

# ENGR 421

## HW3 Report

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- **Data Generation:** The data and the labels were imported from the given files in the homework file.
- **The prior probability estimation:**

The prior probabilities  $\hat{p}_1, \hat{p}_2, \hat{p}_3, \hat{p}_4$  and  $\hat{p}_5$  were estimated using the following formula:

$$P_i = \frac{\sum_{i=1}^N 1(y_i = c)}{N}$$

- **Data Points Estimation:**

Using the score function:

$$g_i(x) = \sum [x_j \log p_{ij} + (1 - x_j) \log(1 - p_{ij})] + \log P(Ci)$$

And the estimator was:

$$\hat{P}_{ij} = \frac{\sum_t x_j^t r_i^t}{\sum_t r_i^t}$$

Where  $r_i$  is the true labels for given class  $i$ .

and  $x_j$  is the  $j$ th element of a vector  $x$ .