1 Neural network

Design a two-layer feedforward neural network which computes the XOR (exclusive OR) function. The network should have two input units, a number of hidden units, and a single output unit. Specify the network structure:

- Activation function
- Connections between units
- Connection weights

Show the state of each unit in your network for each of the four possible inputs: \{(1, 1), (1, 0), (0, 1), (0, 0)\}

2 HMM POS-tagger

In this exercise you will implement a simple supervised HMM Part-of-Speech tagger. Your implementation should learn the model parameters from annotated data, and then decode unlabeled data with the learned model.

- Learning: estimate emission and transition parameters from sentences marked with POS-tags. For the purpose of this exercise it is enough to use a simple add-one method for smoothing out zero probabilities. In addition, in order to deal with unseen words, you can do the following: find words which have frequency less than 2 in the training set. Then replace occurrences of those words in both the training and test set with a special UNKNOWN token prior to estimating the probabilities.

- Decoding: implement the (first-order) Viterbi algorithm to find the most likely POS-tag sequence for a new sentence.

The training and test data are child-directed transcribed and POS-tagged sentences from the CHILDES corpus: training set and the test set.

Train your model, run it on the test data and report the per-token accuracy.

Please send your solutions by Wednesday Jan 19 to gchrupala@lsv.uni-saarland.de

Important: Please use PDF as a document format. If you need to compress files, use ZIP or GZIP.