

Machine Learning

Exercise Sheet 9

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Exercise 17: Constraint Optimization with Lagrange Multipliers (5 Points)

- a) Minimize the function $f(x, y) = (x + y)^2$ subject to $-3x + y = -1$. What are all feasible minima?
- b) Maximize the function $g(x) = 2x^3 - 3x$ subject to $x \leq 0.5$. What are all feasible maxima?

Exercise 18: SVM (5 Points)

x_1	x_2	y	α_i
-1	0	1	1
0	0	-1	1
1	0	-1	0
-1	-1	1	0
0	-1	1	1
1	-1	-1	1/3
-0.5	-0.5	-1	2/3

- a) Give a pseudo code that summarizes how an SVM is learned using SMO.
- b) Read (at least) section 12.2.2 of the SMO Book. Explain the heuristic for choosing which multipliers to optimize in your own words.
- c) Classify all instances in the table above using an SVM with the given α and $b = 1$.
- d) Plot the data and add the decision boundary of the SVM. Which are the support vectors?