STATS 415 Homework 9

No due date

1. For this question, please use graph paper; you can print it for free from many websites, for example, www.printfreegraphpaper.com. [15 points per question]

   (a) Draw the hyperplane defined by $2X_1 - 2X_2 - 1 = 0$. Indicate the set of points satisfying $2X_1 - 2X_2 - 1 > 0$ with a "+" sign, and the set of points satisfying $2X_1 - 2X_2 - 1 < 0$ with a "−" sign.

   (b) Suppose your hyperplane is the optimal separating hyperplane for an SVM classifier fitted to some data, with the margin $m = \sqrt{2}$. Draw the margin lines.

   (c) What class label (+ or −, as defined above) does this SVM predict for the following points: (1,4); (1,1); (2, -5); (2, -1); (4,2)?

   (d) Suppose these five points were part of the training data, and their true labels, given in the same order, are −, −, +, +, −. Calculate the corresponding slack values (ξ_i's) for each of the five points.

2. Textbook "An Introduction to Statistical Learning with Applications in R", Section 10.7, p. 413, Conceptual exercise 3. [40 points]