Intelligent systems – Neural nets

Labs summary

The artificial neuron

- simple processing units with multiple inputs and a single output
- fully connected feedforward networks: number of neuron inputs is determined by the neuron count of the previous layer
- output range is determined by the range of the transfer function
- frequently used transfer functions: step/sign, sigmoid/hyperbolic tangent

Feedforward networks

- supervised training, ideal for classification
- input neurons are passive (no processing, no weights to train)
- neuron count of the input layer is determined by the dimension of input data
- neuron count of the output layer is determined by the expected output (e.g. how many categories to classify in)
- number of hidden layers, hidden neurons count: determined by empirical knowledge
- single-layer (perceptron) networks can learn linearly separable problems

    Supervised training:

    - inputs and expected outputs
    - training dataset should be large and representative
    - choosing the appropriate learning coefficient: speed vs. accuracy
    - separate test dataset (not used for training)

Kohonen networks

- Self-Organizing Map (SOM)
- unsupervised training
- finding relationships in datasets, representing multi-dimensional data in 2 dimensions

    Kohonen training:

    - only inputs, no expected outputs
    - only winner neuron and neurons in its neighborhood learn
    - learning coefficient and neighborhood radius decrease during training