

**Assignment 1****Due Date: April.2.2024 Tuesday**

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**1-** Given two synthetic datasets**class2\_tr** : 220 samples with 2 features and 1 label bit, from 2 classes**class2\_test**: 80 samples with 2 features and 1 label bit, from 2 classes

- Create a suitable perceptron (a single unit) structure
  - Train it with perceptron learning which uses gradient descent, and test it with the test data.
  - Train it with perceptron learning which uses gradient descent, and test it with the test data.
  - Train it with delta rule which uses gradient descent, and test it with the test data.
  - Train it with delta rule which uses stochastic gradient descent, and test it with the test data
  - Get related figures to display data distribution, classification for training data, classification for test data, training error vs iterations
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**2-** Given two synthetic datasets**class3\_tr** : 330 samples with 2 features and 2 label bits, from 3 classes**class3\_test**: 120 samples with 2 features and 2 label bits, from 3 classes  
(for the test file the labels are given yet we assume that we do not know them)

- Create a suitable MLP structure
  - Train it with backpropagation algorithm using the training data, and test it using the test data
  - Get related figures to display data distribution, classification for training data, classification for test data, training error vs iterations
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- You can consider the classification result of the sample good if the output is close enough to the target value. If the desired value is  $t = [1 \ 1]$  and you have  $o = [0.99 \ 0.93]$  you may regard it still a good classification
  - The weights are initialized randomly for each run you may have different results
  - You can do different experiments on a) number of hidden layer units, b) learning rate, c) momentum
  - For the activation functions perceptron learning needs sign or threshold function, delta rule can be employed with linear or sigmoid function.
  - You have to write source codes to train and test the perceptron and MLP you created.
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**3-** Create a doc. file as the documentation to include your outputs and codes.Dr. Muharrem Mercimek

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- The due date is firm and it is **midnight of the due date**.
- Submit your document as a {.doc} or a {.pdf} document. Name your document as KOM6110\_yourName\_yourNumber\_Assignment1.{doc,pdf}
- Also you should submit your source files.**
- Zip your files and name the zip file KOM6110\_yourName\_yourNumber\_Assignment1.{zip,rar}
- Submit your work via **online system**.