



PATTERN RECOGNITION

LEARNING FROM EXPERIENCE

WHAT IS PATTERN RECOGNITION?

A subset area of Artificial Intelligence

Includes tasks such as:

Face recognition Object recognition Speech recognition Handwriting recognition

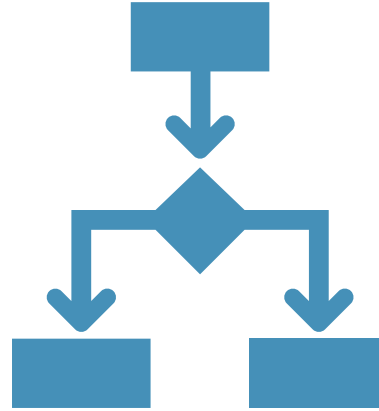
One of the best methods to teach pattern recognition to AI is to give the computer a large amount of labeled data samples that have already been classified.

This is referred to as "training" and the labeled data referred to as "training data".

Training the computer requires submitting the already classified training data and then providing the unlabeled data samples to compare against the labeled data. (1)



Nearest-Neighbor
Classifier



Decision Trees



Artificial Neural
Networks

THREE ALGORITHMS DISCUSSED FOR PATTERN RECOGNITION



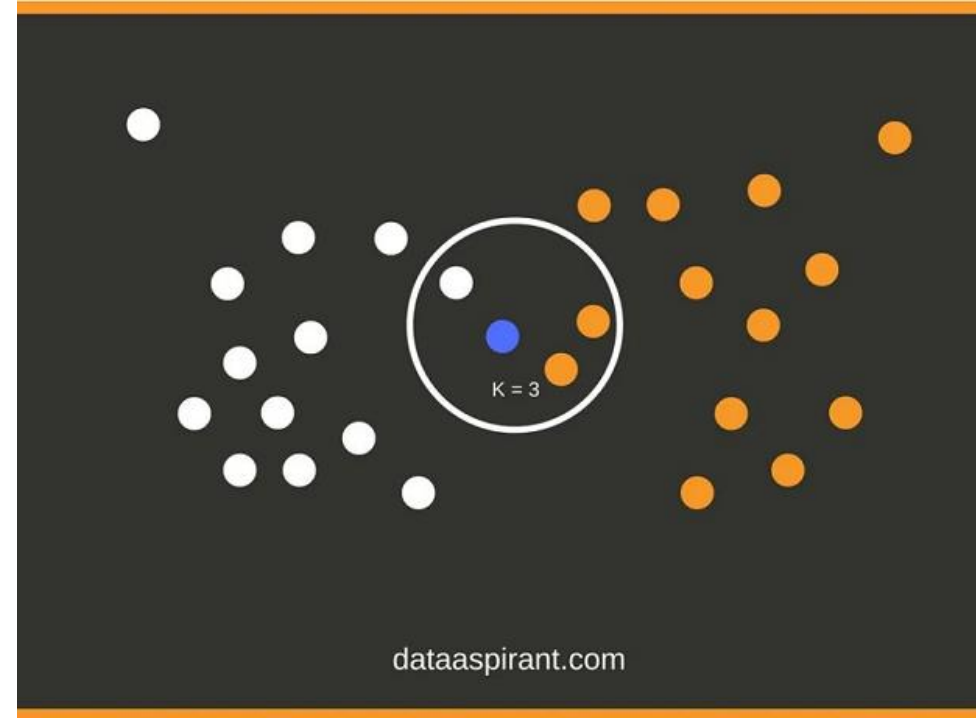
Nearest-Neighbor Classifier or kNN algorithm

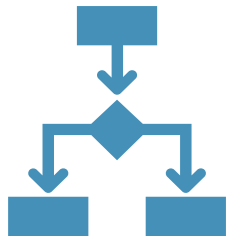
An unclassified data sample is given this is referred to as "x".

The data sample x is compared to its adjacent neighbors' samples "N" with a predetermined distance "k".

Whatever sample value the majority of the neighbors have, that fall within the predetermined distance, that sample value will be assigned to x. ⁽²⁾

In the example show the unclassified sample is the blue dot, the distance around the blue dot to compare samples with is 3. Within 3 units around the blue dot 2 orange and 1 white dot appear. So the blue dot likely has the value of an orange dot.



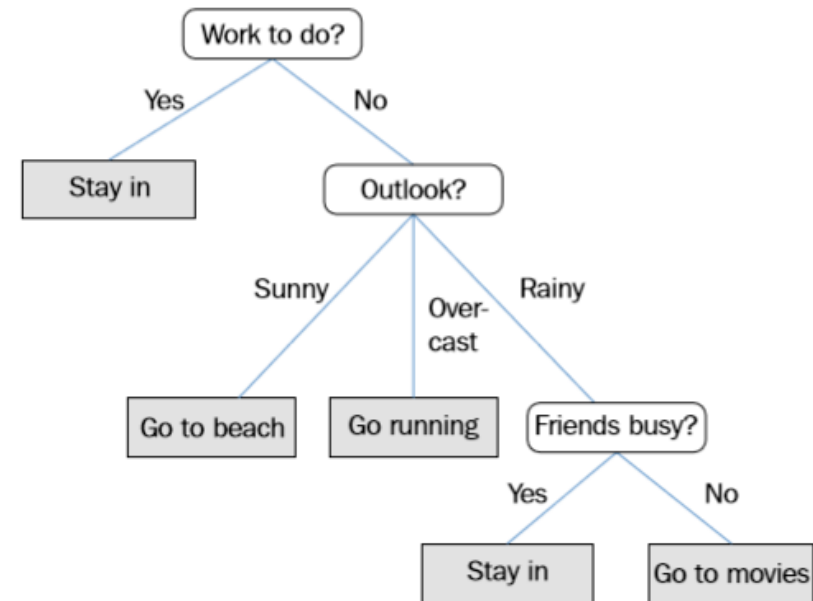


Decision Tree

"The goal of using a Decision Tree is to create a training model that can use to predict the class or value of the target variable by learning simple decision rules inferred from prior data(training data)." ⁽³⁾

During the learning phase the computer checks the sample given against its stored data. The correct answer is given to the computer and it determines what relation the data has to the sample.

In this way, computers create their own decision trees based on training data questions it generates during the learning phase.



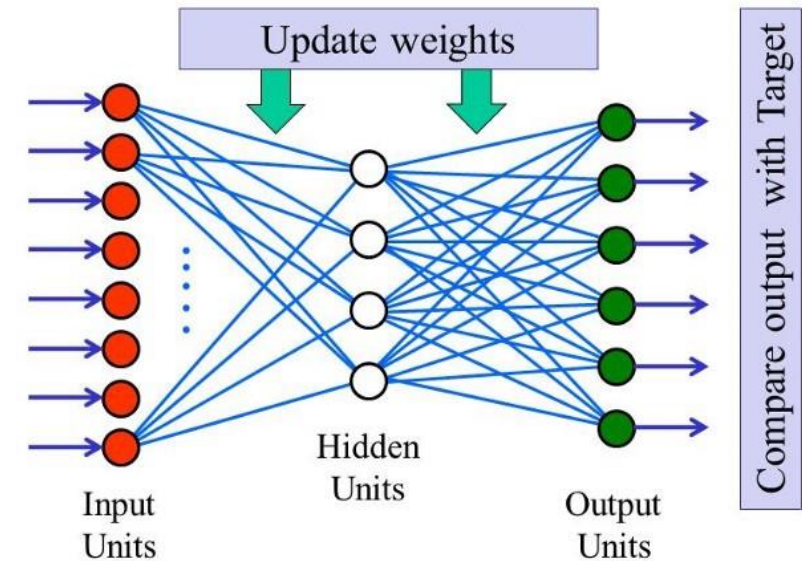


Artificial Neural Networks

Artificial Neural Networks were designed by researchers in an attempt to replicate the neuronal networks of the human brain.

- Each input node takes input data and connects to hidden unit nodes that contains a threshold measurement.
- Depending on if the threshold is met a new value that is considered positive or negative can be passed to further nodes an n number of times.
- Each subsequent node testing the data to determine if a threshold is met again and passing on the new value of that data.
- The results of data can be weighted allowing for smaller outlier data to not be considered as much as more concentrated data.

Artificial Neural Network

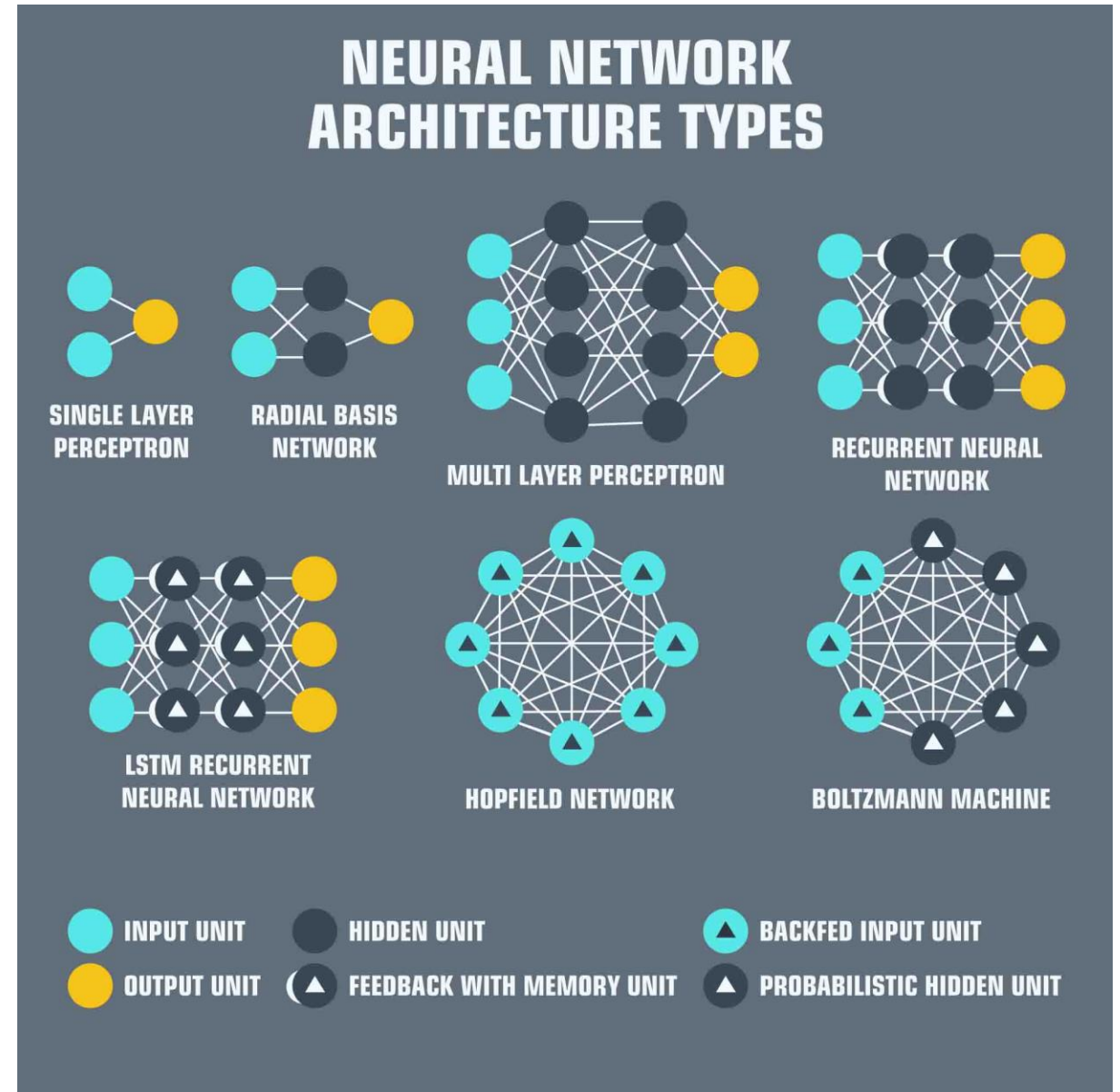




Artificial Neural Networks

- Therefore a node does not just need to be either a positive or negative new value it can be a range of numbers as assigned to each node's rules.
- Once the data values reach the output node a conclusion can be drawn on these values as they are compared with the target data sample.
- If needed adjustments will be made to the weighted system nodes to get the output values closer to the targeted values.

By creating this system of neural networks computers are working on the ability to identify patterns and interpret perceptual information.⁽⁵⁾



CITATIONS

1. MacCormick, J. (2013). *Nine algorithms that changed the future: The ingenious ideas that drive today's computers*. Princeton, NJ: Princeton University Press.
2. Saxena, R. (2017, June 27). Knn Classifier, Introduction to K-Nearest Neighbor Algorithm. Retrieved August 26, 2020, from <https://dataaspirant.Com/k-nearest-neighbor-classifier-intro/>
3. Chauhan, N. (2020, January 15). Decision Tree Algorithm - Explained. Retrieved August 26, 2020, from <https://towardsdatascience.com/decision-tree-algorithm-explained-83beb6e78ef4>
4. Schlenker, L. (2019, March 08). Artificial Neural Networks: Man vs Machine? Retrieved August 26, 2020, from <https://groupfuturista.com/blog/artificial-neural-networks-man-vs-machine/>
5. Joshi, N. (2019, April 01). 3 types of neural networks that AI uses: Artificial Intelligence. Retrieved August 26, 2020, from <https://www.allerin.com/blog/3-types-of-neural-networks-that-ai-uses>