Machine Learning Homework6

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1 Problem

Show the dual and primal programming in Lagrange Duality theory has the same optimal value.(if one of them exists.)

2 Problem

Show that KKT conditions are necessary and if f, g_i are convex and each h_i is linear then it's also sufficie for (X^*, λ^*, μ^*) to be the optima of primal and dual programmings.

3 Optional Problem

Assume $p : [n] \to [0, 1]$ is a distribution over $[n] = \{1, 2, ..., n\}$. Suppose $m' \sim Poi(m)$ is a random variable has Poisson distribution, show that if we take m' samples indepdently from p and let X_i denote the occurrences of i, then $X_i \sim Poi(mp(i))$ and $X_1, ..., X_n$ are independent.