INF552: Programming Assignment 6 [Support Vector Machines]

Part 1: Implementation [7 points]

You are given two data files - **linsep.txt** and **nonlinsep.txt** - each of which contains 100 2D points with classification labels +1 or -1. The first two columns in each file indicate the 2D coordinates of a point; and the third column indicates its classification label. The points in **linsep.txt** are linearly separable. The points in **nonlinsep.txt** are not linearly separable in the original space but are linearly separable in a *z*-space that uses a simple nonlinear transformation.

Part (a) [3.5 points]: Find the fattest margin line that separates the points in **linsep.txt**. Please solve the problem using a Quadratic Programming solver. Report the equation of the line as well as the support vectors.

Part (b) [3.5 points]: Using a kernel function of your choice along with the same Quadratic Programming solver, find the equation of a curve that separates the points in **nonlinsep.txt**. Report the kernel function you use as well as the support vectors.

You can write your programs in any programming language. However, you will have to implement the algorithms yourself instead of using library functions (except for the Quadratic Programming solver). In your report, please provide a description of the data structures you use, any code-level optimizations you perform, any challenges you face, and of course, the requested outputs.

Part 2: Software Familiarization [2 points]

Do your own research and find out about library functions relevant to Support Vector Machines. Learn how to use them. Compare them against your implementations and suggest some ideas for how you can improve your code. Describe all this in your report.

Part 3: Applications [1 point]

Do your own research and describe some interesting applications of Support Vector Machines.

Submission Guidelines

In your report, please include the names of all group members and mention their individual contributions. The report should be in PDF format. Your submission should include the code as well as the report and is due before **04/20**, **11:59pm** in an archive in zip, tar.gz or tar.xz format. Only one submission is required for each group by one of the group members. Please submit your homework on **BlackBoard** (do NOT email the homework to the instructor or the TA).