

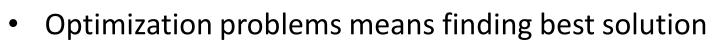
ARTIFICIAL NEURAL NETWORK

Unit-2: Perceptron

Ms. Swetha R.

Department of Electronics and Communication Engineering PES University

Supervised Learning view as an optimization problem





$$f(X) = \frac{1}{2} x^{T} A x - b x^{T} + c$$

$$wh \ ere \qquad x \quad is \quad m - b y - 1 \qquad vector$$

$$A \quad is \quad m - b y - m \ symmetric \qquad po \ sitive \qquad definite \qquad matrix$$

$$b \quad is \quad m - b y - 1 \quad vector$$

$$c \quad is \quad cons \ tan \ t$$



Supervised Learning view as an optimization problem



$$f'(x) = 0$$
 $Ax * - b = 0$
 $x * = A^{-1}b$

- Thus minimizing of f(x) and solving linear system of equations are equivalent problems
- Now, for a given matrix A, we say that a set of non-zero vectors [s(0) s(1) s(m-1)] is A-conjugate vectors if the following condition is satisfied



Supervised Learning view as an optimization problem

• For a given set of A-conjugate vectors, the correspondin conjugate direction method for unconstrained minimization of the quadratic error function is defined by:



where x(0) is an arbitrary starting vector

 η (n) is scalar defined by

$$f(x(n) + \eta(n)s(n)) = \min_{\eta} \left(f(x(n) + \eta(n)s(n)) \right)$$



Supervised Learning view as an optimization problem



The procedure of choose learning rate so as to minimize the function f(.) for some fixed learning rate is referred as line search

$$\eta (n) = \frac{-S^{T}(n)AE(n)}{S^{T}(n)AS(n)}$$
where
$$x(n) - x^{*} = E$$

$$x^{*} = A^{-1}b$$

For conjugate gradient method to work we required A-conjugate vectors, which is computed as follows:

$$S(n) = r(n) + \beta(n) s(n-1)$$

where $\beta(n) = -\frac{S^{T}(n-1) Ar(n)}{S^{T}(n-1) AS(n-1)}$
 $r(n) = b - Ax(n)$



THANK YOU

Ms. Swetha R.

Department of Electronics and Communication Engineering

swethar@pes.edu

+91 80 2672 1983 Extn 753