

Department of Computer Science and Engineering
Indian Institute of Technology Kanpur

Proposal for new course

Course title: Applications of semi-definite programming in complexity

Course No.: CS698AC

Units: 3-0-0-9

Depts to whom course may be of interest: Physics, EE, Mathematics.

Proposer: Rajat Mittal

Others interested in teaching course: None

Topics: Semidefinite programming has emerged as an important tool for computing bounds on various quantities in Complexity theory. The course will mainly focus on their application in quantum complexity theory. We will introduce semidefinite programs (SDP) and study their properties in the beginning. The course will also cover some fundamentals of quantum computing. Later in the course, following topics will be covered depending on time:

- * Goeman-Williamson max cut algorithm (<http://www-math.mit.edu/~goemans/PAPERS/maxcut-jacm.pdf>),
- * Parallel repetition of SDP's (http://www.cs.rutgers.edu/~szegedy/PUBLICATIONS/improved_rajat.pdf),
- * Quantum non-local games (<http://arxiv.org/abs/quantph/0404076>, <http://arxiv.org/abs/quant-ph/0608146>, <http://arxiv.org/abs/0710.0655>, <http://arxiv.org/abs/1104.1140>),
- * Quantum query complexity (<http://arxiv.org/abs/1011.3020>, <http://arxiv.org/abs/0904.2759>, <http://arxiv.org/abs/quant-ph/0002066>).

References: A good book for basics in Quantum computing is:
Quantum computation and quantum information by Nielsen and Chuang
A good survey on semidefinite programming for computer scientists is:
www.cs.elte.hu/~lovasz/semidef.ps

Proposer's signature: Rajat Mittal.

Convenor, DPGC

Chairman, SPGC