Introduction to Machine Learning (67577)

Exercise III – Classification

Hadar Sharvit – 208287599

**Theoretical Questions**

**Bayes Optimal and LDA**

1. Show that :

We know from bayes theorem that , therefore it is sufficient to show that .

Suppose in the first case that . If so, thus the corresponding would be (as ). For the other case, , which in turn means , so would be . We can write those in compart form as followed

1. Show that where :

From Q.1 we have , and we know that for calculating , taking will provide the same result. If so, let us concentrate on the following:

Substituting we have

Since the first is not a function of , it will not affect the result of . Let us simplify the second component

Since is the same for both , :

Yet again, is not a function of , therefore is not relevant for the calculation of . In conclusion we have

And consequently

1. Write your formula for estimating , and based on :

We will use a maximum likelihood estimator to estimate the different parameters

For every we can calculate

**Type I errors**

1. Let us write the possible cases, given that indicates spam and is non-spam:
2. If the current mail is non-spam (:
3. (true negative): I have correctly identified the spam
4. (false positive): I have declared the mail is spam (which is wrong)
5. If the current mail is spam (:
6. (true positive): I have correctly identified the mail as spam
7. (false negative): I have declared the mail is non-spam (which is wrong)

1.b is denoted a Type-I error – we would wish to avoid declaring regular mail as spam

2.b is not as bad, though still an error.

**SVM – Formulation**

**Practical Questions**