Purpose of using Biases in ML and DL

Biases plays a crucial role in Neural Network and Deep Learning by serving several essential purposes

1. Shifting the Activation Function

`Biases` allow for **shifting the activation function** horizontally, effectively adjusting boundary of the neuron. This is particularly useful for tasks involving classification, where the bias term can help the neuron distinguish between different classes.

2. Modeling Non-Linear Relationships

By **introducing a constant offset**, the bias term enables the Neural Network to **model non-linear relationships** between the input data and the output. This is crucial for capturing complex patterns and relationships in the data.

3. Preventing Overfitting

The bias term can **help prevent overfitting**, a condition where the Neural Network memorizes the training data too well and fails to generalize to new data.

By incorporate the bias term, the network has more flexibility in adjusting its output and reducing the risk of overfitting.

4. Representing an Inherent Offset

In some cases, the input data itself may have an inherent offset or bias. For instance, when predicting the temperature, there might be a constant offset due to the location or measurement device. The bias term can effectively represent this offset and ensure accurate predictions.

5. Simplifying the Learning Process

The bias term simplifies the learning process by allowing the weights to focus on capturing the relative strength of the connections between input neurons and the neuron in question. This can make the learning process more efficient and improve the overall performance of the Neural Network.