# Practice 5A: Logistic Regression

*Supervised Learning - 1 December 2021*
**Wine dataset - classification problem**

1. Load explore and preprocess (if needed) the dataset. The dataset is accessible also through `sklearn`

   ```
   from sklearn.datasets import load_wine
   data = load_wine()
   ```

2. Create a binary attribute `Class0` that contains a $1$ if `target` contains the value $0$, and a $0$ otherwise.
3. Split the data into training set and test set $80:20$
4. Perform Logistic Regression on the training set in order to predict `Class0` using all the features.
5. Compute the training error rate of the model.
6. Produce a confusion matrix comparing the true target test values to the predicted target values.
7. Compute the test error rate.
8. Calculate and plot the ROC curve of the trained model and calculate and print the ROC AUC of the model.
9. Perform a 3-fold Cross Validation (choose an appropriate cross-validation strategy) in order to reliably estimate the performances of the model.
10. Train a Softmax Regression model on the training set in order to predict the original target class, using all the features.
11. Produce a confusion matrix comparing the true target test values to the predicted target values. Calculate Precision, Recall and f-score for each class.