The following dataset (wine.csv) contains wine samples by variety (first column) with test results from a chemical analysis of the samples.

Build a KNN model that predicts the variety (1,2, or 3) of a wine sample using the results of the chemical analysis as input features.

You may begin with the following notebook (knn\_wine\_blank.ipynb). Make sure to put the wine.csv file in the same folder. The template currently loads the wine dataset, and sets up the train and test data. After loading the data, provide code that:

1. Creates 2 KNN models: k = 1 and k = 3. Train these models using the wine training data.
2. Using these trained models, predict the labels for the wine test set. Print out the predicted labels for both k = 1 and k =3.
3. Evaluate both KNN models by getting the accuracy and confusion matrix based on the test data. Print these values for both k = 1 and k = 3.
4. Build KNN models using k = 5,6,7,8,9,10,11 and print their corresponding accuracies.
5. Based on the output of step 4, determine the k with the best accuracy, rebuild the model and print the confusion matrix for that model. Make sure this is at the end of your notebook.

You may pattern your work after the following notebooks that carry out similar task but uses the iris dataset:

* knn\_iris
* knn\_iris\_loop

Note: we will not carry out normalization for this lab.

Optional:

Some of you may finish early. For those who know how to program (or would like to explore), I encourage you to carry out the following additional task:

1. Use a for loop when building KNN models for k = 5 to k = 11. Modify the loop so that it automatically determines the model with the maximum accuracy. This way, step 5 above need not be manually identified.
2. Using matplotlib and/or the provided function in this notebook (knn\_iris\_with\_plot), plot the confusion matrix for the optimal k instead of printing it as a string.