



Universidade do Minho

Departamento de Informática

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Mestrado em Matemática e Computação

Dados e Aprendizagem Automática

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Practical Exercise no. 8

Theme Artificial Neural Networks

Exercise Artificial Neural Networks (ANNs) are computer models that mimic the human central nervous system and are capable of solving classification and regression problems.

A MultiLayer Perceptron (MLP) is a fully connected class of feedforward ANN. It contains at least three layers of nodes, and, except for the input nodes, each node is a neuron that typically uses a non-linear activation function. MLPs form the basis of neural networks and improve computational performance when applied to classification or regression problems.

The aim of this practical statement is to carry out a series of tasks that will give you a better understanding of the structure and operation of this type of network.

Tasks This practical exercise includes the following tasks:

T1. Follow and implement the steps presented in the practical notebooks in order to design and optimise neural networks in the context of the datasets of the practical group work (the PyTorch should be used for classification problems);

T2. Try to optimise the previous networks by varying additional hyperparameters such as the number of neurons or layers in the network. How do these changes affect the performance of the network? What is the best network configuration?

T2. Vary the training hyperparameters to improve the results obtained by the previous networks. Adjust the number or epochs, the learning rate, the loss and optimization functions. What is the best set of hyperparameters and what is the corresponding accuracy?

T3. What is the variation in performance when compared to models such as Decision Trees or Random Forests?