

# Part-I: Naive Bayes Classifier

## Task 1: Theory Questions

### 1. What is the core assumption of Naive Bayes?

The core assumption of Naive Bayes is that all features in the dataset are conditionally independent of each other given the class label. This means the presence or absence of one feature does not affect the probability of another feature within the same class. This assumption simplifies computation and works surprisingly well in many practical applications.

### 2. Differentiate between GaussianNB, MultinomialNB, and BernoulliNB.

- **GaussianNB** assumes that the features follow a normal (Gaussian) distribution and is typically used for continuous data.
- **MultinomialNB** works with discrete count-based features such as word frequencies in text classification.
- **BernoulliNB** is designed for binary/boolean features where each feature represents a yes/no (0/1) occurrence.

### 3. Why is Naive Bayes considered suitable for high-dimensional data?

Naive Bayes is suitable for high-dimensional data because it assumes feature independence, which reduces computational complexity and avoids the curse of dimensionality to some extent. It requires relatively few training data points to estimate parameters and works well in text classification tasks with thousands of features.