Assignment 02 Report

**1.How to determine the optimal value of K in the KNN Regression model?**

To determine the optimal value of K in the KNN Regression model, you can use a technique called Grid Search Cross-Validation. The basic idea is to train and evaluate the model with different values of K, and choose the value of K that gives the best performance. It is used in the code and give the value as 3 given in the code.

**2.Can decision tree classifiers be used for feature selection, and if so, how?**

The importance of each feature can be calculated using the feature\_importances\_ attribute of the trained decision tree model. This outputs the top important features along with their importance

**3.How to determine the optimal number of trees or the tree depth in the decision tree classifier?**

By cross validation the best tree depth can be calculated. Cross-validation is a technique used to estimate the performance of a machine learning model on unseen data. By using cross-validation, we can determine the optimal number of trees or the tree depth that gives the best performance on the validation set.

**4.What are the advantages and disadvantages of different kernel functions in the Support Vector Regressor model?**

* Linear kernel: used for linearly separable datasets, computationally efficient
* Polynomial kernel: used for non-linear datasets, has a parameter to control degree of polynomial
* Gaussian (RBF) kernel: used for non-linear datasets, versatile, can capture complex decision boundaries
* Sigmoid kernel: used for binary classification, similar to a neural network activation function, can be sensitive to hyperparameters

**5. What are the different regularization techniques used in SVR and how do they affect the performance of the model?**

Regularization techniques are used in SVR to avoid overfitting and improve the generalization of the model. L1 regularization adds a penalty term to the loss function that is proportional to the absolute value of the coefficients, which leads to sparse solutions. L2 regularization adds a penalty term that is proportional to the square of the coefficients, which results in smaller but non-zero coefficients. Elastic Net regularization combines both L1 and L2 regularization to balance between sparsity and smoothness in the model.

**6. Create a table and compare the model’s performances on all 3 datasets**

|  |  |  |  |
| --- | --- | --- | --- |
|  | Decision Tree | SVR | KNN |
| Dataset 1 | 90% | -29% | 6% |
| Dataset 2 | 57% | 91% | 99% |
| Dataset 3 | Error'continuous'  Values |  | 99% |