

**2002j:90051** 90C22 90-02 90C51

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**Semidefinite programming. (English. English summary)**

*European J. Oper. Res.* **137** (2002), no. 3, 461–482.

This is a nice survey on the state of the art in semidefinite programming (SDP), an extension of linear programming to the cone of positive semidefinite matrices. Different problem formulations in SDP are first recalled, with a focus on its specific duality theory. Miscellaneous results on the geometry of feasible sets and computational complexity of solving semidefinite programs are enumerated. Several applications of SDP are then described in control theory and combinatorial optimization (people working in these fields were the first to recognize the potentialities of SDP in engineering) and also more recent one in eigenvalue optimization and robust optimization. Finally, the survey winds up with an original, large, and documented section on algorithms to solve SDP problems. Interior-point methods are first described, with a focus on the use of self-concordant barrier functions and computation of search directions from primal-dual first-order necessary optimality conditions. Then, spectral bundle methods are presented as a fast, low-memory alternative to obtain rough estimates on optimal solutions of larger problems. SDP is currently a very active research area, and pointers to latest achievements in the field can be found at the web page maintained by Christoph Helmberg at <http://www.mathematik.uni-kl.de/~helmberg/semidef.html>.

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