Data Science

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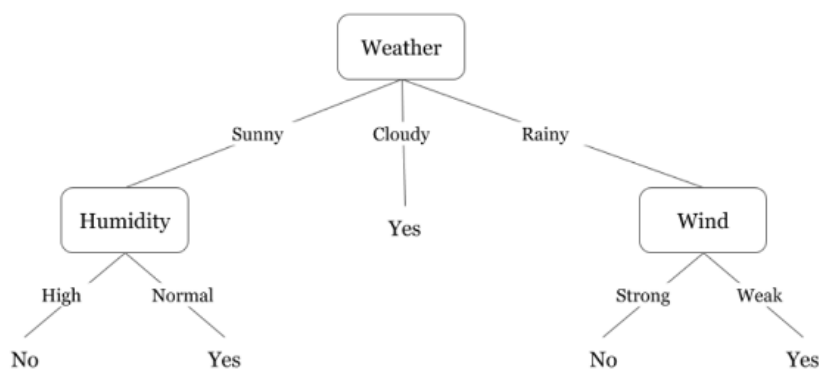
1. Assignment 1

Q_1 Explain the use of decision trees in data science.

Answer. Decision trees are a fundamental tool in the field of data science. They are versatile and intuitive machine learning algorithms used for both *classification* and *regression* tasks. Decision trees work by recursively splitting the dataset into subsets based on the most significant attribute at each node. These splits create a tree-like structure of decisions, where each internal node represents a decision based on a specific feature, and each leaf node represents the predicted outcome.

- **Decision Making:** Decision trees are excellent for decision-making processes. They allow data scientists to visualize decisions and understand the implications of each choice.

- **Feature Importance:** By evaluating which features are used for splitting nodes, data scientists can prioritize features for further analysis.

- **Non-Linear Relationships:** Decision trees can capture non-linear relationships between features and the target variable. Unlike linear models, decision trees can model complex patterns in the data.

- **Handling Missing Values:** Decision trees can handle missing values in the dataset. They can make decisions even if some values are missing for certain features.

- **Interpretability:** Decision trees are easy to interpret and explain to non-experts. The visual representation of a tree structure simplifies complex decision-making processes.

- **Ensemble Methods:** Decision trees serve as the building blocks for powerful ensemble methods like Random Forest and Gradient Boosting. These methods combine multiple decision trees to improve predictive performance.

2. Assignment 2

How many ways are there to rearrange the letters in the word "anagram"?

Solution. We can choose an arrangement of the letters in "anagram" in two steps. We first choose 3 of the 7 positions to be a's, then permute "ngrm" in the remaining positions. Thus, we have

$$\binom{7}{3} 4!$$

ways to choose an arrangement.