

Seminars in Applied Mathematics: Semidefinite Optimization and Applications

Spring 2012

5 ECTS

Week	Date		Theme	Material	
1	9	1.3.2012	Göran/Anders/ Ray	Course introduction, some initial examples of convex optimization and overview on optimization	Selected examples
2	9	2.3.2012	Ray	Applications of SDP and introduction to CVX software	Introduction to CVX and more examples
3	10		Göran	Linear algebra	Fundamentals from "Matrices" that supports the course. Material from [2] appendix A5.1-4.
4	11		Göran	Linear algebra	Chapter 1.1 from [1]. Symmetric and positive (semi)definite matrices
5	12		Göran	Linear algebra	Chapter 1.2 from [1]. The cone of positive semidefinite matrices
6	13		Göran	Linear optimization	Chapter 4.3 from [2]. Different forms of LP and some applications
7	14		Anders	Quadratic programming problems	Chapter 4.4 from [2]. Structure of QPs, examples and explicit solution of simple QPs using Lagrange function (diff. of quadratic forms $x^T Qx + c^T x$) and multipliers
8	15		Anders	Convex sets and convex functions	Selected parts from Chapter 2.1.4-5, 2.2, 2.3.1-7 in [2]
16	Assignments and home work week				
9	17	26.4.2012	Ray	Basics in SDP and simple examples by hand	Material from [2] and [3]
10	17	27.4.2012	Ray	Duality and primal/dual relations, additional examples	Material from [2] and [3]
11	18	3.5.2012	Ray	Linear and quadratic classification, convex quadratic approximation	Material from [2]
12	18	4.5.2012	Ray	What can be expressed using SDP? For example eigenvalue and singular value formulations	Material from [2] and [5]
13	19	10.5.2012	Ray	Quadratic programming and 0-1 IP/QP, MAX/CUT and Coulomb glass (equicut)	Material from [3] and [4]
14	19	10.5.2012	Ray	Second order conic programming and quadratically constrained quadratic programming (SOCP/QCQP)	Material from [2], [3] and [4]
15	19	11.5.2012	Ray	Euclidean distance problems	Material from [2]
20	Assignments and home work week				

On-line material

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| [1] | Semidefinite Programming for Combinatorial Optimization | http://www.zib.de/Publications/Reports/ZR-00-34.pdf |
| [2] | Convex Optimization | http://www.stanford.edu/~boyd/cvxbook/ |
| [3] | Introduction to semidefinite programming | http://ocw.mit.edu/courses/sloan-school-of-management/15-094j-systems-optimization-models-and-computation-sma-5223-spring-2004/lecture-notes/sdp094_digest.pdf |
| [4] | Relaxations and Randomized Methods for Nonconvex QCQPs | http://www.stanford.edu/class/ee392o/relaxations.pdf |
| [5] | Lectures on modern convex optimization | http://www2.isye.gatech.edu/~nemirovs/Lect_ModConvOpt.pdf |