Computational Psycholinguistics

Dozenten: M. Crocker & M. Mayberry
Probeklausur: (Closed Book)

NAME: MATR.-NR.:

Hinweise:

- You have 90 minutes to complete the exam.
- Write your name and matr.-nr. in the space provided above.
- Part I is worth 48%, with each question being of equal value (i.e. 8%).
- Parts II & III are each worth 26%.
- Return this sheet, along with your answers to the questions, at the end of the exam.

Part I: For **each** of the following 6 questions, give a short reply.

1. Give two reasons why a bottom-up, shift-reduce parser is unsatisfactory as a model of human sentence processing.

2. Briefly outline the three main parsing techniques for dealing with local ambiguity and reanalysis.

3. What two probabilities would Jurafsky's model use to determine the preferred VP structure for the following NP/S complement ambiguity:

   The man knew the solution was incorrect.

4. Of the models/theories of human sentence processing discussed in the course, state which one you found most convincing, and briefly discuss why.

5. Briefly describe three properties of connectionist models that distinguish them from symbolic systems.

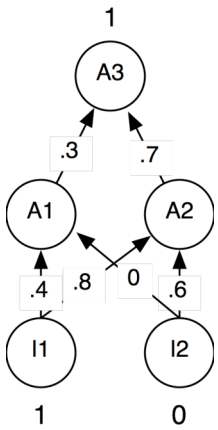
6. Briefly describe how the simple recurrent network (SRN) makes it possible to process sequences with a two-layer feedforward network.

Part II: Answer **one** of the following essay questions.

- Discuss the various kinds of (on-line and off-line) empirical methods which were used in the McRae et al "competition-integration" model. Be clear about what aspect of modelling each method contributes to.

- Outline Jurafsky's probabilistic model of sentence processing. What properties do such probabilistic models have in common with modular models? What aspects do they share with constraint-based theories of processing?

Part III: Answer **one** of the following essay questions.



- Using the network shown to the right, answer the following questions:

  a) For the inputs and initial weights shown, calculate the output activations of A_1, A_2, and A_3 (assume the logistic activation function; see appendix). **10 points**
  b) Assuming the target output is as shown (T_3=1), calculate the RMS error. **6 points**
  c) Assuming the same target output, calculate the weight changes (with learning rate = 0.2) for all six connections. **10 points**

- Derive the backpropagation algorithm used to update weights through gradient descent.

Appendix

Logistic function			
Input	Activation	Activation	Derivative
0,0	0,500	0,0	0,00
0,1	0,525	0,1	0,09
0,2	0,550	0,2	0,16
0,3	0,574	0,3	0,21
0,4	0,599	0,4	0,24
0,5	0,622	0,5	0,25
0,6	0,646	0,6	0,24
0,7	0,668	0,7	0,21
0,8	0,690	0,8	0,16
0,9	0,711	0,9	0,09
1,0	0,731	1,0	0,00