Training Day-71 Report:

Cost Function and **Gradient Descent**:

Cost Function

A **Cost Function** measures the error or difference between the predicted values and actual values in a model. It quantifies the model's performance and helps in optimizing it. The objective is to minimize the cost function during the training phase to improve the model's accuracy.

Types of Cost Functions:

1. **Mean Squared Error (MSE):**

MSE=1n∑i=1n(yi−y^i)2MSE = \frac{1}{n} \sum_{i=1}^{n} (y_i - \hat{y}_i)^2

Where:

   - yiy_i: Actual output
   - y^i\hat{y}_i: Predicted output
   - nn: Number of data points

2. **Log Loss (Cross-Entropy Loss):** Commonly used for classification tasks.

LogLoss=−1n∑i=1n[yilog⁡(y^i)+(1−yi)log⁡(1−y^i)]Log Loss = -\frac{1}{n} \sum_{i=1}^{n} \left[y_i \log(\hat{y}_i) + (1 - y_i) \log(1 - \hat{y}_i) \right]

3. **Hinge Loss:** Used for SVM models in classification.

Gradient Descent

Gradient Descent is an optimization algorithm used to minimize the cost function. It updates the model's parameters iteratively by moving in the direction of the negative gradient of the cost function.

Algorithm Steps:

1. **Initialize** the parameters (e.g., weights and biases) randomly or with zeros.
2. Compute the **gradient** of the cost function with respect to each parameter.
3. Update the parameters using the formula:

θ=θ−α∂J(θ)∂θ\theta = \theta - \alpha \frac{\partial J(\theta)}{\partial \theta}

Where:

   - θ\theta: Model parameter

- α\alpha: Learning rate
- ∂J(θ)∂θ\frac{\partial J(\theta)}{\partial \theta}: Gradient of the cost function

4. Repeat until the cost function converges to a minimum.

Variants of Gradient Descent:

1. **Batch Gradient Descent:** Uses the entire dataset for each iteration.
2. **Stochastic Gradient Descent (SGD):** Updates parameters using a single data point at each iteration.
3. **Mini-Batch Gradient Descent:** Combines aspects of batch and SGD by using small batches of data.

This explanation is concise and suitable for understanding the concepts of cost function and gradient descent in the context of machine learning【6†source】【7†source】. Let me know if you need more details or practical examples!