ARTIFICIAL NEURAL NETWORK

Unit-2: Perceptron

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Artificial Neural Network-Perceptron

BPA: Heuristics to make performance better

- **Sequential v/s Batch mode:**
  - For large data sequential processing is faster
  - For smaller data and network, batch processing is faster
- **Maximizing the information content**
- Every traning example presented to the BPA should be choosen on the basis that its information content is the largest possible for the task at hand
- This can be achieved in 2 ways

  a. use of an example that results in the largest traing error

  b. the use of example that is radially different from all those previously used

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Activation Function:

- A M.L.P trained with the back-propagation algorithm may, in general,learn faster when the asymmetric sigmoidal activation function are used in neuron model,for example tanh(.).

Target Value: it is important to choose the target value within the activation function range i.e +1 and -1

Normalization of the inputs:

The training samples must be preprocessed before presenting to the neural network. the preprocessing steps are

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a. subtracting each input from mean

b.decorrelate the training samples

c. covariance: it ensures the different synaptic weight in the networks learn at same speed.

Learning Rate

Initialization

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BPA-Output representation and decision rule

Consider a M-class classification problems, which means each input pattern belong to one of the M-distinct classes.

Therefore, we will have M number outputs in the network.

Xj denotes the jth input pattern. and it is m-dimensional input vector

The output is M-dimensional vector. ykj is the kth ouput of network in correspondence to the jth input

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BPA-Output representation and decision rule

Therefore, block diagram can be represented as

$$y_{kj} = F_k\left(x_j\right)$$

Let the output vector y_j

$$y_j = \begin{bmatrix} y_{1j} & y_{2j} & ..... & y_{kj} & ..... & y_{Mj} \end{bmatrix}^T$$

$$y_j = \begin{bmatrix} F_1(x_j) & F_2(x_j) & ..... & F_k(x_j) & ..... & F_M(x_j) \end{bmatrix}^T$$

$$y_j = F\left(x_j\right)$$

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BPA-Output representation and decision rule

F(.) is continuous function and minimizes the emprical risk function

$$R = \frac{1}{2N}\sum_{j=1}^{N}\left\|d_j - F(x_j)\right\|^2$$

Now train the network with binary values as follows:

- The output space has M dimension
- An input Xj belongs to class Ck
- let d_k=1 when Xj belongs to class C_k otherwise 0

Output Decision Rule stated as follows:

Classify the random vector X as belonging to C_k if

$$F_k(X) > F_j(X) \quad for all k \neq j$$

THANK YOU

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