Task 25

**Introduction to Regularization: -** Regularization is a technique used in machine learning to prevent overfitting of models to the training data. Overfitting occurs when the model is too complex and fits the training data too closely, resulting in poor performance on new or unseen data. Regularization helps to reduce the complexity of the model and prevents it from fitting the noise in the data.

The basic idea behind regularization is to add a penalty term to the loss function that the model is optimizing during training. The penalty term discourages the model from fitting the training data too closely by adding a cost for large weights or complex models.

**There are two main types of regularization techniques: L1 regularization and L2 regularization.**

**L1 regularization:** Also known as Lasso regularization, this technique adds a penalty term to the loss function that is proportional to the absolute value of the weights of the model. This penalty term results in sparse models where many of the weights are set to zero. L1 regularization is useful for feature selection, where only a subset of the input features are relevant to the output.

**L2 regularization:** Also known as Ridge regularization, this technique adds a penalty term to the loss function that is proportional to the square of the weights of the model. This penalty term results in models where the weights are small but non-zero. L2 regularization is useful for preventing overfitting and improving the generalization performance of the model.

Regularization can be applied to a wide range of machine learning models, including linear regression, logistic regression, and neural networks. The strength of the regularization term is a hyperparameter that needs to be tuned using cross-validation or other techniques.

Overall, regularization is an important technique in machine learning for preventing overfitting and improving the generalization performance of the model.

**Under fit: -** Under fitting means that your model makes accurate, but initially incorrect predictions. In

this case, train error is large and val/test error is large too. Overfitting means that your model makes not

accurate predictions. In this case, train error is very small and val/test error is large.

**Over fit:** - Overfitting means that your model makes not accurate predictions. In this case, train error is

very small and val/test error is large. When you find a good model, train error is small (but larger than in

the case of overfitting), and val/test error is small too.