Soft Margin SVM....

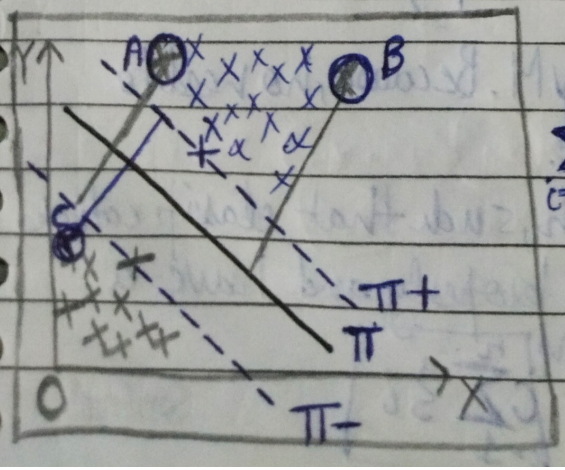
Soft Margin SVM... ⇒ In Soft Margin SVM, we provide the Outliers some permission to come in the data. Soft Margin SVM can handle the Outliers...

$\text{argmax}(w^*, b^*) = \frac{2}{\|w\|}$ [Should be maximum or highest]

$\text{argmin}(w^*, b^* = \frac{\|w\|}{2}$ [It is used to minimise the Margin Error]

So :- **Soft Margin SVM = Margin Error + Classification Error**

$$\text{Soft Margin SVM} = \frac{\|w\|}{2} + C\sum_{i=1}^{n} \zeta_i \quad [\text{Zeta} = \zeta]$$



• In Graph some data points are misclassified.

$\sum_{i=1}^{n} \zeta_i$ [For Correct Classification data points, $\zeta = 0$]

For Mis-classified points :-
ζ value for that point is the distance from the point to the Correct hyperplan

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"If Margin Error is low, then Margin Value is high."

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For example:- In the graph, 3 data points are mis-classified which are marked with circle 'O'. Points are 'A', 'B' and 'C' respectively.

Let's say for correct classification of Point 'A'.

'ξ' = Distance between the Point 'A' and the hyperplane{Correct} from which it belongs.

i.e; 'A' is a Negative point and it's correct hyperplane is π−.

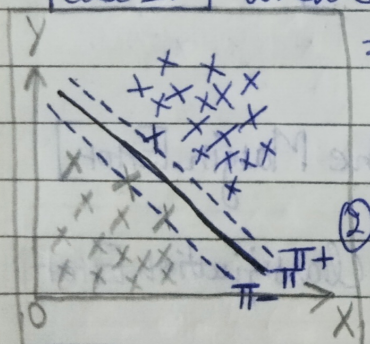
∴ Distance between ('A', π−).

Similarly, for Point 'B' ⇒ Distance between (B, π−) = ξ[Zeta]

for Point 'C' ⇒ Distance between ('C', π+) = ξ[Zeta]

Soft Margin SVM = $\frac{\|W\|}{2} + C\sum_{i=1}^{n} \xi_i$ {C is a hyper Parameter}

Case 1:- When 'C' value should be ~~too~~ small.

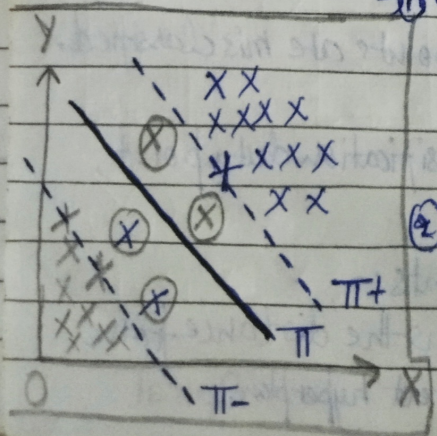


⇒ (1) it means $\frac{\|W\|}{2}$ helps to increase the Margins by reducing the Margin Error.

(2) if 'C' is too much small, means less preference should be given to classification error. $C\sum_{i=1}^{n} \xi_i$

Case 2:- When 'C' value should be too high.

⇒ (1) it means $\frac{\|W\|}{2}$ will get less preference in the overall Soft Margin SVM. Because, no need to reduce Margin Error.



(2) 'C' Value should be high, such that classification error should be done properly and have a higher impact on SVM $C\sum_{i=1}^{n} \xi_i$

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