

Assignment 4

Write jupyter notebook scripts for all of the questions. Print out the required results.

1. Artificial Neural Network (ANN) (50 points)

Apply ANN to virginica and versicolor in the iris dataset. Use `LeaveOneOut` in `sklearn` to split the data for training and testing. `LeaveOneOut` means that, in each training-testing cycle, exactly one sample is used for testing and all of the remaining samples are used for training. Repeat the training-testing cycle until all of the samples have been used for testing. Compute the average error rate after the all of the training-testing cycles.

Figure 1 shows example python code to split the samples for training and testing using `LeaveOneOut`. You can find more information about how to use `LeaveOneOut` in `sklearn` [here](#).

```
import numpy as np
from sklearn.model_selection import LeaveOneOut

X = np.array([[1, 2], [3, 4]])
y = np.array([1, 2])

object_loo = LeaveOneOut()
num_of_cases = object_loo.get_n_splits(X)
train_test_split_index = object_loo.split(X)

train_test_cycle = 1
for train_index, test_index in train_test_split_index:
    X_train = X[train_index]
    X_test = X[test_index]
    y_train = y[train_index]
    y_test = y[test_index]

    print(train_test_cycle)
    train_test_cycle += 1
```

Figure 1: Example python code to split samples for training and testing using `LeaveOneOut`.

To do classification using ANN, use the following python code with the given values of parameters:

```
from sklearn.neural_network import MLPClassifier  
  
MLPClassifier(random_state=1, hidden_layer_sizes=50, max_iter=1000)
```

You can find more information about how to use LeaveOneOut in sklearn [here](#).

2. Comparison of ANN with Decision Tree and KNN

Use LeaveOneOut to split samples for training and testing and apply decision tree and KNN (5 neighbors) and compare the average error rate.