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## # Remedial Assignment #

Q1) How does backpropagation algorithm works?

Ans Backpropagation is a supervised learning algorithm used for training artificial neural network.

1) Forward Pass:-

- Inputs data is fed through the network and calculation are made layer by layer using weight and activation functions.
- The network produces an output.

2) Calculate Error:-

- Compare the network's output to the actual target value, calculate the error.

3) Backward Pass (Backpropagation):-

- Propagate the error backward through the network.
- update weights to minimize the error using optimization techniques like gradient descent.
- This involves computing gradients of the error with respect to the weights.

4) Update weights:-

- Adjust weights in the network using the computed gradients. The idea is to move the network's weight in the direction that reduce the error.

5) Iterate:-

- Repeat the process for multiple epochs until the network converges, i.e., the error is minimized.



## Key Concepts:-

- 1) Gradients Descent:- minimize weight by adjusting weights.
- 2) Activation function:- Applied to the outputs of neurons.
- 3) Chain Rule:- Used in calculus to compute the gradients of the ~~error~~ error with respect to the weight in each layer during the backward pass.

Q2) What is the difference between supervised learning and <sup>un</sup> supervised learning?

Ans 1) Supervised Learning

- In supervised learning, the algorithm is trained on a labeled dataset, where each input is paired with its corresponding output.
- The goal is to learn a mapping from inputs to ~~the~~ output, so the algorithm can make prediction or classification on new, unseen data.
- Examples include regression and classification tasks.

2) Unsupervised Learning

- In unsupervised learning, the algorithm is given unlabeled data and must find pattern, relationship, or structure within it.
- There is no explicit output to learn from; the algorithm explores the data's inherent structure.
- Clustering and dimensionality reduction are common tasks in unsupervised learning.

The main difference lies in the availability of labeled data. Supervised learning deals with labeled data. Unsupervised learning, on the other hand, explores patterns in unlabeled data without explicit output guidance.



Q3) How does K-means performing clustering?

Ans K-means is a popular algorithm for clustering in unsupervised machine learning.

- Each data point belongs to only one cluster at a time.
- The algorithm aims to minimize the sum of squared distance between data points and their assigned cluster centroids.

1) Initialization:-

- Choose the no. of cluster 'K'.
- Randomly initialise K cluster centroids.

2) Assign Data Points:-

- For each point, calculate the distance to each centroid.
- Assign the point to the cluster whose centroid is the closest.

3) Update Centroids:-

- Recalculate the centroid by taking the mean of all data points assigned to each cluster.
- The centroid becomes the new centre of the cluster.

4) Repeat:-

- Repeat steps 2 and 3 until the centroids no longer change significantly or a specified no. of iteration is reached.

Q4) What is SVM? How does SVM work?

Ans Support Vector Machine (SVM) is a supervised machine learning algorithm used for classification and regression tasks. Its primary objective is to find a hyperplane that best separates data points into different classes in a high-dimensional space.

SVM works for classification:-

- |                  |                   |
|------------------|-------------------|
| 1) Input Data    | 4) Support vector |
| 2) Feature Space | 5) Kernel Tricks  |
| 3) Hyperplane    | 6) C-Parameter    |



It is widely used for both classification and regression problem in various domain.

Q5) What is decision tree algorithm. list down some popular algorithm and their attribute selection measure?

Ans Decision tree algorithm are used for both classification and regression tasks. They recursively split the dataset based on features to create a tree-like structure.

Some popular decision tree algorithm:-

1) ID3 (Iterative Dichotomiser 3):

• Attribute selection measure:- Information Gain

2) C4.5:

• Attribute selection Measure:- Gain Ratio

3) CART (Classification and Regression Trees)

• Attribute selection Measure:-

1) Gini Index, 2) Mean Squared Error

4) CHAID (Chi-Squared Automatic Interaction Detector):-

• Attribute selection Measure:- Chi-squared test.

5) Random Forest:-

• Attribute selection Measure:- Typically Gini Index or Information gain

6) Gradients Boosted Trees:

• Attribute selection Measure:- Gini Index for Classification  
MSE for regression.