# Mini Project – Part 1: Probabilistic Reasoning on System Data

**Dataset:** easy_queue_data.csv

## Objective

The objective of this project is to reason under uncertainty using a simple probabilistic model. Accuracy is not the primary goal; instead, understanding probabilities and model behavior is emphasized.

**Model Chosen:** Naive Bayes Classifier

## 1. Data Understanding

**Most useful feature:** Wait time is the most useful feature because requests that wait longer are more likely to indicate congestion or system stress.
**Noisy feature:** Service time appears noisy since long service time does not always mean the request is problematic.
**Problematic request:** A problematic request usually has a high wait time, sometimes combined with moderate or high service time.

## 2. Model Application – Naive Bayes

Naive Bayes was selected because it provides probability estimates rather than only class labels. This helps in reasoning about uncertainty.
The model shows confident correct predictions when patterns are clear. It also produces confident wrong predictions due to noisy labels in the dataset.

## 3. Reflection

**Model reliability:** The model is reliable when wait time values are clearly high or low.
**Model failure:** The model fails when features give mixed signals, such as moderate wait time and high service time.
**Reason for failure:** Failures occur due to noisy labels and the independence assumption of Naive Bayes.