hw0\_sol Haoyuan Du

**Q1.**

**a.**

φ(w) =

=

Because in equation φ(w) + 2 [Xw − y] + Xδ, is a 1\*n matrix, [Xw − y] is a n\*1 matrix, so the product is a 1\*1 matrix which is a positive number. Similarly, is a 1\*n matrix. So Xδ is a 1\*1 matrix which is a positive number (sum of squares). φ(w) plus a positive number will greater than φ(w) itself which can’t be the optimal solution (minimum). Thus, w must be determined so that φ(w + ) ≥ φ(w) for any possible vector .

**b.**

Sol:

**Q2.**

**a.**

No. Because the probability can’t be used to determine a single (individual) event. It can only describe a large group of data.

**b.**

Table 1

|  |  |  |  |
| --- | --- | --- | --- |
|  | D | Not D |  |
| Positive+ | P (X = 1|D = 1) = 0.7  1000\*0.7 = 700 | 1800 | 2500 |
| Negative- | 300 | P (X = 0|D = 0) = 0.8)  9000\*0.8 = 7200 | 7500 |
|  | 10000\*0.1 = 1000 | 9000 | 10000 |

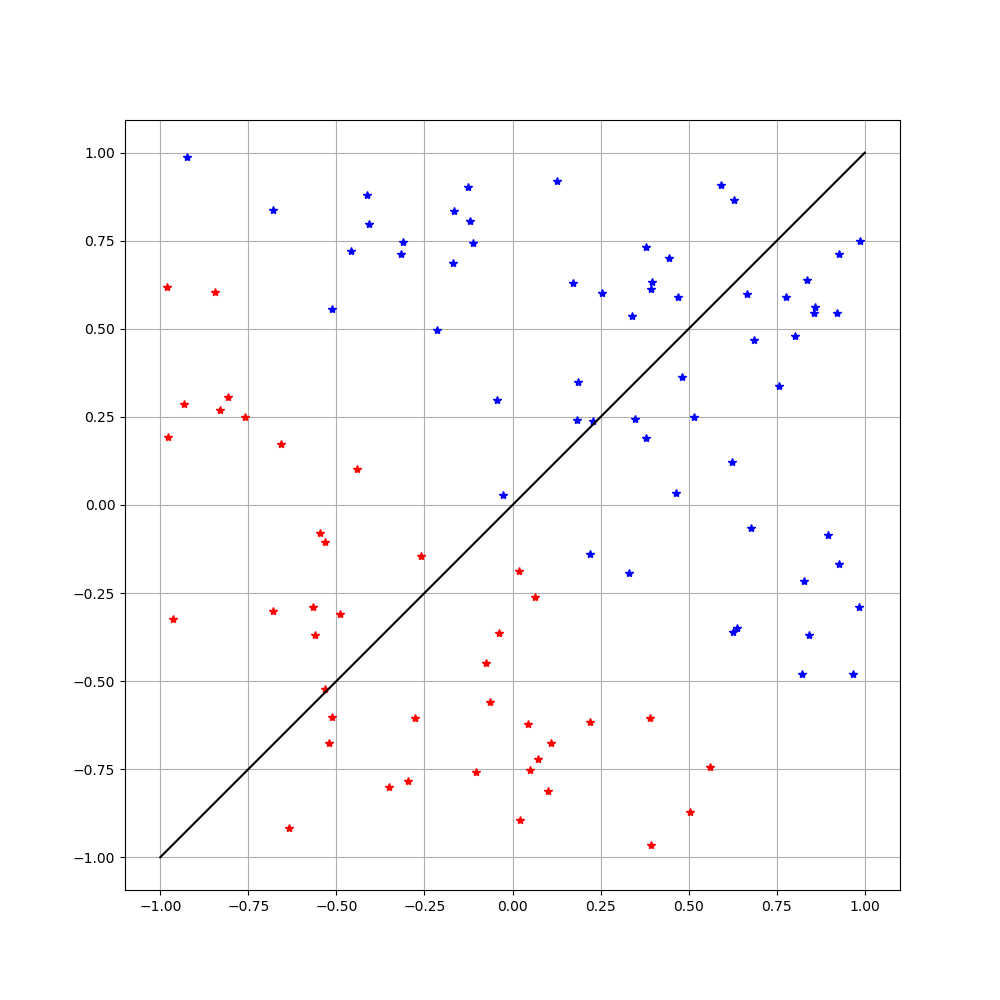
As the table above, P(disease) = P(b) = 0.1, P(positive | disease) = 0.7, P(positive) = P(a) = 2500 / 10000 = 0.25

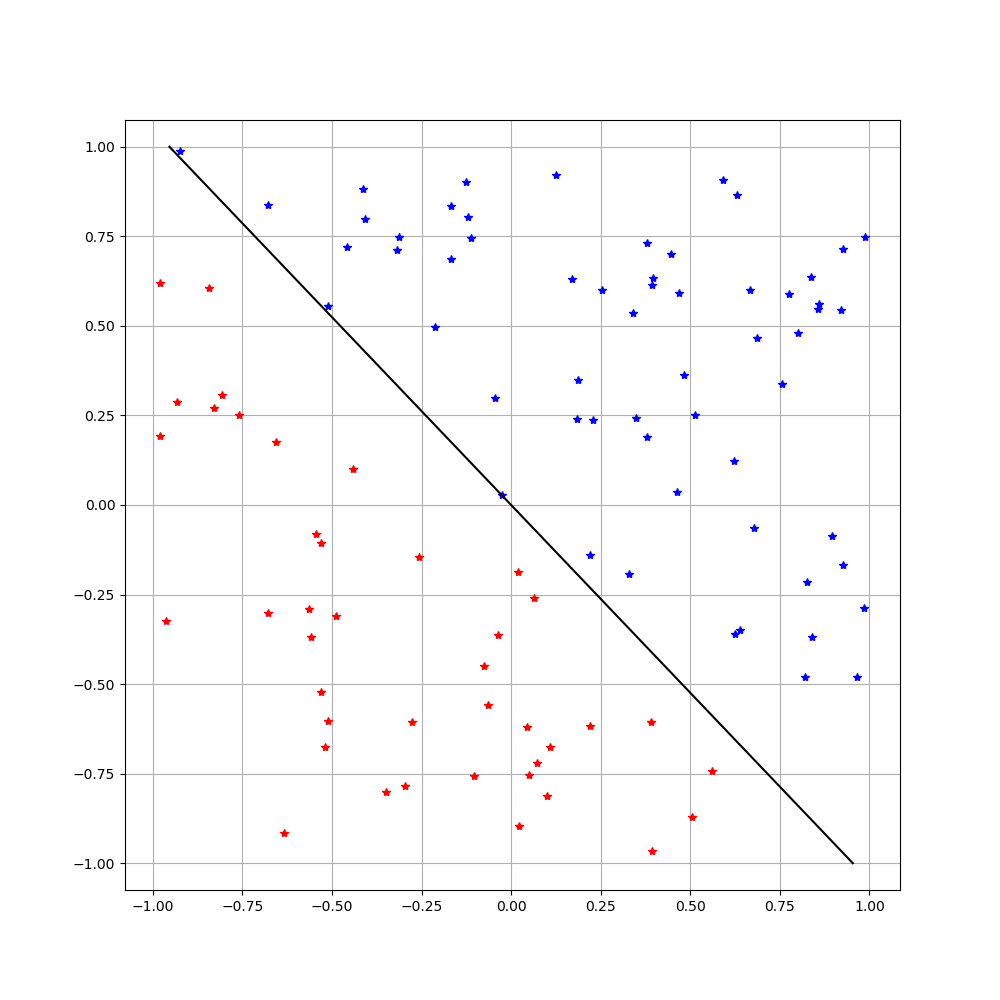
Thus, according to the Bayes Rule: p(b|a) = p(a|b)p(b) / p(a) = 0.7\*0.1 / 0.25 = 0.28

We can get the same answer from the table: 700/2500 = 0.28

**Q3.**

81 iterations for convergence. Error rate = 0.09.





**Q4**.

error rate = 0.00

