HW #3: HeatMiser Meet OSHA

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CS.321 AI

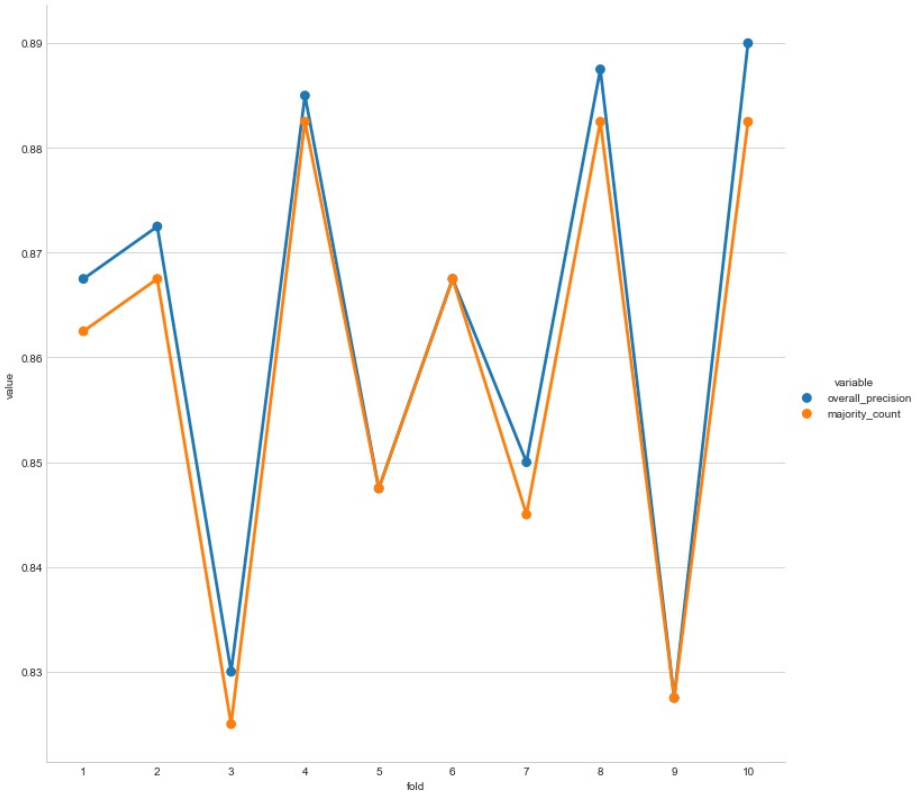
Introduction

Part I: Decision Tree

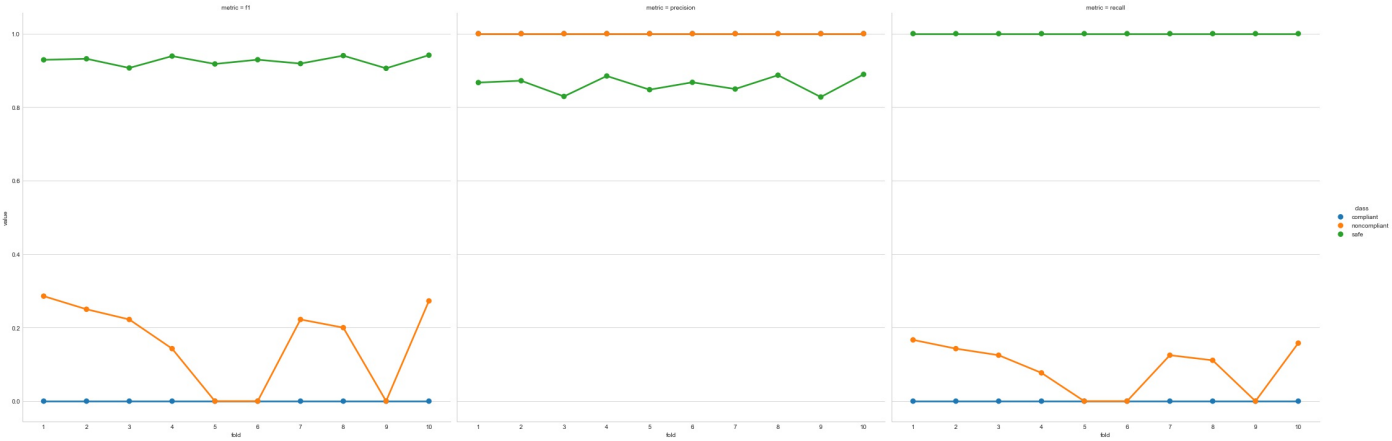
We implemented a decision tree from scratch in pure python, as well as using scikit learn.

Our own implementation had a precision that fluctuated within the range from 80-90%.

Here is precision compared to a baseline.



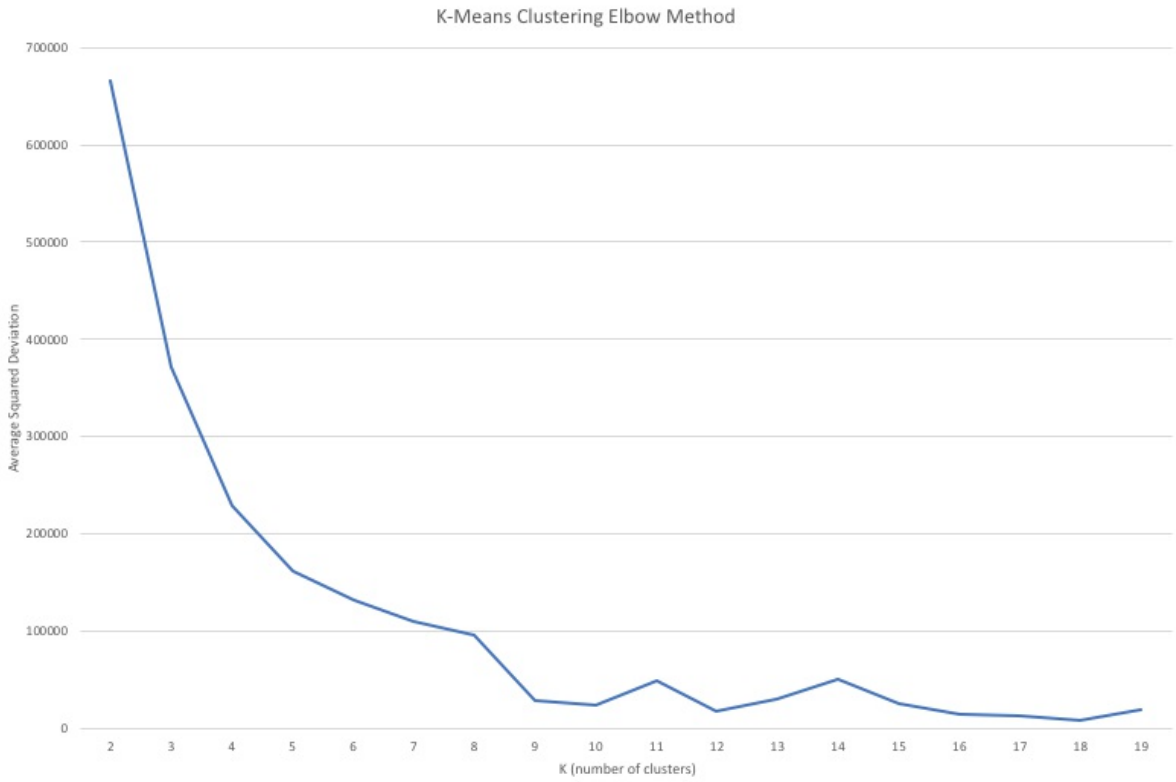
Here is each metric for each class.



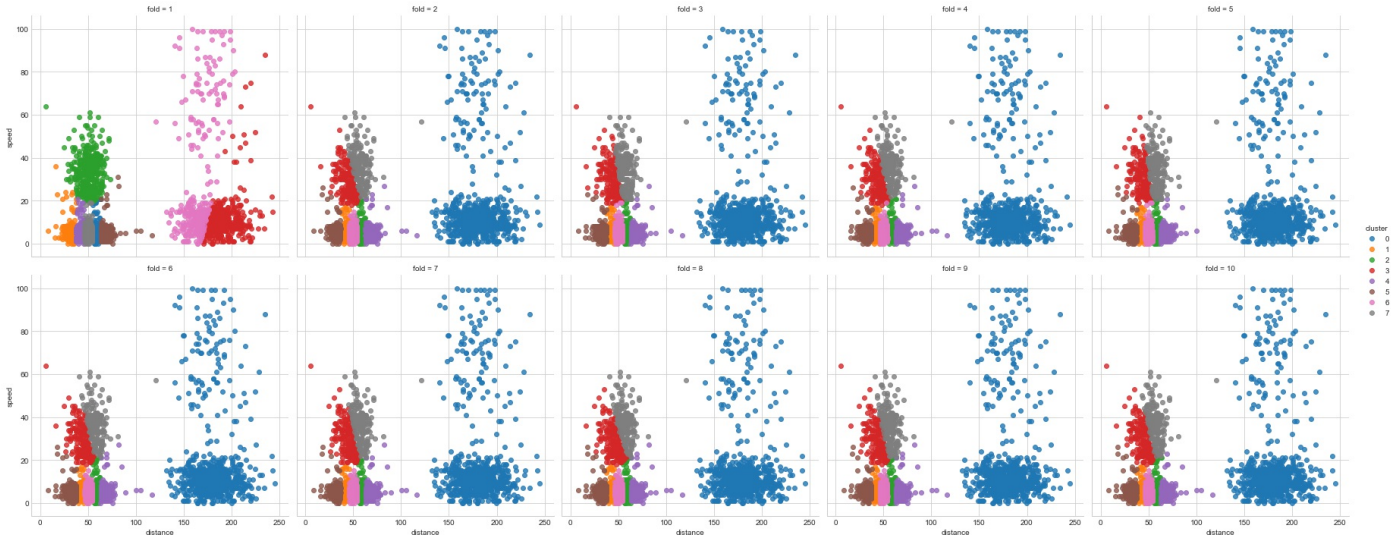
The Scikit Learn implementation consistently obtained f1 scores around 99%.

Part II: K-Means Clustering

We determined the optimal k-value using an elbow implementation.



Here are the clusters over 10 folds:



Part III: Evaluation

Based on the results of our implementation of the elbow method, we tried a range of k values from 4 to 8 - the graph generated by the elbow method was quite smooth and we could make a case for any of these values being the correct elbow. Of these, 4 broke up the data into the most natural-looking sections, but 8 had the best performance on the test data by about 1.5%. We chose to stick with 4, since the

performance difference was fairly small and it illustrated the layout of the data much more cleanly.

The clustering process, much more so than the decision trees, identified the areas of moderate speed and distance that were by far the most likely to be either "compliant" or "noncompliant" rather than "safe". Thanks to the small number of information classes, the decision tree usually had to make the "best guess" of safe when it reached a leaf node, only once identifying a definitive (0-entropy) non-safe leaf node.