

ENGR421

HW06: One vs All Support Vector Classification

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1. I specified training and test indices and split my data accordingly.
2. Before implementing the one-vs-all, I implemented helper functions.
 - a. `hadamard` takes a `y` value does matrix multiplication with itself then performs Hadamard(elementwise) multiplication with given `K`
 - b. `gaussian_kernel` takes to data set `X1` and `X2` and `s` to calculate gaussian kernel which is going to be used as similarity matrix.
 - c. `dual_problem` takes `C`, `epsilon`, Hadamard multiplication of `yy` and `K`, and `y` It solves the dual problem matrix-vector form following the algorithm we defined in lab. It uses `cvxopt` library to accomplish this. It returns `alpha` and `w0`.
 - d. `binary_y` converts our label set `y` as if it is a binary classification. It takes `y` and `class_label` and if a label in `y` is equal to `class_label` then it is positive class and represented as 1 if not then it is represented as -1.
 - e. `f_predict` calculates value using `y` `K` `alpha` and `w0` that is obtained by above functions.
 - f. `one_vs_all` calculates `f_predict` values for all classes then for each label chooses the class with highest `f_predict` value.
3. Using above-described functions I calculated training and test performances and obtained confusion matrices
4. For each `C` value in the `hw06_description` file I trained our algorithm and calculated accuracies, stored them and plot.