Exercise 5 : Artificial neural networks

- Open the "cpu.arff" dataset
- Go to the "Classify" tab. Select the **MultilayerPerceptron** classifier (i.e., weka.classifier.functions.MultilayerPerceptron).
- In the "Test options" panel, select the "Percentage split" option, and use the default splitting (66% per training).
- Click on the "MultiplayerPerceptron" label. In the "About" panel, click the "More" button to read and understand the parameters supported in the WEKA's implementation.

1. Run the classifier and observe the results shown in the "Classifier output" window. *(Note that by default, WEKA use one hidden layer with the number of hidden neurons = (# of input attributes + # of classes) / 2.)*
    - 1.1 How many units in the input layer, how many in the hidden layer, and how many in the output layer?
    - 1.2 What is the MAE (mean absolute error) made by the learned NN?
    - 1.3 What is the RMSE (root mean squared error) made by the learned NN?
    - 1.4 Visualize the errors made by the learned NN. In the plot, how can you see the detailed information of a test instance?
    - 1.5 Draw (on paper) the topology (together with the weights) of the learned NN.

2. To modify the value of a parameter, click on the "MultiplayerPerceptron" label. Set the value of the "momentum" parameter equal to 0.7. Run the classifier and observe the results shown in the "Classifier output" window.
    - 2.1 What is the MAE (mean absolute error) made by the learned NN?
    - 2.2 What is the RMSE (root mean squared error) made by the learned NN?
    - 2.3 Visualize the errors made by the learned NN. In the plot, how can you see the detailed information of a test instance?

3. Now, we shall modify the network structure. Click on the "MultiplayerPerceptron" label. Set the value of the "hiddenLayers" to "3, 2". Run the classifier and observe the results shown in the "Classifier output" window.
    - 3.1 How many layers does the current NN have?
    - 3.2 How many units in each (input/hidden/output) layer?
    - 3.3 What is the MAE (mean absolute error) made by the learned NN?
    - 3.4 What is the RMSE (root mean squared error) made by the learned NN?
    - 3.5 Visualize the errors made by the learned NN. In the plot, how can you see the detailed information of a test instance?
    - 3.6 Draw (on paper) the topology (together with the weights) of the learned NN.