**Problem Description:**

**Input**: 32x32 RGB images of various objects (e.g., cars, bicycles, animals).

**Output**: Class label representing the type of object (aeroplanes, cars, birds, cats, deer, dogs, frogs, horses, ships, and trucks).

**Sample Data:**

The CIFAR10 dataset contains 50,000 training images and 10,000 testing images. Each image is labeled with one of 10 classes.

**Key Terminologies and Parameters:**

**1. Neural Network:**

A neural network is a computational model inspired by the human brain's neural structure. It is the interconnected layers of neurons that process input data to produced an output (among 10 classes).

**2. Layer:**

**Input Layer:** The first layer of the neural network that receives raw input data. For CIFAR10, it would have 32x32x3 neurons (each pixel has 3 values for RGB or use 1 also it represents the grayscale image).

**Hidden Layer:** Intermediate layers between the input and output layers. They extract and learning the important features from the input data.

**Output Layer:** The final layer of the neural network that produces the network's output. For CIFAR10, it has 10 neurons, each representing a class label(dense layer) l.

**3. Convolutional Layer:**

A type of layer in a convolutional neural network (CNN) that applies convolution operations to the input, extracting important features in the input data.It usee for images.

**4. Convolutional Neural Network (CNN):**

A specialized neural network designed for processing structured gridlike data, such as images. It includes convolutional layers for feature extraction and typically uses pooling layers to reduce dimensionality.

**5. Recurrent Neural Network (RNN):**

A type of neural network designed to handle sequential data by maintaining a state vector and using it as context for predictions.It used for videos.

**6. Activation Function:**

A function applied to the output of each neuron, introducing nonlinearity into the neural network and it allows learning complex patterns in the input data.

**7. ReLU (Rectified Linear Unit):**

It is a type of activation function commonly used in neural networks that outputs the input directly if it is positive, otherwise outputs zero.

Types : Leaky ReLU, Parameterised ReLU and Exponential ReLU.

**8. Sigmoid:**

Sigmoid/Logistic activation is used for models where we have to predict the probability as an output. It maps input values to a range between 0 and 1.It is used in the output layer for binary classification.

**9. Tanh (Hyperbolic Tangent):**

Tanh activation function that maps input values to a range between -1 and 1. tanh function became preferred over the sigmoid function as it gave better performance for multi-layer neural networks.

**10. Softmax:**

Softmax activation function is used in the output layer of a neural network for multiclass classification, which outputs a probability distribution over mutually exclusive classes.

(In cifar dataset softmax activation function is also used as activation function).

**11. Forward Propagation:**

The process of computing the output of a neural network given an input, from the input layer through each layer to the output layer.

**12. Backpropagation:**

An algorithm used to train neural networks by computing gradients of the loss function with respect to each weight and bias in the network.

**13. Loss Function:**

Loss function computes the losses between the predicted outputs and true labels, whilw used to train neural networks.

**14. Cost Function:**

Cost function aggregates the losses of individual training examples, used to evaluate the overall performance of a neural network.It measures the error between the predicted and actual values and helps the network to adjust its weights and biases to make accurate predictions.

**15. Gradient Descent:**

It is used when training data models, can be combined with every algorithm and is easy to understand and implement. The goal of gradient descent is to minimize the cost function, or the error between predicted and actual y.

**16. Learning Rate:**

The learning rate (LR) determines how far the neural network weights change within the context of optimization while minimizing the loss function. Thus, this parameter is important to optimizer and loss function.

**17. Batch Size:**

The number of training examples utilized in one iteration of gradient descent.

**18. Epoch:**

An epoch means training the neural network with all the training data for one cycle. In an epoch, we use all of the data exactly once. A forward pass and a backward pass together are counted as one pass:

**19. Overfitting:**

The models perform to well in the training data but performs poorly on unseen or test data.

**20. Underfitting:**

The models performs poorly on both training data and test data.

**21. Training Set:**

The subset of data used to train the neural network.(we use 70 or 80 percent in dataset)

**22. Validation Set:**

The subset of data used to evaluate the performance of the neural network during training (use 20 percent in dataset).

**23. Test Set:**

The subset of data used to evaluate the final performance of the trained neural network after training (use 10 percent in dataset).

**24. CrossValidation:**

A technique used to evaluate predictive models by partitioning the original dataset into multiple subsets and iteratively training and testing the model.

**25. Hyperparameters:**

Hyperparameter is a Parameters that define the structure and behaviour of a neural network, typically set before the training process.

**26. Model Parameters:**

Model parameter is a Parameters that are learned during the training process of a neural network, such as weights and biases.

**27. Regularization:**

It is a Techniques that is used for prevent overfitting by penalising large weights or adding noise to the network during training.

**28. Dropout:**

It is a regularization technique that randomly drops a fraction of neurons during training to prevent coadaptation of neurons.

**29. Weight Initialization:**

Techniques used to set initial values of weights in a neural network, influencing how quickly the network learns.

**30. Normalization:**

Scaling input data to a standard range to facilitate better convergence during training.