**APPLICATIONS**

**Reconstructing clean images from noisy images:** Bayes’ theorem is used in Bayesian inverse problems such as **Bayesian tomography**. Bayesian inference can be applied to the problem of reconstructing images from noisy versions of those images using **Bayes’ theorem and Markov Chain Monte Carlo (MCMC) algorithms**.

**Weather prediction:** Bayesian inference can be used in Bayesian machine learning to predict the weather with more accuracy. Bayes’ theorem can be applied for predicting real-time weather patterns and probabilities of rain based on past data such as temperature, humidity, etc. Bayesian models compare favourably against classical approaches because they take into account the historical behaviour of the system being modelled and provide a probability distribution over the possible outcomes of the forecast.

False Negative Rate = 0%

False Positive Rate = 5%

**Credit card fraud detection:** Bayesian inference can identify patterns or clues for credit card fraud by analysing the data and inferring probabilities with **Bayes’ theorem**. Credit card fraud detection may have false positives due to incomplete information. After an unusual activity is reported to enterprise risk management, Bayesian neural network techniques are used on the customer profile dataset that includes each customer’s financial transactions over time. These analyses confirm whether there are any indications of fraudulent activities.

**Spam filtering:** Bayesian inference allows for the identification of spam messages by using Bayes’ theorem to construct a model that can tell if an email is likely to be spam or not. The Bayesian model trained using the Bayesian algorithm will take each word in the message into account and give it different weights based on how often they appear in both spam and non-spam messages. **Bayesian neural networks** are also used to classify spam emails by looking at the probability of an email being spam or not based on features like number of words, word length, presence/absence of particular characters etc.

**Medical diagnosis:** Bayes’ theorem is applied in medical diagnoses to use data from previous cases and determine the probability of a patient having a certain disease. Bayesian inference allows for better prediction than traditional statistic methods because it can take into account all the factors that may affect an outcome and provide probabilities instead of just binary results. Bayes’ theorem is used to compute posterior probabilities, which are combined with clinical knowledge about diseases and symptoms to estimate the likelihood of a condition. Bayesian inference is used in the diagnosis of **Alzheimer’s disease**by analysing past patient data and finding a pattern that can indicate whether a person has this condition. Bayes’ theorem is especially useful for **rare diseases**that may occur infrequently and require a large amount of data to make accurate predictions.