CSC411- Machine Learning and Data Mining– Neural Network

Tutorial 3 – Feb 2\textsuperscript{nd}, 2007
Single layer network (Perceptron)

\[ \sum_{i=1}^{m} \text{bias} + \left( w^i x^i \right) \]

Refer to http://www.codeproject.com/useritems/Backprop_ann.asp
AND Problem:

\[
\text{output} = I_1 \cdot W_1 + I_2 \cdot W_2
\]

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<th>I_1</th>
<th>I_2</th>
<th>Out</th>
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input

- I_1
- I_2

output

- O

weights:
- \( w_1 = 0.5 \)
- \( w_2 = 0.5 \)
The Classic XOR Problem:

\[ \text{output} = I_1 \times W_1 + I_2 \times W_2 \]
The Classic XOR Problem:

\[ \text{output} = I_1 \cdot W_1 + I_2 \cdot W_2 \]

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\[ w_1 = 1 \quad W_2 = 1 \]

input \rightarrow I_1 \quad \text{output} \rightarrow O \quad \text{output} = I_1 \cdot W_1 + I_2 \cdot W_2
The Classic XOR Problem:

\[ H_1 = I_1 \times w_{11} + I_2 \times w_{21} \]
\[ H_2 = I_2 \times w_{12} + I_2 \times w_{22} \]

Output = \( H_1 + H_2 \)
Multiple layers

Refer to http://www.codeproject.com/useritems/Backprop_ANN.asp
Multiple layers

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Solve the XOR problem using Back Propagation algorithm

\[ y = g(x) = \frac{1}{1 + e^{-x}} \]

\[ \frac{dg}{dx} = g'(x) = g(x)(1 - g(x)) \]

\[ \delta_{outputs[i]} = outputs[i] \times (1.0 - outputs[i]) \times (targets[i] - outputs[i]) \]

Refer to http://www.codeproject.com/useritems/Backprop_ANN.asp