

AI1001: Introduction to Modern AI
Homework Assignment 2
Due Date: 14 August 2019

1. Search the Internet and find three successful applications of support vector machines (including higher-order or kernel-based).
2. Give three examples of classification problems where the consequences of misclassification are not symmetric, that is, classifying a negative sample as positive is more (or less) serious than classifying a positive sample as negative.
3. The object of study in this problem is the set of perceptrons with two inputs, but *without a bias term*. So the perceptron operates as

$$y = \text{sign}(w_1x_1 + w_2x_2).$$

Show that the VC-dimension of this restricted class of perceptrons is two. To do this, you must show two things:

- First, you should find a pair of 2-D vectors for which all $2^2 = 4$ labellings can be achieved by a suitable perceptron of the above type.
- Second, you must show that for *every* set of three 2-D vectors, at least one of the $2^3 = 8$ labellings *cannot* be achieved by a perceptron of the above type.