University of TEHRAN

# Machine Learning

## Problem Set 8

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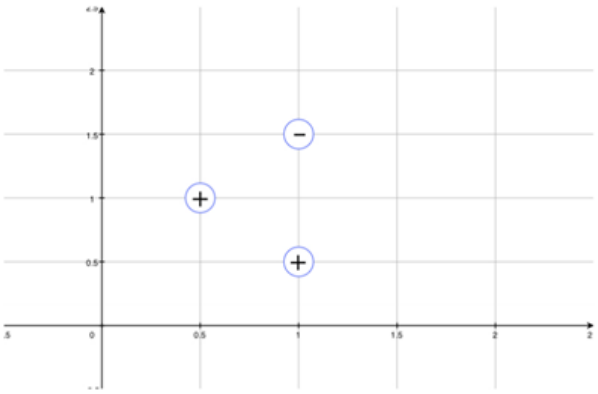
**Problem 1: Review part**
Write your reviews for the whiteboard notes and the slides of the lectures of this week. Write down all formulas and explain in detail each step of the derivations, if applicable.

**Problem 2: Conceptual questions (Optional)**
ISL chapter 9, questions 1-3

**Problem 3: Bias-variance tradeoff in SVM**
Discuss how the bias and variance vary with the parameter $C$ in SVM.

**Problem 4: Programming: Coordinate descent algorithm**
Implement coordinate descent algorithms for fitting linear regression and LASSO for a simple simulated problem of your choice and compare to the built-in functions in R.

**Problem 5: Programming: Primal and dual problems in SVM**
In the following figure, find the optimal linear SVM for separating the classes (math problem).



Now fit a linear SMV model by solving the primal and dual optimization problems for the following data points using a quadratic programming solver in R (or programming language of your choice).

We encourage discussing the problems with other students, however, similarity between solutions is not allowed. (**Important**) Studying any online or previous solutions, no matter to what extent, is strictly forbidden and is considered as a violation of the academic honor code. Submit your solutions by Khordad 8, 1399.