Deep Learning

Theoretical Exercises – Week 6 – Chapter 6

Exercises on the book "Deep Learning" written by Ian Goodfellow,
Yoshua Bengio, and Aaron Courville.
Exercises and solutions by T. Méndez and G. Schuster

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1 Exercises on Deep Feedforward Networks

1. Analyze the XOR problem:
   (a) Why is it not possible to solve the XOR problem with a single neuron?
   (b) To solve the XOR problem, a hidden layer is necessary. What property does the activation function of the hidden layer need for the network to be able to solve the XOR problem and why?
   (c) What is the task of the hidden neurons so that the network can solve the XOR problem?
2. What has to be considered when saturating activation functions are used in the output neurons or hidden neurons, respectively?
3. Assign the following keywords to the correct column. A keyword can be assigned to several columns.

   - Gaussian output distribution
   - Output of a probability
   - Real-valued output
   - Regression
   - Output of a probability distribution
   - Classification of four classes
   - Multinoulli output distribution
   - Minimizing mean-squared error
   - Classification of two classes
   - Maximizing log-likelihood
   - Bernoulli output distribution
   - Minimizing cross entropy

Output Units		
Linear Units	**Sigmoid Units**	**Softmax Units**