NYCU Pattern Recognition, Homework 2

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The screenshot and the figures we provided below are just examples. **The results below are not guaranteed to be correct.** Please make sure your answers are clear and readable, or no points will be given. Please also remember to convert it to a pdf file before submission. You should use English to answer the questions. After reading this paragraph, you can delete this paragraph.

**Part. 1, Coding (60%)**:

**(25%) Logistic Regression w/ Gradient Descent Method (**[**slide ref**](https://docs.google.com/presentation/d/15Pveu9xLAnRPJLWsMADBCm99uzGtISVLIgHqmvLnZm4/edit#slide=id.g269b22b591e_0_90)**)**

1. (0%) Show the hyperparameters (learning rate and iteration, etc) that you used
2. (5%) Show your weights and the intercept of your model.
3. (5%) Show the AUC of the classification results on the testing set.
4. (15%) Show the accuracy score of your model on the testing set

**(25%) Fisher Linear Discriminant, FLD (**[**slide\_ref**](https://docs.google.com/presentation/d/15Pveu9xLAnRPJLWsMADBCm99uzGtISVLIgHqmvLnZm4/edit#slide=id.g2c7fd2fe751_0_156)**)**

1. (0%) Show the mean vectors mi (i=0, 1) of each class of the training set.
2. (5%) Show the within-class scatter matrix *Sw* and between-class scatter matrix *Sb* of the training set.
3. (5%) Show the Fisher’s linear discriminant *w* of the training set.
4. (15%) Obtain predictions for the testing set by measuring the distance between the projected value of the testing data and the projected means of the training data for the two classes. Show the accuracy score on the testing set.

**(10%) Code Check and Verification**

1. (10%) Lint the code and show the PyTest results.

**Part. 2, Questions (40%):**

1. (10%) Is it suitable to use Mean Square Error (MSE) as the loss function for Logistic Regression? Please explain in detail.

Write or type your answer here.

1. (15%) In page 31 of the lecture material (linear\_classification.pdf), we introduce two methods for performing classification tasks using Fisher's linear discriminator: 1) Determining a threshold, 2) Using the k-NN (k-nearest neighbors) rule. Please discuss at least three aspects, either advantages or disadvantages, of using the k-NN method compared to determining a threshold (resources, performance, etc.).

Write or type your answer here.

1. (15%) In logistic regression, what is the relationship between the sigmoid function and the softmax function? In what scenarios will the two functions be used respectively?

Write or type your answer here.