3. Naive Bayes

Naive Bayes is a simple but effective classification algorithm based on Bayes' theorem, with an assumption of independence among features. It's commonly used in machine learning for text classification tasks like spam filtering, sentiment analysis, and document categorization.

Bayes' Theorem: It calculates the probability of a hypothesis given the data. In simple terms, it helps us determine the probability of a certain event happening based on prior knowledge of conditions that might be related to the event.

$$P(y \mid x_1, \ldots, x_n) = \frac{P(y)P(x_1, \ldots, x_n \mid y)}{P(x_1, \ldots, x_n)}$$

Independence Assumption: Naive Bayes assumes that all features are independent of each other. This means that the presence of a particular feature in a class is unrelated to the presence of any other feature. Though this assumption might not hold true in real-world scenarios, Naive Bayes can still perform well in practice.

Classification: When given a new piece of data, Naive Bayes calculates the probability of that data belonging to each possible class. It then assigns the class with the highest probability as the classification result.