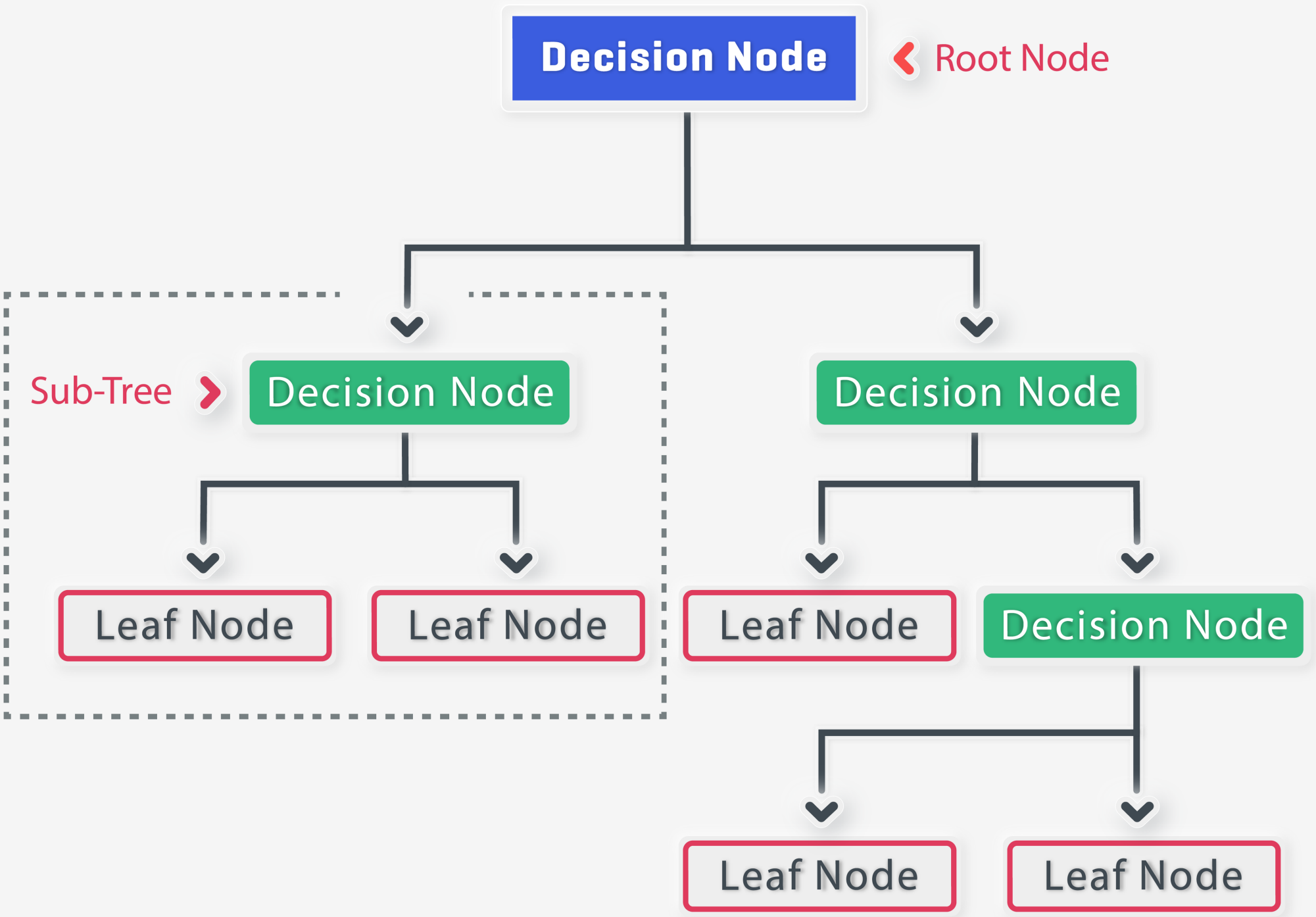
DECISION TREES



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Decision Trees

Decision Trees (DTs) are a **non-parametric** supervised learning method used for classification and regression.

The goal is to create a model that **predicts the value** of a target variable by learning simple decision rules inferred from the data features.

A tree can be seen as a piecewise **constant approximation**.

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Advantages of Decision Trees

Simple to understand and to interpret.
Trees can be **visualised**.

Requires **little** data preparation

The cost of using the tree (i.e., predicting data) is **logarithmic** in the number of data points used to train the tree.

Able to **handle** both numerical and categorical data

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Advantages of Decision Trees

Able to handle **multi-output** problems.

Possible to validate a model using **statistical tests**

Uses a **white box** model. If a given situation is observable in a model, the explanation for the condition is easily explained by boolean logic.

Performs well even if its assumptions are somewhat violated by the true model from which the data were generated.

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Disdvantages of Decision Trees

Decision-tree learners can create **over-complex trees** that do not generalise the data well

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Predictions of decision trees are **neither smooth nor continuous**, but piecewise constant approximations.

Decision trees can be **unstable** because small variations in the data might result in a completely different tree being generated. This problem is mitigated by using decision trees within an ensemble.

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Disdvantages of Decision Trees

There are concepts that are hard to learn because decision trees **do not express** them easily, such as XOR, parity or multiplexer problems.

Decision tree learners **create biased trees** if some classes dominate. It is therefore recommended to balance the dataset prior to fitting with the decision tree.

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