**Report on Experience with Q1 and Q2**

**Q1: Decision Trees and Random Forests for Classification:**

**1. Data Preparation:**

- Both questions initiated with the loading of a dataset using the pandas library. The data was then divided into feature variables (X) and target variables (y).

- Categorical variables were converted into numerical format through one-hot encoding to facilitate model training.

**2. Model Building with Decision Trees:**

- DecisionTreeClassifier and DecisionTreeRegressor models were employed for classification and regression tasks, respectively.

- Baseline models were constructed and evaluated using accuracy (for classification) and mean squared error (MSE) (for regression) metrics.

**3. Hyperparameter Tuning with Random and Grid Search:**

- Hyperparameter tuning was carried out using RandomizedSearchCV and GridSearchCV.

- RandomizedSearchCV explored a random subset of hyperparameter combinations, while GridSearchCV performed an exhaustive search across all combinations.

**4. Evaluation:**

- Model performance was assessed using classification\_report and accuracy\_score for classification tasks, and mean\_squared\_error for regression tasks.

**Q2: Decision Trees for Regression**:

**1. Data Handling:**

- Similar to Q1, the dataset was loaded and preprocessed through one-hot encoding to handle categorical variables.

**2. Model Construction with Decision Trees:**

- DecisionTreeRegressor was utilized to develop a regression model aimed at predicting continuous outcomes.

- Baseline model performance was evaluated using MSE as the primary metric.

**3. Hyperparameter Tuning:**

- RandomizedSearchCV and GridSearchCV were employed to optimize hyperparameters and enhance model performance.

**4. Evaluation:**

- Model effectiveness was gauged using MSE to determine the accuracy of predictions.

**Comparison:**

- Q1 and Q2 followed analogous workflows in terms of data preprocessing, model building, hyperparameter tuning, and evaluation.

- The key difference lied in the nature of the prediction task - classification (Q1) versus regression (Q2).

- Both tasks underscored the significance of hyperparameter tuning in refining model performance.

**Conclusion:**

- Engaging with Q1 and Q2 provided valuable hands-on experience in implementing decision tree-based models for distinct machine learning tasks.

- It underscored the importance of understanding diverse evaluation metrics and adopting suitable hyperparameter tuning strategies for optimal model performance.

- Overall, tackling both questions enriched my proficiency in leveraging decision trees for a range of machine learning applications.

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