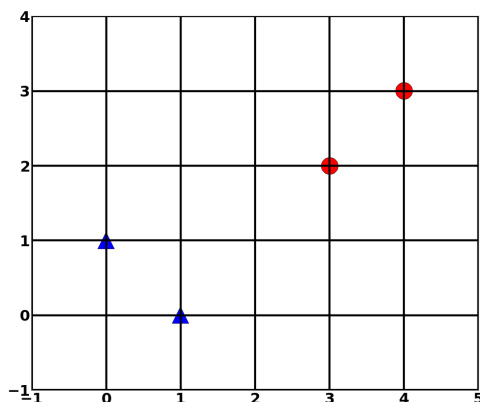


CSE 250B: Section 7 - Sharad Vikram

1. SVM Example

You're presented with the following set of data (triangle = +1, circle = -1):



Find the equation (by hand) of the hyperplane $w^T x + b = 0$ that the SVM algorithm would learn. Which points are support vectors?

2. RBF Kernel

Show that the simple RBF kernel for 1-dimensional data

$$k(x_1, x_2) = \exp \{-(x_1 - x_2)^2\}$$

is equivalent to an infinite dimensional feature mapping. Hint: the Taylor expansion of $e^{f(x)}$ is $\sum_{i=0}^{\infty} \frac{f(x)^i}{i!}$.

3. Kernel Math

To show that a kernel is valid, you need to show its corresponding feature mapping exists i.e. $k(x_1, x_2) = \phi(x_1)^T \phi(x_2)$. Let $k_1(x_1, x_2)$ and $k_2(x_1, x_2)$ be valid kernel functions. Show that the following kernel functions are valid:

- (a) $k'(x_1, x_2) = ck_1(x_1, x_2)$ where $c > 0$.
- (b) $k'(x_1, x_2) = f(x_1)k_1(x_1, x_2)f(x_2)$ where f is any function.
- (c) $k'(x_1, x_2) = k_1(x_1, x_2)k_2(x_1, x_2)$