# Lab 4

**Exercise 1**

1.

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**Calculate P(R):**

**Bayes Theorem:**

The probability that the child has measles given the rash is approximately 56.9%

2. Naïve bayes code can be found at “**Naive-Bayes-classification-on-Iris-dataset**” folder

**Exercise 2**

Codes can be found at “**Exercise2**” folder.

Explanation of the Viterbi Algorithm

The Viterbi algorithm is used to find the probable sequence of hidden states (often called the Viterbi path) that results in a sequence of observed events, especially in the context of hidden Markov models (HMMs).

1. **Initialisation:**
   1. Initialise the Viterbi matrix (**viterbi\_prob**) where each cell **viterbi\_prob[s, t]** holds the maximum probability of reaching state **s** at time **t**.
   2. Initialise the backpointer matrix **backpointer** which helps in backtracking the most probable path.
2. **Recusion:** 
   1. For each observation at time **t** (from **t=1** to **T-1**), compute the probability for each state **s** considering the previous state and the transition probabilities.
   2. Update the Viterbi matrix with the minimum probability of reaching state **s** at time **t**.
   3. Update the backpointer matrix to keep track of the state which gave the maximum probability.
3. **Termination:** 
   1. Using the backpointer matrix, trace back the most probable path from the last state to the first state to get the optimal sequence of hidden states.