CS 760: Machine Learning Spring 2024

Homework 5: Nearest Neighbors & Naive Bayes

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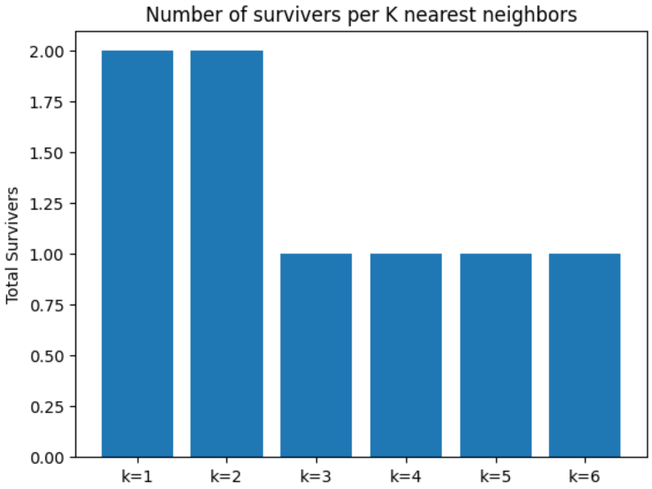
Problem 5.1

(a) See code in *KNN.ipynb* under Problem 5.1. I chose to implement K-Nearest Neighbors where $K = 5$. I went this route since it's as simple as normal Nearest Neighbors to implement, but more robust.

(b) I used *np.linalg.norm* to implement the euclidean distance. I chose the L2 norm because I find it to be more straightforward and intuitive, plus I'm much more used to using it from my previous Linear Algebra classes.

(c) See code in *KNN.ipynb* under Problem 5.1. I tested out multiple features and summed up the counts of survival, based on how many K nearest neighbors I use. Unfortunately, I did not survive based on my demographics. Notably, as I increased K, the number of survivers went down.



(d) While $k = 1$ and $k = 2$ have the most survivors among my samples, I beleive that's because there isn't enough wiggle room for correct classification. I believe $k = 6$ is most representative give the fact that I have 6 different features.

(e) The most apparent solution is to run multiple rounds of cross validation along different values for K to assess the accuracy.

Problem 5.2

(a) See code in *$KNN.ipynb$* under Problem 5.2.

(b) For simplicity, I modeled all my variables normally.

(c) Yet again, I do not survive the titanic. But just to quadruple check, I used my $test_features$ array to try out multiple demographics. Among them, the only sample that survived was a female minor with parents, siblings, and paid a decent fare of 30 dollars.

(d) I calculated the accuracy using *train_test_split* from sklearn which gave me around 80% accuracy. However, another method could be to perform cross validation using different distributions for the different variables. For example, you change it so that sex is modeled bernoulli and then run a CV on that.

Problem 5.3

While KNN was by far the easiest to implement among all the other algorithms, I still prefer linear regression. Most likely, that's due to my familiarity with having used it so often.

Problem 5.4

Problem 5.5