TOPICS FOR COURSE PRESENTATION

Please choose one of the following to present to the class. Your presentation should be roughly 50 minutes (possibly more or less depending on the topic). Please email me your proposed topic/paper by **Feb 6**. I will want to discuss it with you in person and go through a dry run a week or two before your presentation. You are welcome to work in pairs.

1. Algorithms using Sherali Adams
    - Scheduling algorithms via SA. Garg (Arxiv 2017) Quasi-PTAs for Scheduling with Precedences using LP hierarchies. Imprves upon earlier paper by Levey and Rothvoss (STOC 2016) A (1+epsilon) approximation for makespan scheduling with precedence constraints using LP hierarchies.
    - Paper about bounded arborescences via SA Bateni,Charikar, Guruswami (STOC 2009) MaxMin Allocation via Degree Lower-bounded Arborescences.
    - Thapper, Zivny. The power of Sherali-Adams relaxations for general-valued CSPs (SIAM Jrl on Computing 2017)
    - Conditioning rounding technique. General rounding scheme for SA.
2. SOS algorithms
    - (**) Goemans-Willimson Approximation algorithm for Maxcut using SDP (very famous and beautiful. not hard. Can find tons of lecture notes on it, plus original paper.)
    - Chlamtac (FOCS 2007) Approximation algorithms using hierarchies of semidefinite programming relaxations. (Coloring 3-colorable graphs via SOS)
    - degree 2 SOS certificates for min expansion, Cheegers inequality (this is part of lecture 2 of boaz's notes, plus associated papers and video)
    - Grothendeik inequality (also part of lecture 2 of boaz's notes, plus associated reading and video)

- (*) ARV algorithm. Arora, Rao, Vazirani. Expander flows, geometric embeddings and graph partitioning. (STOC 2004) See also lecture 4 and video from barak. This is a highlight of Barak/Steurer lecture notes as they substantially simplified the proof. This is a famous paper and would be great for the class to hear about it.
- (*) Dictionary learning and Tensor decomposition via sum-of-squares Barak, Kelner, Steurer. Dictionary learning and tensor decomposition via the sum-of-squares method. Proceedings STOC 2015. (See also part of lecture 7 from Barak/Steurer course and accompanying and video.)
- (**) Learning mixtures of Gaussians: Hopkins-Li, Kothari-Steinhardt, Dianakonikolas-Kane-Stewart. Hopkins has a blog on this.
- (**) Raghavendra, Steurer (FOCS 2009) How to Round any CSP.
- Barak, Raghavendra, Steurer. Rounding semidefinite programming hierarchies via global correlation. (FOCS 2011)

3. SOS and Extended Formulation lower bounds

    - (**) Buss-Grigoriev-Impagliazzo-Pitassi lower bound for PC, and Grigoriev's extension to SOS (for Tseitin, random kCNF)
    - (*) Grigoriev SOS lower bound for knapsack
    - (Harder) Planted Clique lower bound
    - (Harder) Kothari, Meka, Raghavendra (STOC 2017) Aitem pproximating Rectangles by Juntas and Weakly-Exponential Lower Bounds for LP relaxation of CSPs.
    - (Harder) Lee Raghavendra Steurer. Lower bounds on the size of SDP relaxations. STOC 2015.
    - Extended Formulations Lower Bounds and Lifting Theorems

4. Other

    - Raghavendra, Rao, Schramm (STOC 2017) Strongly Refuting Random CSPs Below the Spectral Thrshold.
    - (*) The Relation between Polynomial Calculus, Sherali-Adams and Sum-of-Squares. Berkoltz ECCC, October 2017.