

Q1. What are Artificial Neural Networks?

Artificial Neural Networks (ANNs) are computational models inspired by the biological neural networks in the human brain. They consist of layers of interconnected nodes (neurons) designed to process information and identify patterns in data. ANNs are the foundation of deep learning, and they are used for tasks like classification, regression, and clustering.

Q2. What are Layers in a Neural Network?

Layers in a neural network are organized groups of neurons, and they determine how data flows through the network:

1. **Input Layer:** Receives input data (e.g., features of a dataset).
2. **Hidden Layers:** Perform intermediate computations. These layers apply weights, biases, and activation functions to the inputs to extract features.
3. **Output Layer:** Produces the final result of the network, such as predicted class labels or numerical values.

Each layer transforms the data and passes it to the next layer.

Q3. What are Neurons in a Neural Network?

Neurons are the fundamental units of a neural network, mimicking the behavior of biological neurons:

- **Inputs:** Neurons receive inputs from previous neurons or the environment.
- **Weights:** Each input is multiplied by a weight to determine its importance.
- **Bias:** A bias term is added to the weighted sum of inputs to improve flexibility.
- **Activation Function:** Applies a non-linear transformation to the output, enabling the network to learn complex patterns.

Q4. What are Activation Functions in a Neural Network?

Activation functions introduce non-linearity into the network, enabling it to model complex patterns. Without activation functions, the network would behave like a linear model. Common types include:

- **Sigmoid:** Outputs probabilities between 0 and 1.
- **Tanh:** Outputs values between -1 and 1, used for zero-centered outputs.
- **ReLU:** Outputs values between 0 and infinity, widely used for efficiency.
- **Softmax:** Outputs probabilities for multi-class classification tasks.

Q5. What are the Differences Between a Biological Neuron and an Artificial Neuron?

Aspect	Biological Neuron	Artificial Neuron
Node	Cell Nucleus	A single computational unit
Input	Dendrites	Inputs (e.g., x_1, x_2)
Weights	Strength of synapse	Weights (w_1, w_2)
Processing	Processes electrochemical signals	Applies weighted sums and biases
Output	Axon	Final output (e.g., y)
Functionality	Transfers information in a biological network	Transfers information in a computational model

Artificial neurons simplify the biological process but are designed to mimic information transfer and learning.