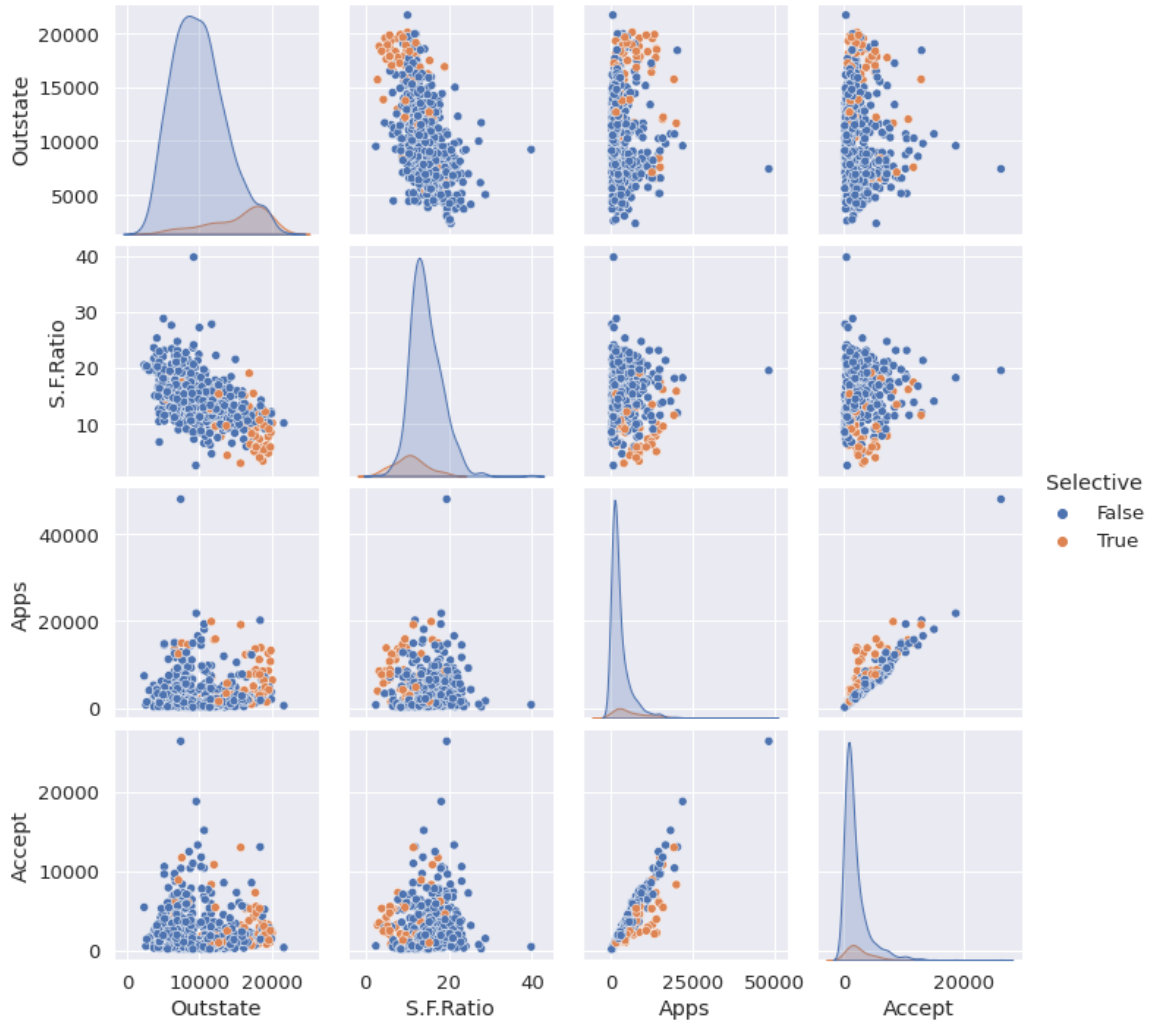
Colab link for Parts 1-2:
https://colab.research.google.com/drive/1Mk9EiaGSQK88KiMJ7FJnevCNjhxFHHo3#scrollTo=-BQcidnp68zI

Part 3:



The features I chose to pair plot were: Out of state cost (*Outstate*), Student to Faculty Ratio (*S.F.Ratio*), Number of applications received (*Apps*) and Number of students accepted (*Accept*). Based on the pair plots of these four features, I saw an inverse relationship between S.F.Ratio and Outstate. As Outstate increased, S.F.Ratio decreased. I also saw a direct relationship between Accept and Apps. As Accept increased, so did Apps.
Features that seem to correlate with a highly selective school were Outstate (tended to be higher for selective schools) and S.F.Ratio (which tended to be lower for selective schools). Furthermore, these two features as a pair also correlated to a highly selective school, where schools with higher Outstate and lower S.F.Ratio tended to be more selective. This was clear by the two distinct clusters of Selective and Non Selective schools.
Based on this analysis, I would recommend schools to increase their out of state cost and lower their Student to Faculty ratio in order to seem more selective.

Part 4:

a.

Model 1: Small K

Training Precision: 1.0
Training Recall: 1.0
Training Accuracy: 1.0
Training F1-Score: 1.0

Test Precision: 0.43
Test Recall: 0.38
Test Accuracy: 0.87
Test F1-Score: 0.38

Model 2: Large K

Training Precision: 0
Training Recall: 0
Training Accuracy: 0.92
Training F1-Score: 0
Test Precision: 0
Test Recall: 0
Test Accuracy: 0.89
Test F1-Score: 0

b.

Best: train

Precision: KNN with Small K (1.0)
Recall: KNN with Small K and All Selective Classifier (1.0)
Accuracy: KNN with Small K (1.0)
F1-Score: KNN with Small K (1.0)

Worst:

Precision: KNN with Large K, All Not Selective Classifier (0)
Recall: KNN with Large K, All Not Selective Classifier (0)
Accuracy: All Selective Classifier (0.08)
F1-Score: KNN with Large K, All Not Selective Classifier (0)

c.

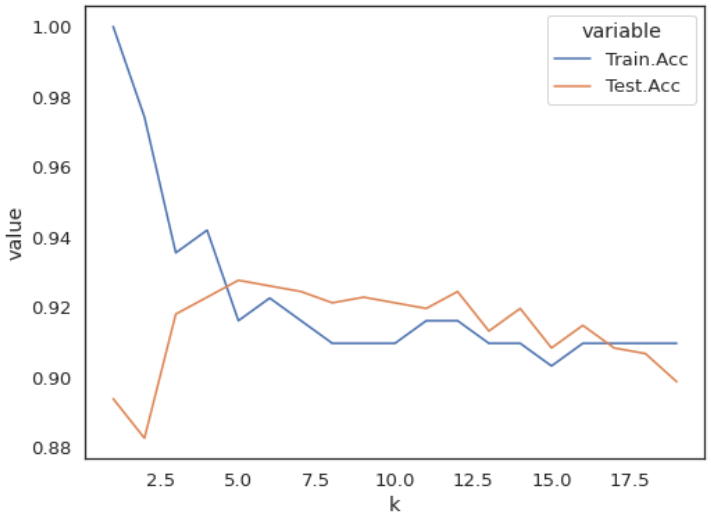
Best: test

Precision: KNN with Small K (0.43)
Recall: All Selective Classifier (1.0)
Accuracy: KNN with Large K (0.90)
F1-Score: KNN with Small K (0.38)

Worst:
Precision: KNN with Large K (0)
Recall: KNN with Large K (0)
Accuracy: All Selective Classifier (0.10)
F1-Score: KNN with Large K (0)

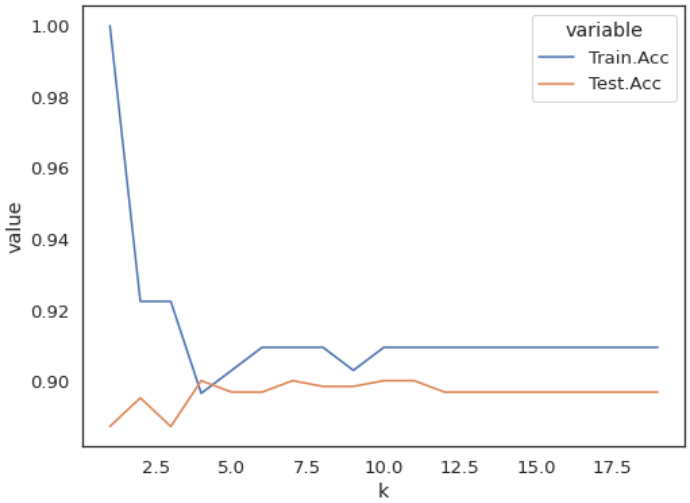
d. I would recommend KNN with Small K. An all selective or not all selective classifier performs very poorly because it classifies everything as the same thing. Therefore, a KNN classifier would be much better. Based on the metrics on training and testing data, a small K did better overall than a large K.

Part 5:



a. I expect this university to be private. I ran KNN with k = 5 based on the results of the graph above. I used all the features given to me in the write up to train the data and classify the school with, and my model returned that the school was private.

b.



Using a K of 4 for a KNN analysis, the hypothetical university is *not* selective. Based on parts 2 and 3, I noticed that Outstate and S.F.Ratio had a relationship that did the best at showing whether a school was selective or not, so I used those 2 features to classify the hypothetical university. I trained the model using all the data points in the csv file and made sure to normalize the training and test data before running it through the classifier. I would say that this prediction makes sense because the out of state tuition on this hypothetical school is lower than most selective school's out of state tuition and the hypothetical school's student to faculty ratio is higher than it is for most selective schools.

c. A small change I would make is lowering the student to faculty ratio to be about 10:1. I noticed that most selective schools had a student to faculty ratio lower than 10:1, and changing the ratio from 12:1 to 10:1 sounds reasonable and small. I am suggesting lowering the student to faculty ratio rather than the out of state tuition because the out of state tuition for most selective schools were about 16,000-20,000 and that seems like a much bigger jump for a school that has originally an out of state tuition of 14,000.