## Homework 3

1. Use logistic regression to do the classification for the Iris Dataset.

**PAY ATTENTION to the multi-class classification problem:**

The **classical logistic regression** is inherently designed for binary classification, meaning it distinguishes between two classes. However, **scikit-learn's LogisticRegression** implementation extends this basic concept to handle multi-class classification using techniques like:

1. **One-vs-Rest (OvR):**
   * This is the default approach used by scikit-learn when dealing with multi-class problems. In this method, a separate binary classifier is trained for each class. For example, in the Iris dataset (3 classes), the algorithm would train three separate binary classifiers:
     + Class 1 vs. all others
     + Class 2 vs. all others
     + Class 3 vs. all others
   * During prediction, the classifier with the highest confidence score (probability) wins, meaning the model chooses the class with the highest predicted likelihood.
2. **Softmax (Multinomial Logistic Regression):**
   * In multinomial logistic regression, the algorithm uses a generalized version of logistic regression called softmax or the cross-entropy loss function, which assigns probabilities to multiple classes simultaneously.
   * In scikit-learn, this can be specified with the multi\_class='multinomial' parameter, making it fit all classes directly rather than using the one-vs-rest approach.
3. (optional) Compare the difference between one-vs-one, one-vs-rest and softmax techniques in extending two-class classifier to multi-class classification problem.