**Non-Programming Assignment:**

1. **Normalization:**
   * Normalization refers to the process of adjusting the data to ensure that each feature is on a similar scale, typically ranging from 0 to 1 or -1 to 1. This process is essential because features with larger scales can dominate the training process, leading to inaccurate learning. By normalizing, the algorithm treats all input features equally, leading to faster convergence during training and improved model performance.
2. **Vanishing and Exploding Gradients:**
   * **Vanishing Gradients:** This occurs when the gradients become very small during backpropagation, leading to extremely slow or stalled learning. It is often seen when using certain activation functions (e.g., sigmoid or tanh) or in deep neural networks where gradients diminish as they propagate backward through the layers.
   * **Exploding Gradients:** This happens when the gradients grow exponentially during backpropagation, causing the weights to oscillate or diverge. It is mainly a problem in deep networks and can be mitigated by techniques such as gradient clipping.
3. **Adam Algorithm:**
   * The Adam (Adaptive Moment Estimation) algorithm is an adaptive learning rate optimization technique designed to improve training speeds in deep neural networks. It uses two moving averages — one for the mean of the gradients and one for the uncentered variance of the gradients — to adaptively scale learning rates for each parameter. Adam combines the advantages of both RMSprop and momentum-based gradient descent, leading to faster and more stable convergence.
4. **Choosing Hyperparameters:**
   * Hyperparameter tuning involves selecting the values for parameters that are not learned directly through training, such as the learning rate, batch size, number of epochs, and regularization terms. Effective hyperparameter tuning is crucial as it significantly impacts model performance. Common approaches include manual tuning, grid search, and randomized search. Cross-validation is often used to evaluate different hyperparameter settings.