Intro To ML – HW2

students:

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**Theory Questions**

**Question 1:**

1. Consider the following problems:

We will show that It doesn’t matter whether the following constrain is included or not:

. We will show that problem (1)’s parameters are equivalent to problem (2)’s:

* : Proof by contradiction: Let be the parameters that minimize the function in problem (1), and let be the parameters that minimize the function in problem (2), so that (2)’s target function gives a smaller solution than (1)’s. We get that are the parameters that minimize the function in problem (1) and also satisfy the constraint

, but contradicting that (2) gives the smallest solution.

* : Proof by contradiction: Let be the parameters that minimize the function in problem (2), and let be the parameters that minimize the function in problem (1), so that (1)’s target function gives a smaller solution than (2)’s. It’s obvious that (1)’s parameters satisfy the (2)’s constrains, so again, we get the same minimal value for both (1) and (2) target functions, in contradiction.



By comparing (1) to 0 we get the relation: .

By comparing (2) to 0 we get the new constrain: .

By comparing (3) to 0 we get the relation: or .

So now our Lagrangian is:

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1. Our dual problem is:

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**Question 2:**