CMP 0575
Artificial Neural Networks

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Resumen

- **Conjunto de datos:** Química
- **Subset:**

cv	# features	Selected Features	cv score
8	23	[28, 38, 42, 43, 44, 45, 46, 47, 48, 49, 55, 64, 65, 66, 73, 75, 103, 105, 106, 108, 115, 119, 121]	**68.12%**

- **Lenguaje utilizado:** Java
- **Librerías externas:** WEKA, xchart
- **Proceso de normalización:**
  - Normalización estándar [0,1] $z = \frac{x - \mu}{\sigma}$
- **ANN**
  - MultilayerPerceptron (apr. backpropagation)
  - CV

Multilayer Perceptron

- Backpropagation
- Nodes => sigmoid
- Parametros:
  - 2 Hidden Layers
    - Weights: 75 = (23 * 3) + (2 * 3)
    - Biases: 5 = 3 + 2

Momentum

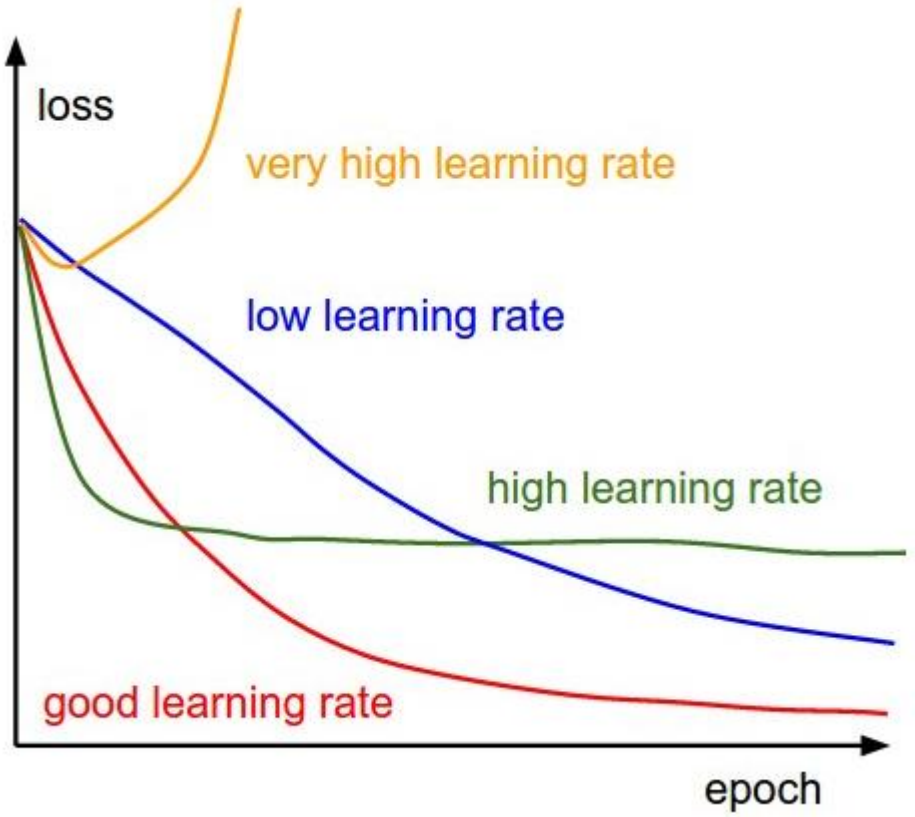
$$\Delta w_{ij} = (\eta * \frac{\partial E}{\partial w_{ij}})$$

weight increment — learning rate — weight gradient

$$\Delta w_{ij} = (\eta * \frac{\partial E}{\partial w_{ij}}) + (\gamma * \Delta w_{ij}^{t-1})$$

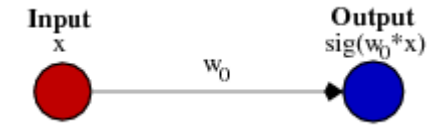
momentum factor — weight increment, previous iteration

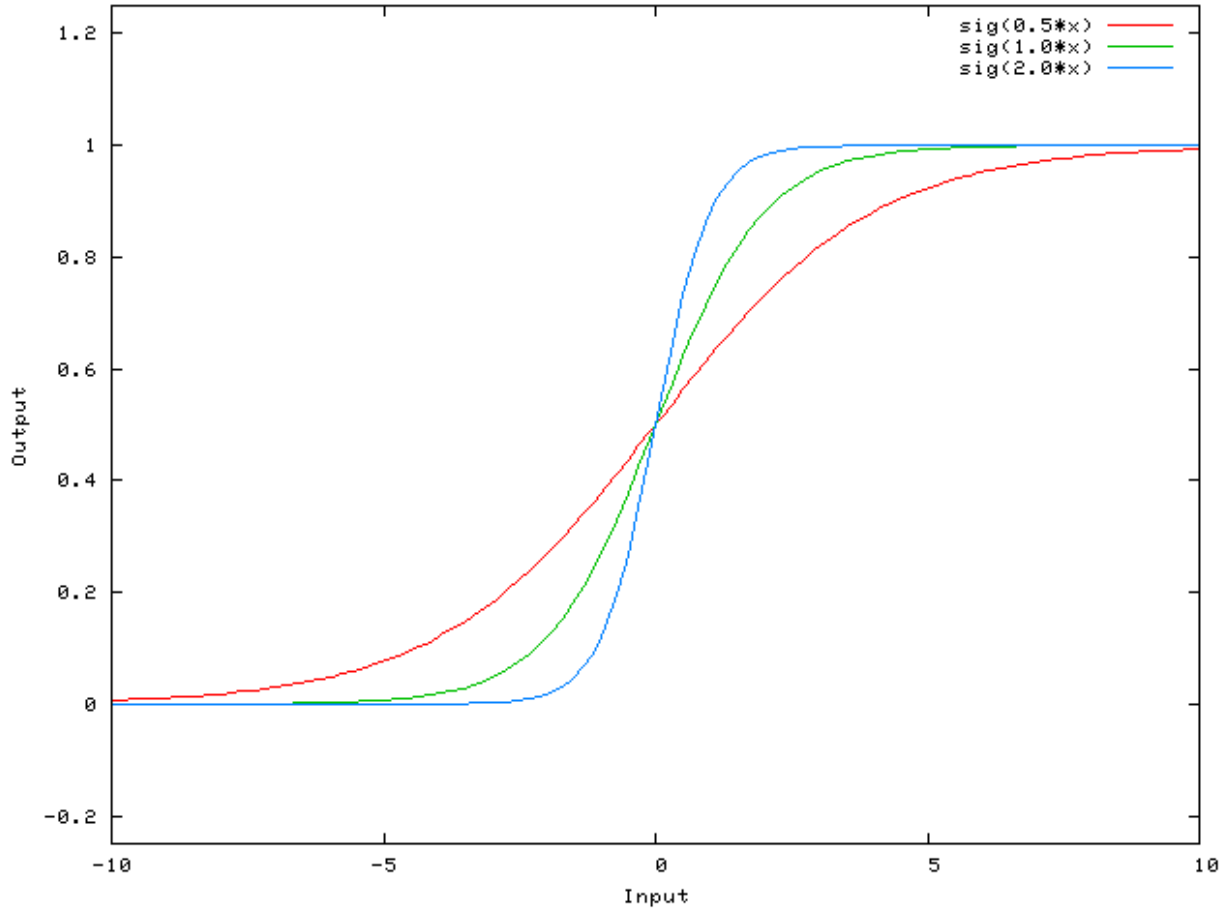
Learning Rate



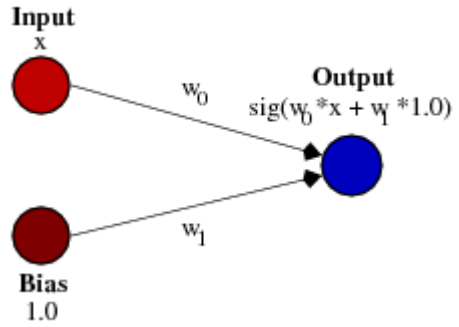
Hidden Layers

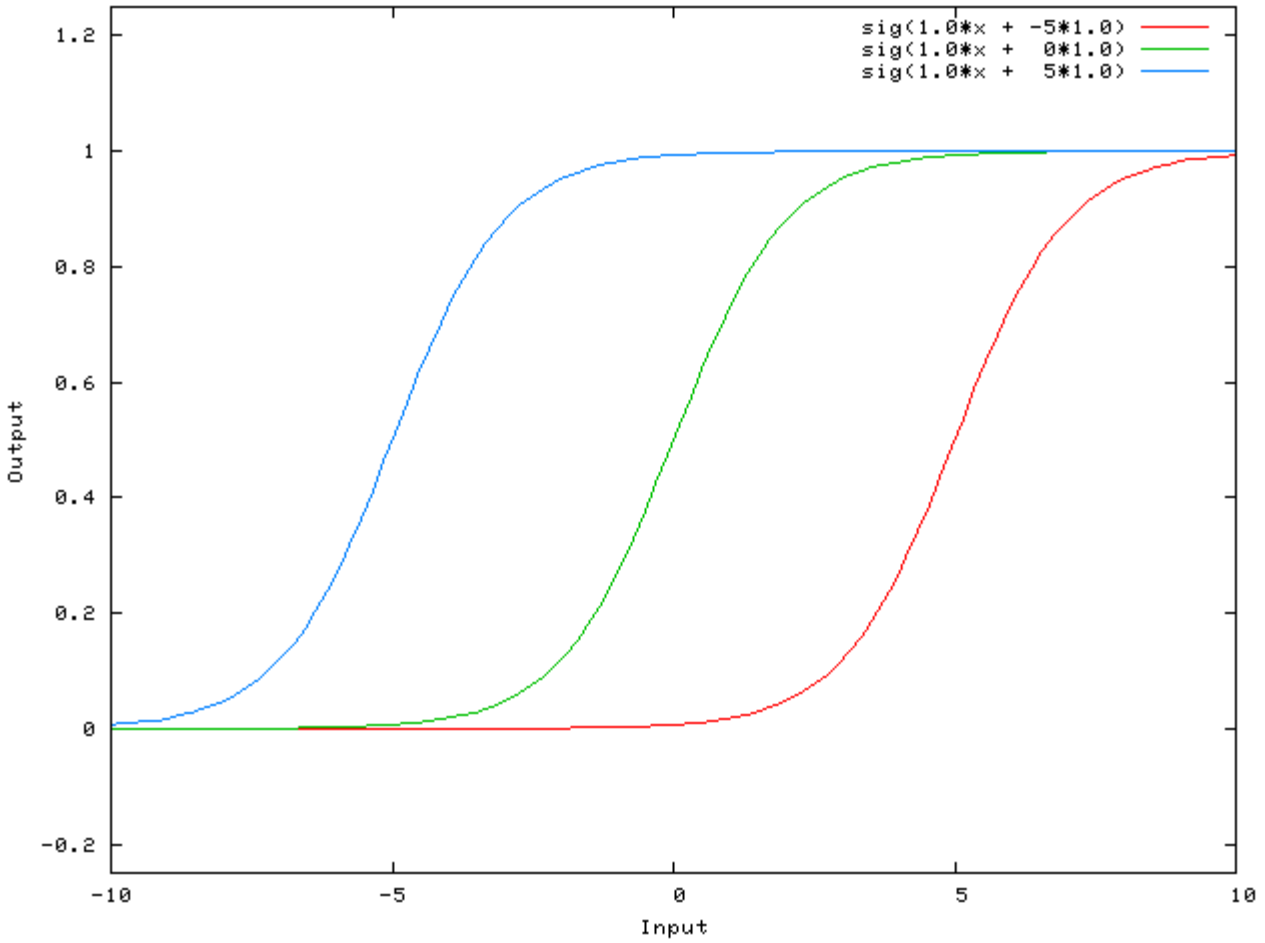
Weight


Input
x
w_0
Output
$sig(w_0*x)$


sig(0.5*x)
sig(1.0*x)
sig(2.0*x)
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
Output
-10
-5
0
5
10
Input

BIAS


Input
x
w_0
Output
$sig(w_0*x + w_1*1.0)$
w_1
Bias
1.0


sig(1.0*x + -5*1.0)
sig(1.0*x + 0*1.0)
sig(1.0*x + 5*1.0)
Output
Input
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-10
-5
0
5
10

Activation Function

Name	Input/Output Relation	Icon	MATLAB Function
Hard Limit	$a = 0 \quad n < 0$ $a = 1 \quad n \geq 0$		hardlim
Symmetrical Hard Limit	$a = -1 \quad n < 0$ $a = +1 \quad n \geq 0$		hardlims
Linear	$a = n$		purelin
Saturating Linear	$a = 0 \quad n < 0$ $a = n \quad 0 \leq n \leq 1$ $a = 1 \quad n > 1$		satlin
Symmetric Saturating Linear	$a = -1 \quad n < -1$ $a = n \quad -1 \leq n \leq 1$ $a = 1 \quad n > 1$		satlins
Log-Sigmoid	$a = \frac{1}{1+e^{-n}}$		logsig
Hyperbolic Tangent Sigmoid	$a = \frac{e^{n}-e^{-n}}{e^{n}+e^{-n}}$		tansig
Positive Linear	$a = 0 \quad n < 0$ $a = n \quad 0 \leq n$		poslin
Competitive	$a = 1$ neuron with max n $a = 0$ all other neurons		compet

Backpropagation