)$ % existing positives identified
  - **Optimal point** on ROC (precision/recall) curve
  - **Accuracy**: $(TP + TN) \div (TP + TN + FP + FN)$
  - **F-test**: $2 \cdot (P \cdot R) \div (P + R)$