Embedded Methods

Feature Selection Techniques

What are Embedded Methods?

> Embedded methods are feature selection techniques that perform feature selection as part of the model construction process. They are called "embedded" because feature selection is embedded within the construction of the machine learning model. These methods aim to solve the limitations of filter and wrapper methods by including the interactions of the features while also being more computationally efficient.

Linear Regression (LR) as Embedded Method

Key Concept

> Once you are done with training the Linear Regression model, you can use **lr.coef_** to get the coefficients. All of them will behave as scores for those features, helping you identify the most important features.

```
# After training your model coefficients = lr.coef_ # Higher absolute values indicate more important features
```

⚠️ Linear Regression Assumptions (Must be followed)

> **1. Linearity:** The relationship between independent and dependent variables is linear. The change in the dependent variable for a unit change in independent

variable(s) is constant.

2. Independence: The observations are independent of each other. This implies that the residuals (differences between observed and predicted values) are independent.

3. Homoscedasticity: The variance of the residuals is constant across all levels of the independent variables.

4. Normality: The residuals are normally distributed.

5. No Multicollinearity: The independent variables are not highly correlated with each other. This assumption is really important when you want to interpret the regression coefficients.

Regularized Models

Regularized linear models are linear models that include a penalty term in the loss function during training. The penalty term discourages the learning of a too complex model, which can help prevent overfitting.

Types of Regularized Models

Ridge	Lasso	Elastic Net
Adds L2 penalty term (sum of squares of coefficients)	Adds L1 penalty term (sum of absolute values of coefficients)	Combines both L1 and L2 penalty terms

📚 **Next Topic:** We will learn about Regularization in detail in the next section.

Decision Trees as Embedded Method

> Decision Trees can also be used as an embedded method for feature selection. They naturally provide feature importance scores based on how much each feature contributes to decreasing impurity in the tree nodes.

💡 **Key Advantage:** Decision trees automatically perform feature selection during the tree construction process by choosing the most informative features at each split.

```
# After training decision tree feature_importance = tree.feature_importances_ # Higher values indicate more important features
```