MULTILAYER-PERCEPTRON

Part 1. Notation

1. Layers

1.1. L ... number of layers:

$$L \quad \in \quad 2 + \mathbb{N}_0$$

2. Neurons

2.1. N_l ... number of neurons in layer l:

$$N \quad = \quad \begin{pmatrix} N_1 \\ \vdots \\ N_L \end{pmatrix}$$

2.2. o_n^l ... output of neuron n in layer l:

$$o^l \quad = \quad \begin{pmatrix} o_1^l \\ \vdots \\ o_{N_l} \end{pmatrix}$$

3. Weights

3.1. ${}_l w_t^f$ ... weight from neuron f in layer l to neuron t in layer $l+1$:

$$w \quad = \quad \left(\begin{pmatrix} {}_1 w_1^1 & \cdots & {}_1 w_1^{N_f} \\ \vdots & \searrow & \vdots \\ {}_1 w_{N_t}^1 & \cdots & {}_1 w_{N_t}^{N_f} \end{pmatrix} \quad \cdots \quad \begin{pmatrix} {}_{L-1} w_1^1 & \cdots & {}_{L-1} w_1^{N_f} \\ \vdots & \searrow & \vdots \\ {}_{L-1} w_{N_t}^1 & \cdots & {}_{L-1} w_{N_t}^{N_f} \end{pmatrix} \right)$$

4. Net sum

4.1. s_n^{l+1} ... net sum of neuron n in layer $l+1$:

$$s_n^{l+1} \quad = \quad {}_l w_n^f \, o_f^l$$
$$s_n^{l+1} \quad = \quad {}_l w_n \, o^l$$