

## HW2

### PROBLEM :- 4 :- (Chapter 5, Pg 2)

The decision regions for a C-category classifier that ~~classifies~~ (classifies a new point based on voting from  $(\frac{C}{2})$  linear boundaries, need not be convex;

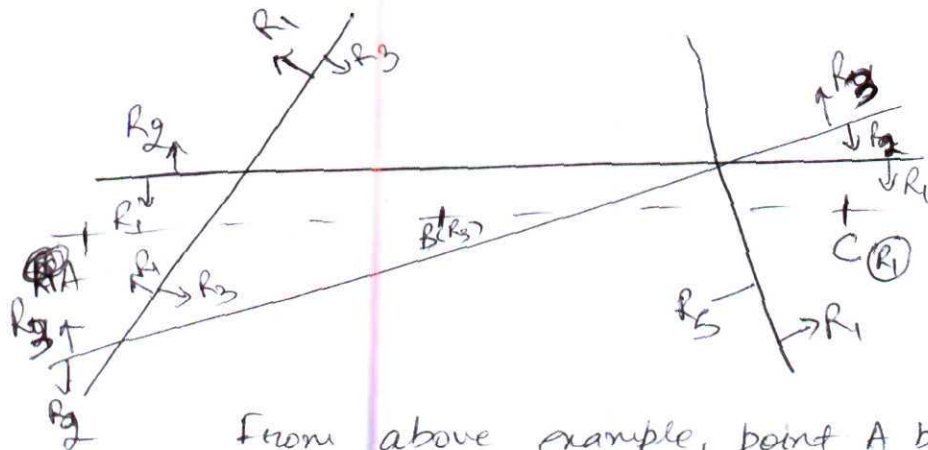
Because, ~~for example~~ In a convex region, any new point  $X_P$  must lie in a region ~~i~~ bounded by two points  $X_A$  &  $X_B$  such that  $\nexists$

$$C_i(X_A) > C_j(X_A) \text{ \& }$$

$$C_i(X_B) > C_j(X_B) \quad \forall j \neq i$$

~~For a new point  $X_P$~~

For a convex region, a new point  $X_P$  can only lie in region  $i$  defined with above criteria if it lies anywhere on a line/hyperplane between points  $X_A$  &  $X_B$ . But if we use voting scheme, this criteria ~~is~~ is not necessary for a point to belong to a region  $i$ . This is illustrated below with an example



From above example, point A belongs to  $R_1$  (based on votes)

point C belongs to  $R_1$  as well.

but point B belongs to  $R_3$  (based on votes)

Hence a non-convex decision region exists in this scenario