**Assignment - 07**

1. What is the COVARIATE SHIFT Issue, and how does it affect you?

Ans: Covariate shift refers to a situation where the distribution of input features (covariates) changes between the training and testing datasets.

It affects machine learning models by making them less robust and reliable, as they may perform well on the training data but fail to generalize to unseen data due to differences in input distributions.

Covariate shift can lead to poor model performance, overfitting, and decreased accuracy.

1. What is the process of BATCH NORMALIZATION?

Ans: Batch normalization is a technique used to normalize the activations of each layer in a neural network by adjusting and scaling the activations.

The process involves the following steps:

* Compute the mean and variance of activations within each mini-batch during training.
* Normalize the activations using the computed mean and variance.
* Scale and shift the normalized activations using learnable parameters (gamma and beta) to maintain the representational capacity of the network.

- Update the parameters during backpropagation to optimize the model.

3. Using our own terms and diagrams, explain LENET ARCHITECTURE.

Ans: LeNet is a pioneering convolutional neural network (CNN) architecture developed by Yann LeCun et al. for handwritten digit recognition.

Key components of LeNet architecture:

Convolutional layers with subsampling (pooling) layers.

Fully connected layers at the end for classification.

4. Using our own terms and diagrams, explain ALEXNET ARCHITECTURE.

Ans: AlexNet is a deep convolutional neural network architecture designed by Alex Krizhevsky et al. for the ImageNet Large Scale Visual Recognition Challenge (ILSVRC) in 2012.

Key features of AlexNet architecture:

Alternating convolutional and max-pooling layers.

ReLU activation functions.

Dropout layers for regularization.

Fully connected layers at the end for classification.

5. Describe the vanishing gradient problem.

Ans: The vanishing gradient problem occurs during training when gradients become increasingly small as they propagate backward through the layers of a deep neural network.

It hinders the training process by slowing down convergence or causing it to stagnate, especially in deep networks with many layers.

The problem arises due to the nature of certain activation functions (e.g., sigmoid, tanh) that saturate and flatten gradients, making it challenging for deep networks to learn meaningful representations.

6. What is NORMALIZATION OF LOCAL RESPONSE?

Ans: Normalization of Local Response (LRN) is a technique used in convolutional neural networks to normalize the activity of neighboring neurons within the same convolutional kernel.

LRN helps enhance the contrast between features by normalizing the responses of adjacent neurons, making them more discernible.

It can improve the model's ability to discriminate between different patterns and features in the input data.

7. In AlexNet, what WEIGHT REGULARIZATION was used?

Ans: AlexNet used L2 weight regularization (also known as weight decay) to penalize large weights in the model.

This regularization technique helps prevent overfitting by adding a regularization term to the loss function, which encourages the model to learn simpler and smoother weight configurations.

8. Using our own terms and diagrams, explain VGGNET ARCHITECTURE.

Ans: VGGNet is a convolutional neural network architecture proposed by the Visual Geometry Group at the University of Oxford.

Key characteristics of VGGNet architecture:

Consists of blocks of convolutional layers with small 3x3 filters.

Max-pooling layers for downsampling.

Fully connected layers at the end for classification.

9. Describe VGGNET CONFIGURATIONS.

Ans: VGGNet comes in several configurations denoted by VGG followed by a number (e.g., VGG16, VGG19), which refers to the depth of the network.

The configurations differ in the number of convolutional layers and their depths.

VGG16 has 16 layers (13 convolutional and 3 fully connected), while VGG19 has 19 layers (16 convolutional and 3 fully connected).

10. What regularization methods are used in VGGNET to prevent overfitting?

Ans: Regularization Methods in VGGNet:

VGGNet uses dropout and L2 weight regularization (weight decay) as regularization methods to prevent overfitting.

Dropout layers randomly drop a fraction of neurons during training to prevent co-adaptation and improve generalization.

L2 weight regularization penalizes large weights by adding a regularization term to the loss function, encouraging simpler weight configurations.