**HMW 1**

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Question 2.1

One of the usage of classifiers models is in neuroscience field of study.

Electroencephalogram (EEG) is a standard neuroimaging tool for the study of neuronal dynamics of human brain. Data extracted from EEG are the recorded waves that shows the cortical electrical activity. One example in which classification model would be used is the classification of EEG signals.

Time and frequency of the EEG data cab be used as domain future such as Wavelet coefficients and relative sub-band energies. With application of Classifiers such as, K-nearest neighbors (KNN) and Support Vector Machine (SVM) we can classify the EEG dataset into different class based on our scientific question. this classification usually can be into TWO class of cognitive task and baseline task.

Question 2.2

Our KSVM model with coefficients is:

( -0.0001500738) X1 + (-0.0014818294 ) X2 + 0.0014083130 X3 + 0.0072863886 X4 + 0.9916470037 X5 +( -0.0044661236) X6 + 0.0071482899 X7 + ( -0.0005468386 )X8 +(-0.0016930578 )X9 + 0.1054824270 X10 +(-0.08198854)

The best classifier is the one that have maximum margin from both class.

Based on the prediction of Response in our ksvm model the best C value is the one that have highest accuracy of response prediction.

Part 1

|  |  |
| --- | --- |
| C Value | Model Accuracy |
| C=0.00001 | 0.5474006 |
| C=0.001 | 0.5474006 |
| C=0.05 | 0.8639144 |
| C=0.01 | 0.8639144 |
| C= 10 | 0.8639144 |

Part 2

Part 3

Before running the KKNN model we split the data to two-part training and test data. And we train our model on training data and then test the model on test data and predict the response on test data. Due to possible overfitting issue we need to test our model on test data.

Based on the prediction of Response in our kknn model the best K value is the one that have highest accuracy of response prediction on our test data

|  |  |
| --- | --- |
| K Value | Model Accuracy |
| K= 2 | 0.7738693 |
| K=4 | 0.7738693 |
| K=8 | 0.8341709 |
| K=12 | 0.839196 |
| K=19 | 0.8442211 |