1. **What is the fundamental difference between shallow and deep learning?**

Shallow learning is for smaller task and or simpler dataset.

Deep learning is or larger dataset and for more complex task, it is widely used for automation and accuracy.

1. **Can you explain the concept of backpropagation and its significance in training neural networks?**

It is used to train multi layered neural network such that it can learn the appropriate internal representation to allow it to learn any arbitrary mapping.

1. **What is the vanishing gradient problem, and how does it affect training in deep neural networks?**

The vanishing and exploding gradient problems occur when the gradients become either too small or too large during backpropagation. This can happen in RNNs because they have recurrent connections that allow them to store information from previous time steps.

1. **Describe the purpose and function of activation functions in neural networks.**

Activation function in neural networks determines which neurons should turn on as information moves through the network's layers. Since the activation function enables non-linear movement of information between neurons within the network, the neural network can learn more about the data it receives.

1. **What are some common activation functions used in deep learning, and when would you choose one over another?**

The ReLU function is another non-linear activation function that has gained popularity in the deep learning domain.

1. **Explain the concept of overfitting in deep learning models and methods to prevent it.**

To prevent it, to use more complete training data. The dataset should cover the full range of inputs that the model is expected to handle. Additional data may only be useful if it covers new and interesting cases. A model trained on more complete data will naturally generalize better.

1. **What is dropout regularization, and how does it work to prevent overfitting?**

By randomly dropping out neurons during training, dropout encourages the network to learn more robust representations of the input data. Although dropout has some limitations. Dropout is a technique for addressing this problem. The key idea is to randomly drop units (along with their connections) from the neural network during training. This prevents units from co-adapting too much. During training, dropout samples from an exponential number of different thinned networks.

1. **What is the role of convolutional layers in convolutional neural networks (CNNs), and how do they differ from fully connected layers?**

A convolutional layer applies to a neural network in which not all input nodes in a neuron are connected to the output nodes. This gives convolutional layers more flexibility in learning. The number of weights per layer is also a lot smaller, which helps with high-dimensional inputs, such as image data.

1. **What is the purpose of pooling layers in CNNs, and how do they help in feature extraction?**

Pooling layers are used to reduce the dimensions of the feature maps. Thus, it reduces the number of parameters to learn and the amount of computation performed in the network. The pooling layer summarises the features present in a region of the feature map generated by a convolution layer

1. **Describe the architecture of a recurrent neural network (RNN) and its applications in sequential data analysis.**

The RNN takes an input vector X and the network generates an output vector y by scanning the data sequentially from left to right, with each time step updating the hidden state and producing an output. It shares the same parameters across all time steps.

1. **Explain YoLo Algorithm in depth along with it's real life applications**

YOLO is able to detect objects in real-time, making it suitable for applications such as video surveillance or self-driving cars. 2. High accuracy: YOLO achieves high accuracy by using a convolutional neural network to predict both the class and location of objects in an image.