

Convex Optimization Solutions

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Optimization is the science of making a best choice in the face of conflicting requirements. Any convex optimization problem has geometric interpretation. If a given optimization problem can be transformed to a convex equivalent, then this interpretive benefit is acquired. That is a powerful attraction: the ability to visualize geometry of an optimization problem.

You can find the global optimum point of a convex optimization, but if your problem is non-convex, your solution procedure may end up with a local optimum point which is one of the emtremum points ...

[Duality \(optimization\) - Wikipedia](#)

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The solution to the dual problem provides a lower bound to the solution of the primal (minimization) problem. However in general the optimal values of the primal and dual problems need not be equal. Their difference is called the duality gap. For convex optimization problems, the duality gap is zero under a constraint qualification condition.

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An important property of convex problems is that their optimal sets are also convex. Theorem 8.3 (convexity of the optimal set in convex optimization). Let $f: C \rightarrow \mathbb{R}$ be a convex function defined over the convex set $C \subseteq \mathbb{R}^n$. Then the set of optimal solutions of the problem $\min\{f(x): x \in C\}$, (8.3) which we denote by X^* , is convex.

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In a convex optimization problem, the feasible region -- the intersection of convex constraint functions -- is a convex region, as pictured below. With a convex objective and a convex feasible region, there can be only one optimal solution, which is globally optimal .

[What is the difference between convex and non-convex ...](#)

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Convex optimization has also found wide application in combinatorial optimization and global optimization, where it is used to find bounds on the optimal value, as well as approximate solutions.

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2.3 Convex Constrained Optimization Problems In this section, we consider a generic convex constrained optimization problem. We introduce the basic

terminology, and study the existence of solutions and the optimality conditions. We conclude this section with the projection problem and projection theorem.

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Yet solution to some convex optimization problem is, in general, not unique; e.g., given a minimization of a convex real function $f(X)$ over some abstracted convex set C , any optimal solution comes from a convex set of optimal solutions. But a strictly convex real function has a unique minimizer; i.e., for the optimal solution set to be a single ...

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However, to get a convex optimization problem, the set of feasible solution, that is the shape of plan of the island/cave must be convex, too. View 1 Recommendation

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Many of the exercises and solutions given here were developed as part of my earlier convex optimization book [BNO03] (coauthored with Angelia Nedić and Asuman Ozdaglar), and are posted on the internet of that book's web site. The contribution of my coauthors in the development of these exercises and their solutions is gratefully acknowledged.

[EE364a Homework 3 solutions](#)

3.57 Show that the function $f(X) = \text{tr}(X^{-1})$ is matrix convex on S_n^{++} . Solution. We must show that for arbitrary $v \in \mathbb{R}^n$, the function $g(X) = v^T X^{-1} v$ is convex in X on S_n^{++} . This follows from example 3.4. 4.1 Consider the optimization problem minimize $f_0(x_1, x_2)$ subject to $2x_1 + x_2 \leq 1$, $x_1 + 3x_2 \leq 1$, $x_1 \geq 0$, $x_2 \geq 0$. Make a sketch of the ...

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A convex optimization problem consists of either minimizing a convex objective or maximizing a concave objective over a convex feasible region.

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Convex optimization is a subfield of mathematical optimization that studies the problem of minimizing convex functions over convex sets. Many classes of convex optimization problems admit polynomial-time algorithms, whereas mathematical optimization is in general NP-hard. Convex optimization has applications in a wide range of disciplines, such as automatic control systems, estimation and ...