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Strong duality

Strong duality is a condition in mathematical optimization in which the primal optimal objective and the dual optimal objective are equal. This is as opposed to weak duality (the primal problem has optimal value larger than or equal to the dual problem, in other words the duality gap is greater than or equal to zero).

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Characterizations

Strong duality holds if and only if the duality gap is equal to 0.

Sufficient conditions

Sufficient conditions comprise:

- $F = F^{**}$ where F is the perturbation function relating the primal and dual problems and F^{**} is the biconjugate of F (follows by construction of the duality gap)
- F is convex and lower semi-continuous (equivalent to the first point by the Fenchel–Moreau theorem)
- the primal problem is a linear optimization problem
- Slater's condition for a convex optimization problem[1][2]

See also

- Convex optimization

References

1. Borwein, Jonathan; Lewis, Adrian (2006). *Convex Analysis and Nonlinear Optimization: Theory and Examples* (2 ed.). Springer. ISBN 978-0-387-29570-1.
2. Boyd, Stephen; Vandenberghe, Lieven (2004). *Convex Optimization* (https://web.stanford.edu/~boyd/cvxbook/bv_cvxbook.pdf) (pdf). Cambridge University Press. ISBN 978-0-521-83378-3. Retrieved October 3, 2011.

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