assn4.2

Daniel Loi
dtloi@ucsc.edu 1547401

Kevin Arellano
kcarella@ucsc.edu 1550271

Claudio Sangeroki
csangero@ucsc.edu 1677403

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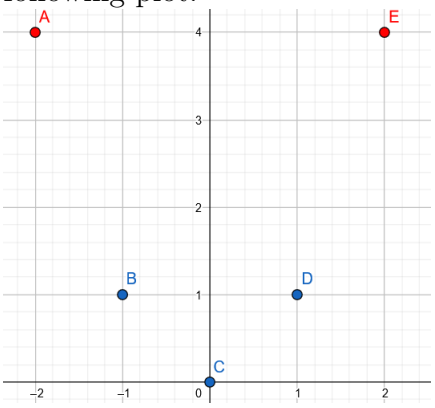
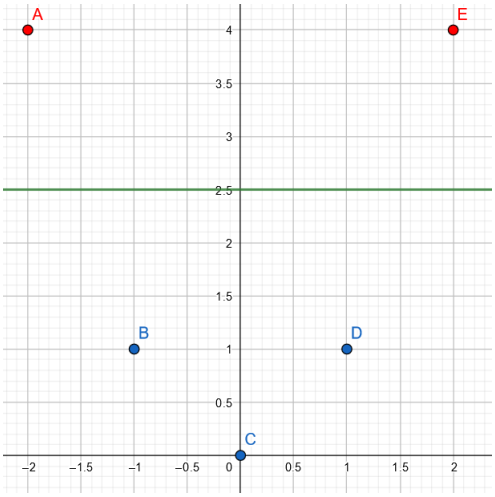
1. The data is not linearly separable in 1d space. We can make the data separable using a mapping function $\phi(x) = (x, x^2)$ which results in the following plot.



2. Intuitively the hard margin SVM decision boundary will be the line $y = 0x + 2.5$ or equivalently a hyperplane of the form $\mathbf{w}.\mathbf{x} + b = 0$ where $b = 2.5$ and $\mathbf{w} = (0, -1)$.



3. This boundary will most likely look like a circle surrounding the three blue points.

4. Given $\phi(x) = (x, x^2)$

$$\begin{aligned} \phi(x).\phi(z) &= (x, x^2).(z, z^2) \\ &= xz + x^2 z^2 \\ K(x, z) &= xz(1 + xz) \end{aligned} \tag{1}$$