**Assignment - In progress**

Complete the form, then choose the appropriate button at the bottom.

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| **Title** | Assignment #2 - Supervised Learning |
| **Due** | Oct 31, 2016 8:00 pm |
| **Status** | Not Started |
| **Grade Scale** | Points (max 100.0) |

**Instructions**

This assignment is to be done in pairs. **Only one person** needs to submit it and please list both team members' names in your document clearly.

Download the  pen -written digit  data sets in the attachments.   
  
These data sets consist of handwritten  digits  as recorded using a  pen -based tablet. Each record/row corresponds to a single digit . The  classification task is to determine which  digit  has been written.   
  
A row consists of 16 independent attributes and the corresponding digit (i.e. 17 columns in training) .  The 16 independent attributes corresponds to the eight x-y  digit  co-ordinates (within a unit square) the  pen  takes as the  digit  was  written. The test set does not have labels and each row has only 16 columns. These files are comma separated.

1. Implement the support vector machines with the Gaussian and Polynomial kernels. You should not simply use  'svm' in existing software libraries. However you are allowed to use optimization packages/libraries. For example, when implementing SVM you must formulate the optimization problem but could plug that into, say, some quadratic  program solver. (20 points)   
  
2. Perform 10-fold cross validation for each Kernel to tune the best performing hyper-parameter and  report the mean error and the confusion matrix.  (10 points)   
  
3. For the SVM formulations draw an example instance corresponding to the support vector for each digit (10 points).   
  
4. Predict the digit being written for each instance in the the test data set we make available. One prediction per line in the order the data is given. (10 points)   
  
5. Implement the transfer SVM. Train your transfer SVM on the source problem (0vs8Source.csv) of differentiating 0s from 8s for one set of writers (1-20) and transfer transfer what was learnt to differentiate 0s from 8s for another set of writers (21-30)  (0vs8Target.csv) . Report your results on the test data set  (0vs8NoLabelTest.csv)  (20 points)

6. Implement the one-class SVM. Train your one-class VM on the target problem (0vs8Target.csv) to predict 8s.  Report your results on the test data set  (0vs8NoLabelTest.csv)  (20 points)