Remember the problem set we solved in the last class. (refer the questions and your answers if needed).

We solved the Separable SVM problem in 1D for

$$(-1, +1), (0, -1), (+1, -1)$$

We knew the solution: w as -2 and b as -1

Assume x was k times (say was measured in a different unit; remember the normalization of the data). For example, when $k = 2$, the data will look like:

$$(-2, +1), (0, -1), (+2, -1)$$

(A) w and b will also become k times.

(B) w will remain the same, while b will become $\frac{b}{k}$.

(C) **[Ans]** b will remain the same, while w will become $\frac{w}{k}$

(D) w and b will remain the same.

(E) No such systematic change is possible for w and b. The problem will have to be solved afreash.

There is a popular problem called "parity". Consider $\mathbf{x}$ be d-dimensional, $d > 1$ which each $x_i \in \{-1, +1\}$ and y be $+1$ if the number of $+1$ in $\mathbf{x}$ is odd and else -1.0

(A) This problem is linearly separable.

(B) **[Ans]** When $d = 2$, this problem reduced to *ExoR*.

(C) **[Ans]** This is an example of a linearly non-separable problem.

Remember the problem set we solved in the last class. (refer the questions and your answers if needed).

We solved the Separable SVM problem in 1D for

$$(-1, +1), (0, -1), (+1, -1)$$

We knew the solution: *w* as -2 and *b* as -1

Consider an extension, we add some small zero mean Gaussian noise $\mathcal{N}(0, \sigma^2)$ to each of the samples and create 10 variations each. (total of 30 samples). (Assume $\sigma = 0.5$.)

We solve the SVM problem.

(A) We expect around 20 Support Vectors. (non zero αs)

(B) We will have only two Support Vectors.

(C) The optimal values of *w* and *b* will become 10 times.

(D) **[Ans]** The optimal values of *w* and *b* will remain almost the same.

(E) Margin remains the same.

(F) None of the above.

Remember the problem set we solved in the last class. (refer the questions and your answers if needed).

Consider the ExOR problem. There are four samples and four αs and four support vectors.

We can generalize this observation as:

"**For any linearly non-separable problem**, *number of support vectors is same as number of samples.*"

Make the necessary minimal changes (if any required) and rewrite as true sentences in the space provided. Avoid changing the words in bold.

Remember the problem set we solved in the last class. (refer the questions and your answers if needed).

We solved SVM for a linearly in-separable data:

$$(-1, +1), (0, -1), (+1, +1)$$

and obtained: $\alpha_1 = \alpha_3 = 1$ and $\alpha_2 = 2$

"**Assume we had an additional (4th) sample** $(+2, +1)$ **in our data**, *the αs for the first three samples, will remain the same.*"

Make the necessary minimal changes (if any required) and rewrite as true sentences in the space provided. Avoid changing the words in bold.