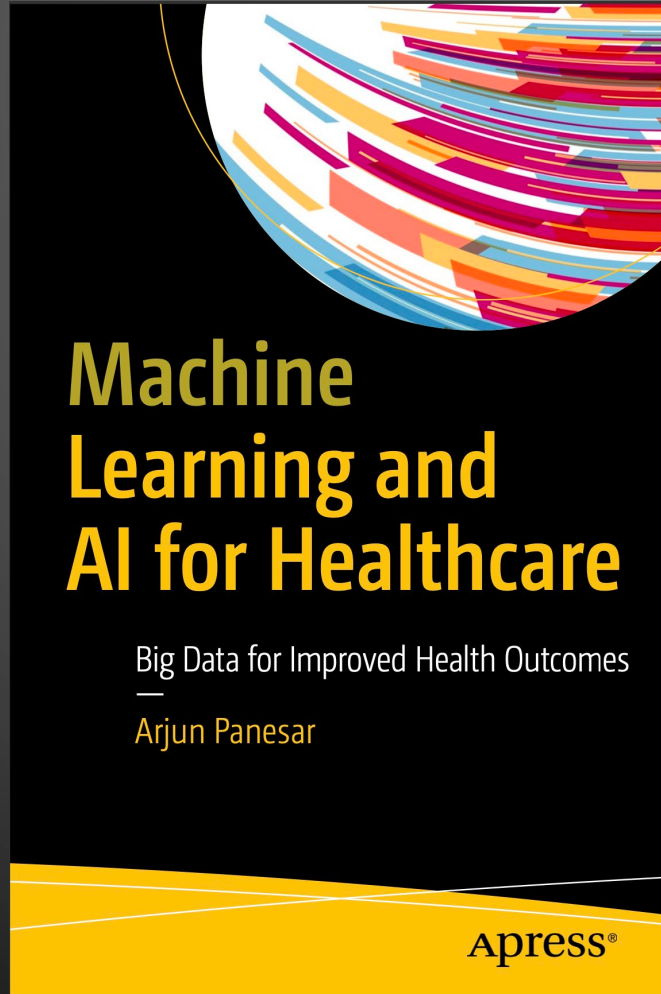
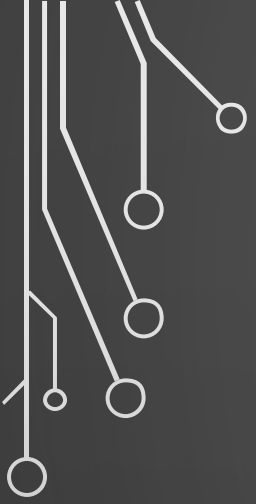


جلسات هفتگی مرور کتاب
مرکز تحقیقات هوش مصنوعی در سلامت
دانشگاه علوم پزشکی ایران

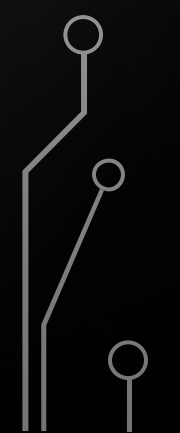


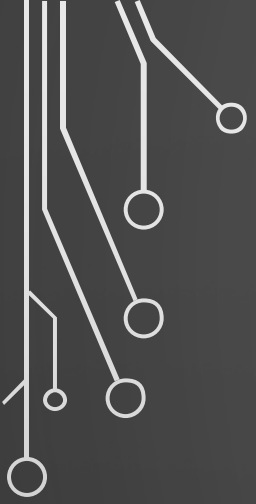
الگوریتم های یادگیری ماشین
علی جلیلیان، پزشک عمومی و پژوهشگر حوزه هوش مصنوعی



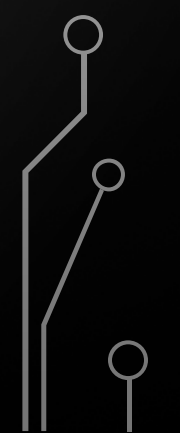
MACHINE LEARNING



- ML is a broad field where computers learn patterns from data to make predictions or decisions without being explicitly programmed for every scenario.
 - Linear regression
 - Logistic regression
 - Neural networks, Deep neural networks
 - Deep learning
 - Decision trees
 - Random forest
 - Support vector machines
 - Natural language processing
- 
- 

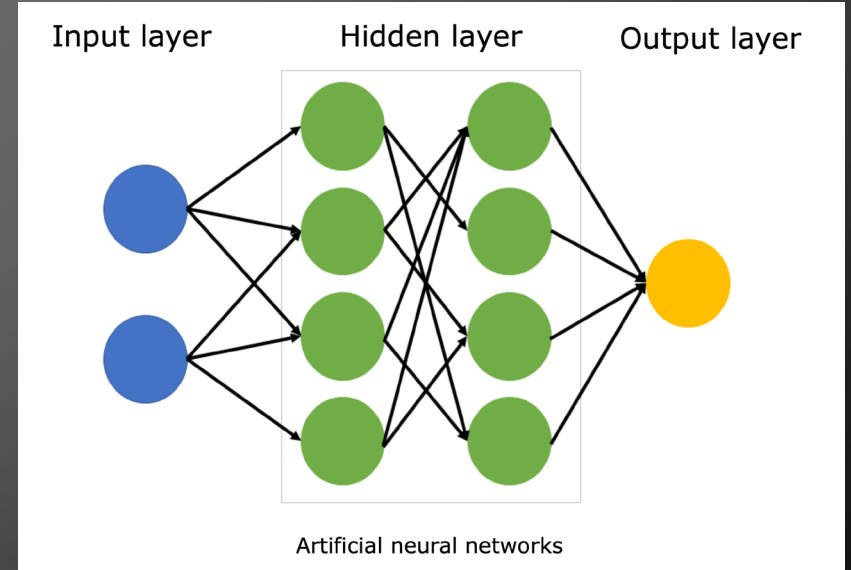


NEURAL NETWORKS TASKS

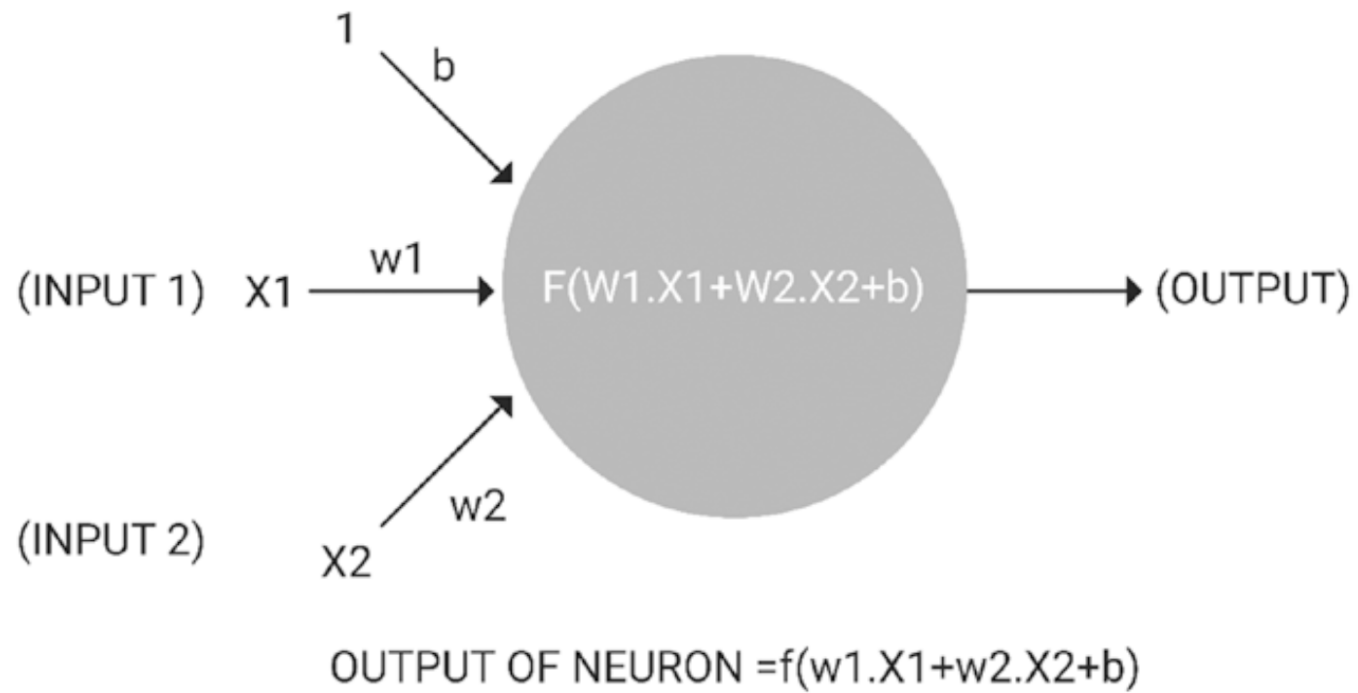
- Classifying disease
 - Image processing
 - Speech recognition
 - Translation and text digitalization
 - Facial recognition
 - Decision making
- 
- 

NEURAL NETWORKS

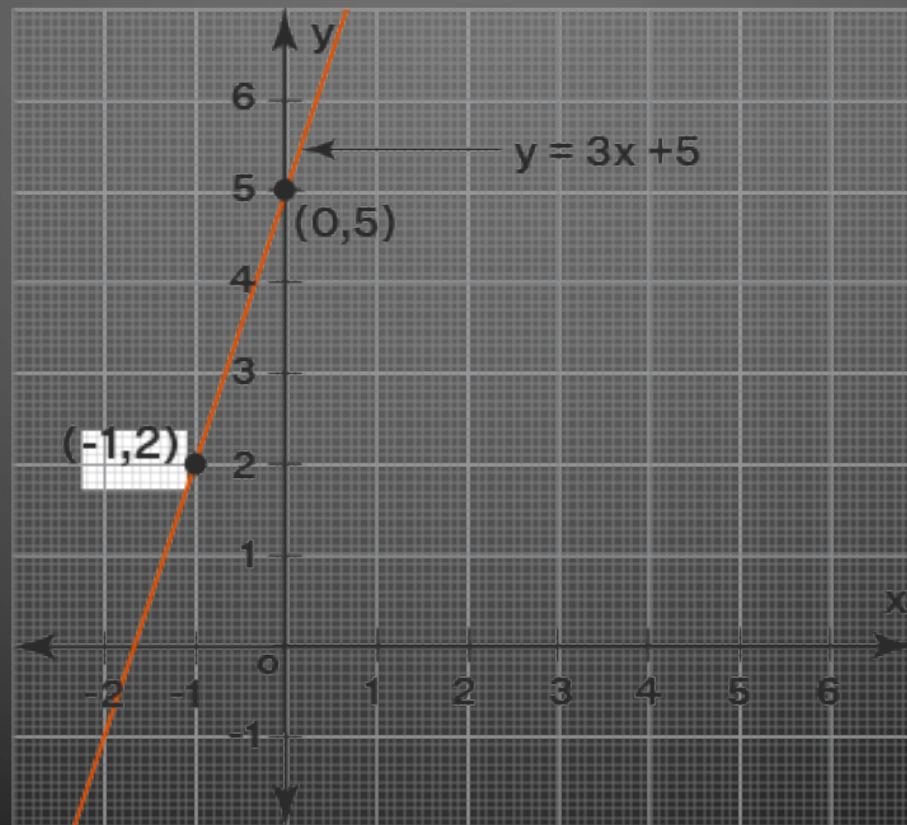
- Feed-forward neural networks
- Modular neural networks
- Convolutional neural networks
- Recurrent neural network
- Long short-term memory neural network
- Radial basis neural network

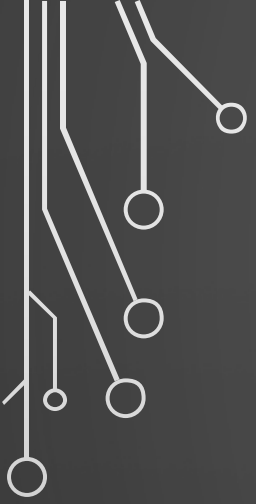


PERCEPTRON

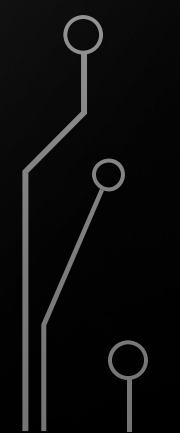


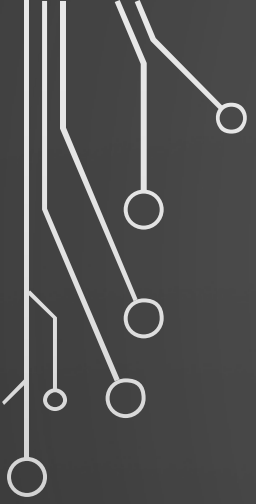
Graph of Linear Function $y = 3x + 5$





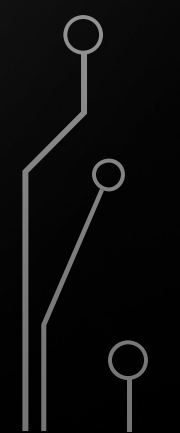
DIFFERENT UNIT FUNCTION TYPES

- Linear
 - Threshold functions
 - Sigma functions
- 
- 

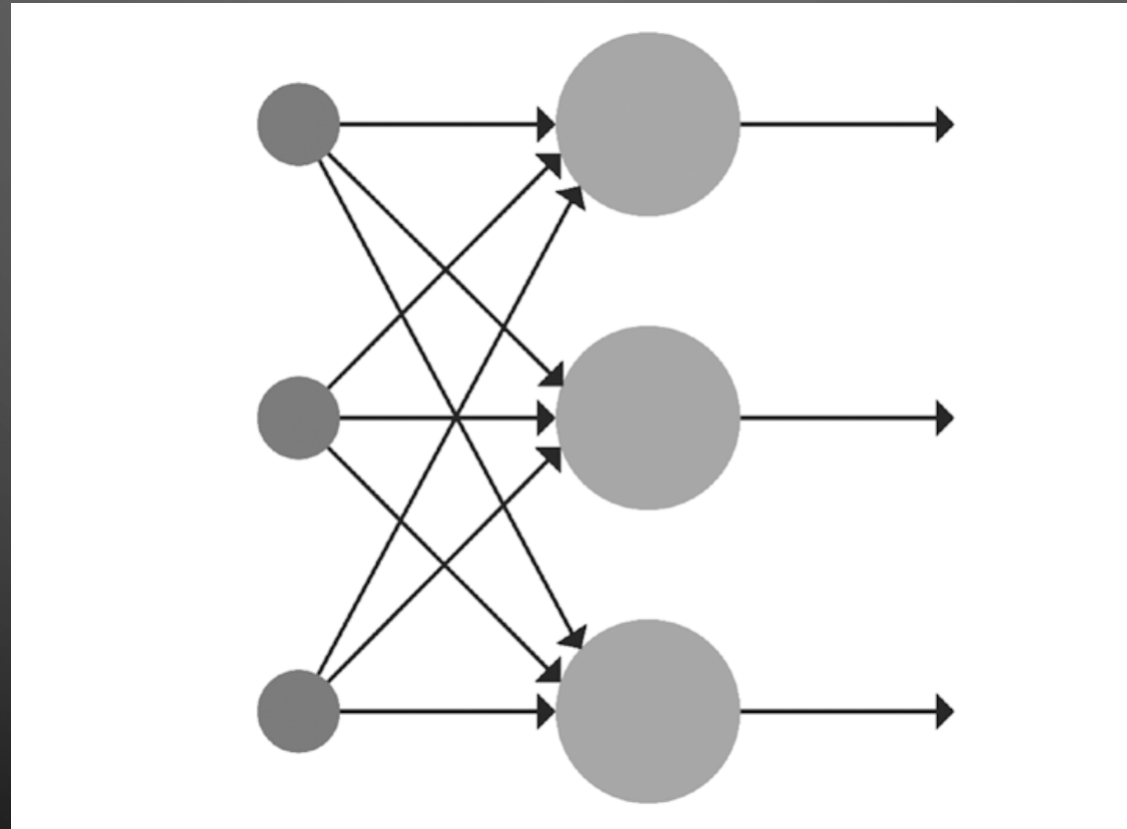


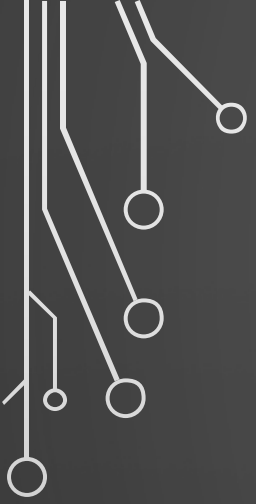
ARTIFICIAL NEURAL NETWORKS



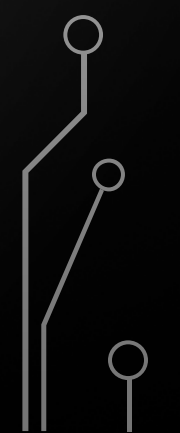
- Backpropagation using an optimization algorithm
 - Adjusting weights
 - Adjusting threshold
 - Adjusting bias
 - Based on the errors of the last test results
 - Deep neural networks and Deep learning
- 
- 

FEED-FORWARD NEURAL NETWORKS

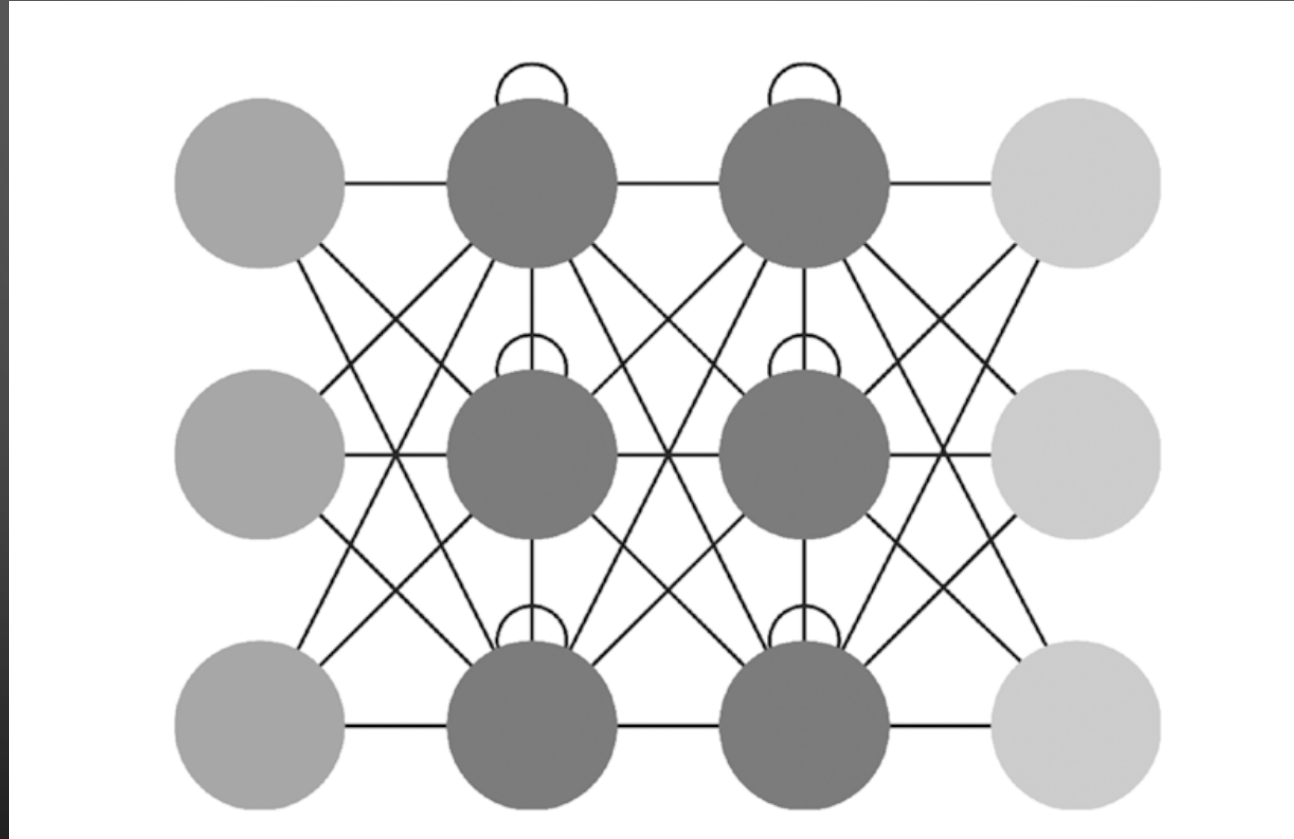


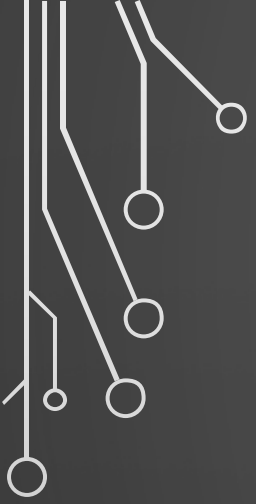


SHOULD I BRING MY UMBRELLA?

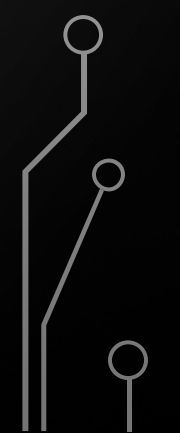
- The weather is cloudy? Yes=1; No=0 ($w=0.8$)
 - The weather forecast predicts rain? Yes=1; No=0 ($w=0.4$)
 - If the summation of the points gets 0.5 or greater, I will bring my umbrella!
- 
- 

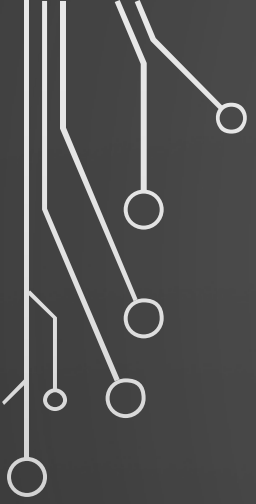
RECURRENT NEURAL NETWORK



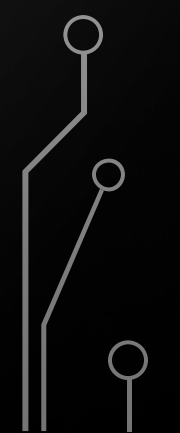


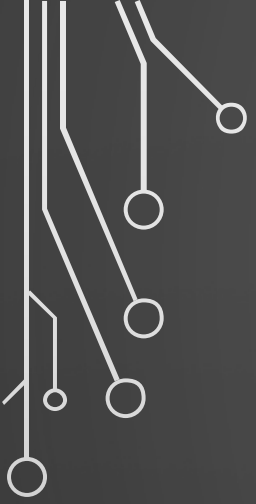
CONVOLUTIONAL NEURAL NETWORK

- Deep
 - Feed-forward
 - Convolutional layers
 - Speech recognition
 - Computer vision
 - Natural language processing
- 
- 

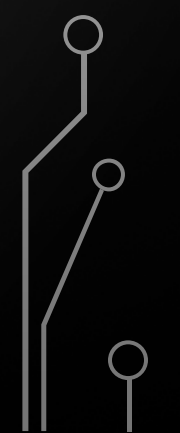


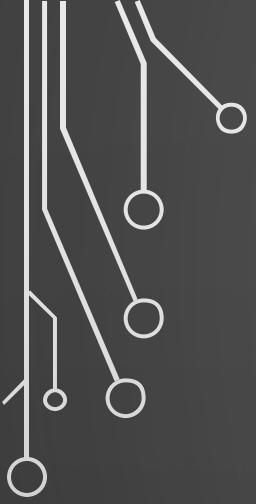
NEURAL NETWORKS LIMITATIONS

- Overfitting
 - Blackbox nature
- 
- 

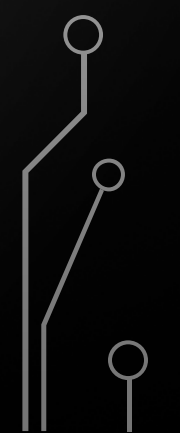


UNSUPERVISED LEARNING

- Learning a model from unlabeled data
 - Looking for patterns
 - Clustering
 - Dimensionality Reduction
- 
- 

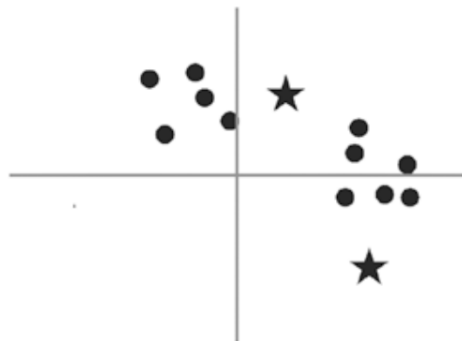


WHEN CAN WE USE UNSUPERVISED LEARNING?

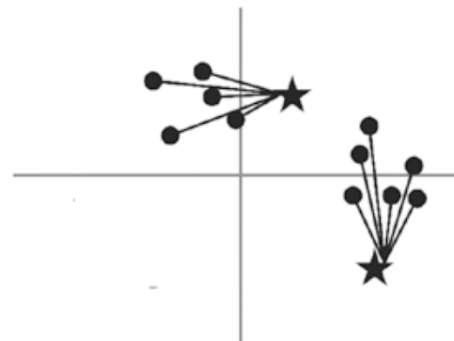
- Recommendation systems
 - Customer/patient classification
 - Anomaly detection
 - Defining outliers
- 
- 

K-MEAN CLUSTERING

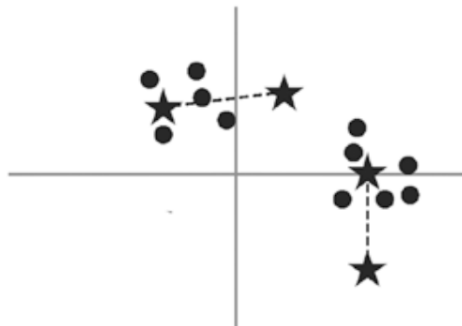
K-MEANS INITIALIZATION



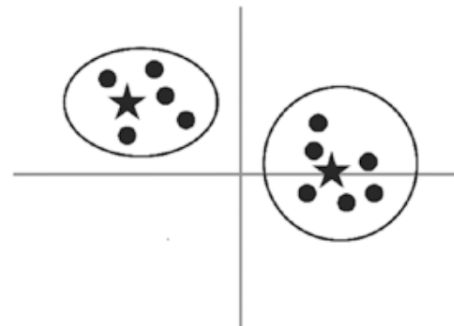
OBSERVATION ASSOCIATED TO CLUSTER



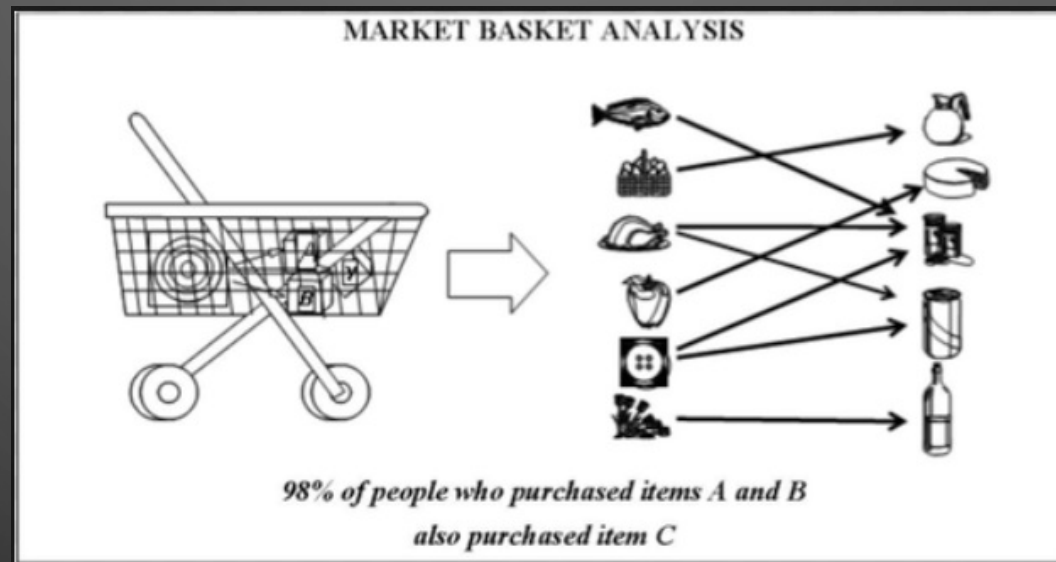
CENTROID RECALCULATION

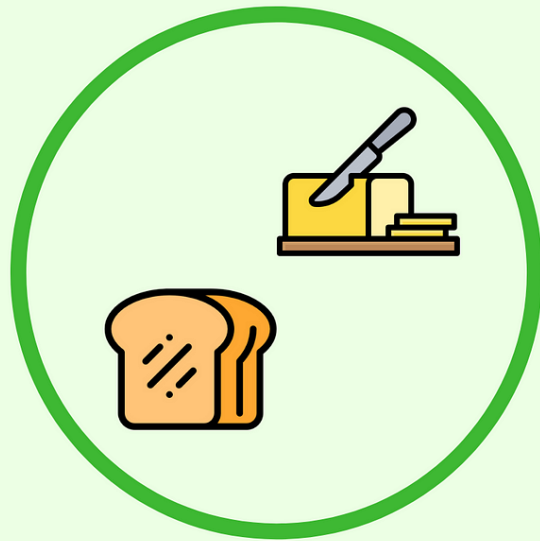


EXIT

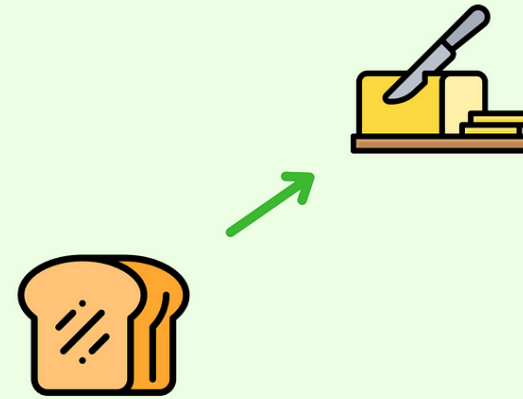


ASSOCIATION RULE LEARNING METHOD

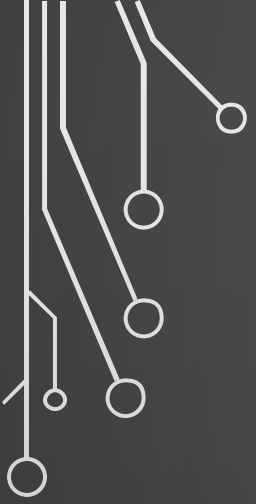




CLUSTERING

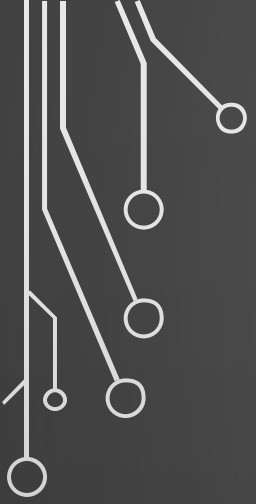


**ASSOCIATION RULE
MINING**

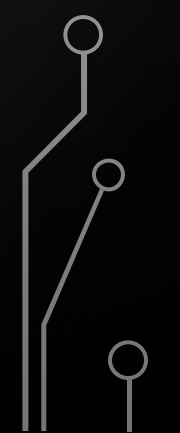


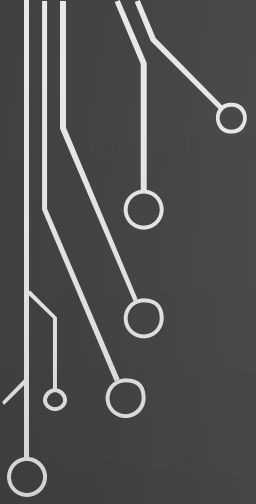
APRIORI ALGORITHM

- Find Frequent Item sets
 - Generate Association Rules
 - Evaluate the Rules
- 
- 
- 

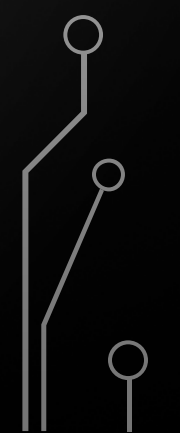


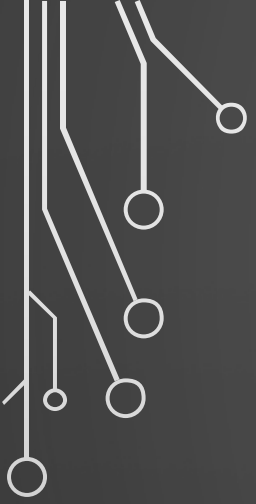
DIMENSIONALITY REDUCTION ALGORITHMS

- Fewer dimensions result in quicker computations.
 - Dimension reduction algorithms reduce the space required for storage
 - Less than three dimensions enables visualization.
 - Redundant data is removed
- 
- 



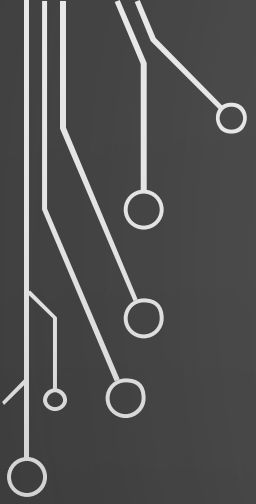
DIMENSIONALITY REDUCTION TECHNIQUES

- Missing/Null Values
 - Low Variance
 - High Correlation
 - Random Forest Decision Trees
 - Backward Feature Elimination
 - Forward Feature Construction
 - Principal Component Analysis (PCA)
- 
- 



NATURAL LANGUAGE PROCESSING

- NLP is a subcategory of machine learning that focuses on enabling computers to understand and work with human language.
 - It uses various ML techniques to process tasks like translation, text classification, and sentiment analysis.
 - Neural networks and deep learning can also be used for NLP tasks.
- 
- 



WHAT CAN NLP DO?

- Searching clinical notes by keyword or phrase
 - Social media monitoring
 - Virtual assistants or speech recognition software
 - Analysis of a document
 - Image to text recognition
- 
- 