Assignment #8

MODEL SOLUTION

ECE449, Intelligent Systems Engineering

Fall 2019

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1. [4 points] Briefly compare neurons used in a) perceptron-type networks and b) RBF-type networks. [Hint: concentrate on what they compare, how tot is calculated, and how neuron output is determined]

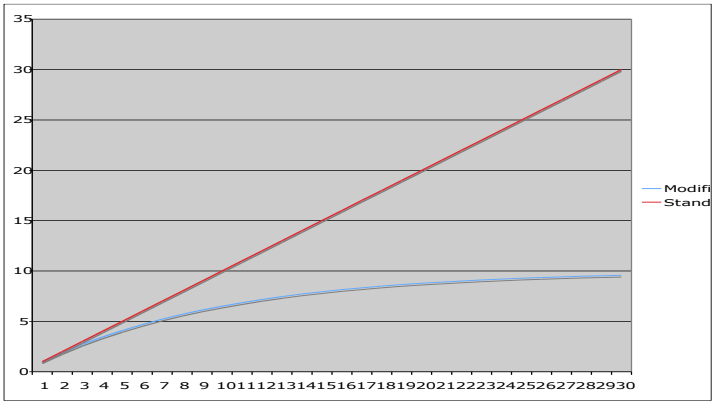
Neuron	Comparison	tot calculation	output calculation
Perceptron	Inputs and weights are compared using inner product	$w^T x = \|w\|\|x\|cos\varphi = \sum x_i w_i$	Using a hard-limiting, squashing (or linear) function
RBF	Inputs and weights are compared using distance measure	$\|\mu - x\| = \sqrt{(\mu_i - x_i)^2}$	Using a radial basis function

2. Consider the modified Hebbian learning rule

$$w_{ij}^{new} = w_{ij}^{old}(1-\alpha) + \eta x_i o_j$$

and assume the following values $x_i = o_j = 1$, learning rate $\eta = 1$, forgetting factor $\alpha = 0.1$, and initial weight $w_{ij}^{old} = 0$.

a) Compare standard ($\alpha = 0$) and modified Hebbian learning by plotting weights over 30 subsequent learning steps (i.e. plot w_{ij}^{new} as a function of time) using the parameters provided.



b) Determine maximum value of weight w that can be obtained by modified Hebbian learning using the parameters provided [Hint: in the limit case, the values of w_{ij}^{new} and w_{ij}^{old} would be identical].

For $w^{final} w_{ij}^{new} = w_{ij}^{old} = (\eta x_i o_i)/\alpha = 10$

Compared to the figure in a), this is that the weight converges to 10 as $n \to \infty$.