

COMP4432 Machine Learning

Tutorial Questions on Neural Networks

1. Suppose we want to classify potential bank customers as good creditors or bad creditors for loan applications. We have a training dataset describing past customers using the following attributes:
 - Marital status {married, single, divorced}
 - Gender {male, female}
 - Age {[18..30[, [30..50[, [50..65[, [65+]}
 - Income {[10K..25K[, [25K..50K[, [50K..65K[, [65K..100K[, [100K+]}
 - a) Design a 3-layer neural network (i.e. 1 input layer, 1 hidden layer and 1 output layer) that could be trained to predict the credit rating of an applicant.
 - b) How many learnable parameters (interconnection weights) are there in the neural network when the hidden layer consists of 8 nodes?
2. For the single layer perceptron using sigmoid output, derive the learning rule based on the error/loss function in slide 11 of the NN lecture notes.

$$y^t = \text{sigmoid}(w^t x^t)$$

$$E^t(\mathbf{w} | \mathbf{x}^t, r^t) = -r^t \log y^t - (1 - r^t) \log (1 - y^t)$$

$$\Delta w_j^t = \eta (r^t - y^t) x_j^t$$