1. **What is the main purpose of regularization when training predictive models?**

A. The main goal of the regularization when training predictive model is to prevent overfitting. Overfitting occurs when a model learns the training data too well and is unable to generalize new data. Regularization attempts to improve a models’ performance by simplifying it. Regularization techniques add a penalty to the loss function used to train the model and encourage the simple models that generalize new data. By balancing the model’s complexity against the training data there is slight increase of error in training dataset and decrease of error in testing dataset these is called bias-variance tradeoff.

2**. What is the role of a loss function in a predictive model? And name two common loss functions for regression models and two common loss functions for classification models**.

A. A loss function is a tool used in machine learning that assesses how effectively a predictive model predicts values that occur. The model is trained by minimizing the loss function by altering its parameters.

**Two common loss functions for Regression model: -**

1. Mean Absolute Error (MAE)

2.Mean Squared Error (MSE)

3.Root Mean Squared Error (RMSE)

**Two Common loss functions for classification model: -**

1. Hinge Loss

2. Binary Cross Entropy Loss

3**. Consider the following scenario. You are building a classification model with many hyperparameters on a relatively small dataset. You will see that the training error is extremely small. Can you fully trust this model? Discuss the reason**.

A. No, we cannot fully trust these models, because having a classification model with many hyperparameters on a small dataset observes extremely small training errors. There are few reasons do not trust this model like small dataset, complexity, and generalization and to overcome this problem reduce the hyper parameters or use the regularization techniques to penalize the complexity, use techniques like k-fold cross validation and finally if there is a chance collect more data it will help the model with a broader learning base.

4. **What is the role of the lambda parameter in regularized linear models such as Lasso or Ridge regression models?**

A. A key factor in regulating the degree of regularization used to regularized linear models such as Lasso or Ridge regression is the lambda parameter. In both Lasso or Ridge regression lambda is used as a hyper parameter that needs to be chosen carefully using cross-validation to balance between bias-variance tradeoff in the model. When a larger lambda increases bias and decreases the variance the smaller lambda will do the opposite.

**Lasso Regression:** - Lasso regression adds the absolute values of the coefficients to the linear regression objective function as a penalty term. Lambda is associated with the sum of the absolute values of the coefficients. As lambda increases, more coefficients are forced to become exactly zero and shrinkage applied to the coefficients making the model simpler.

**Ridge Regression: -** Lambda parameter multiplies the sum of the squares of the coefficients in the cost function. As lambda increases the coefficients are shrunk towards zero, which reduces model complexity and helps to prevent overfitting.