1. Let us denote the following events for this question and identify their probabilities.

T: a randomly selected person is a terrorist, P(T) = 0.01

NT: a randomly selected person is not a terrorist, P(NT) = 0.99

Positve: positive test result for person who is being tested, P (T|Positve) = 0.95, P(NT|Posive) = 0.05

P(First positive person is terrorist) = P(T|Positive)

1. Since the n observations are independent , we have

Since our denominator is a constant, let’s setup our likelihood

Thus, we could have MLE estimator of as

3.1 let’s denote O1(i) as the event that the outcome of i-th classification is 1, similarly, we denote O0(i) as the event that the outcome of i-th classification is 0. Due to the assumption that the classifications are i.i.d., and the classifier is a random classifier, so we could expect

* 1. with the relationships given, we could have

3.3

Then,

3.4

3.5 Since we have known that for each random classification, it is actually a Bernoulli trial. The event that a random classification errors was denoted as **Rand~B(n, p)**, where the n is the total trails (as R+W), the p here is the probability that this specific trial is an error (as 0.5).

It is easy to know that E(Rand) = np, D(Rand) = np(1-p) = 0.25(R+W), S(rand) = 0.5(R+W)1/2. So specify the R and W with the numbers given above,

S(Rand) = D(rand)1/2=0.5\*(22)1/2=2.345

S(Rand) = D(rand)1/2=0.5\*(220)1/2=7.4

1. x is a novel input, with the utility matrix given, we have

Similarly,

Thus, class 1 is the best decision to make.

1. Apply the naïve Bayes to

Thus,