TOPICS FOR COURSE PRESENTATION

Please choose one or two papers to present to the class in the last few lectures. Your presentation should be 30-50 minutes long, depending on the topic. Please email me your proposed topic/paper by **March 6**. If you wish to discuss it in person before the deadline, please email me.

There are a few general surveys if you wish to explore a topic or paper of your choice. (One by Razborov, another by Beame-Pitassi, and a third by Segerlind; see the course webpage for these surveys.)

Below are some suggested papers, divided by topic.

1 Space Complexity and Time/Space Tradeoffs

There are a lot of papers on this subject, most notably led by Jakob Nordstrom. If interested in this subject, please look at his webpage where he has many really great papers on the subject. Here are a few recommended ones.

1. Nordstrom. Pebble Games, Proof Complexity and Time-Space Tradeofs. Logical Methods in Computer Science, 9(3), article 15, Sept 2013.

2. Ben-Sasson, Nordstrom. Understanding space in proof complexity: separations and tradeoffs via substitutions. ICS (Innovations in Computer Science), 2011.

3. Beame, Beck, Impagliazzo. Time-space tradeofs in resolution: superpolynomial lower bounds for superlinear space. STOC 2012. (See also ECCC TR11-149)

4. Bonacina, Galesi, Thapen. Total space in resolution. SIAM Journal on Computing, Vol 45:5, 2016.

5. Razborov. An Ultimate Trade-off in Propositional Proof Complexity. ECCC 22:33 (2015)

2 Proof complexity and SAT solving

There are many papers on this topic and I am no expert. You can for example explore a number of papers by Fahiem Bacchus. Here are some suggestions.

1. Beame, Kautz, Sabhawal. Towards understanding and harnessing the potential of clause learning. JAIR 22:319-351, 2004.

2. Beame, Sabharwal. Non-restarting SAT solvers with simple preproccessing can efficiently simulate Resolution. Proceedings AAAI 2014.

3. Nordstrom. On the Interlay between Proof Complexity and SAT solving. ACM Siglog News, 2(3), pp. 19-44, 2015.

4. Atserias and Dalmau. A combinatorial characterization of Resolution width, JCSS, 74(3), pp. 323-334, 2008. Preliminary version in CCC 2003.

5. Atserias. The Proof-search problem between bounded width Resolution and bounded-degree Semi-Algebraic Proofs.

6. Atserias, Fichte, Thurley. Clause-learning Algorithms with many restarts and bounded-width Resolution. JAIR, 40, 2011, p.353-373.

7. Alekhnovich, Razborov. Satisfiability, Branch-width and Tseitin tautologies. Computational Complexity 20(4):649-678, 2011.

8. Bacchus, Dalmao, Pitasi. Algorithms and Complexity Results for #-SAT and Bayesian Inference. FOCS 2003, pp. 340-351.

9. Hertel, Bacchus, Pitassi, Gelder. Clause Learning can Effectively p-simulate General Propositional Resolution. AAAI 2008, pp. 283-290.

3 Proof Complexity and Optimization

There are a lot of recent papers on this subject. Below are two of the original ones, but if you are interested in this topic I can also provide more recent ones.

1. Buresh-Oppenheim, Galesi, Hoory, Magen, Pitassi. Rank Lower Bounds and Integrality Gaps for the Cutting Planes Procedure. Theory of Computing, 2, 2006, pp.65-90.

2. Arora, Bollobas, Lovasz, Tourlakis. Proving integrality gaps without knowing the linear program. Theory of Computing, Volume 2 (2006), pp. 19-51.

4 Extended Formulations and Proof Complexity

1. Lee, Raghavendra, Steurer. Lower bounds on the size of semidefinite programming relaxations. STOC 2015.

2. Lee, Raghavendra, Steurer, Tan. On the Power of Symmetric LP and SDP Relaxations. CCC 2014.

5 Proof Complexity and Learning

1. Alekhnovich, Braverman, Feldman, Klivans, Pitassi. Learnability and automatizability, Focs 2004. Journal version: The complexity of properly learning simple concept classes. JCSS 74(1), 2008. (See Mark Braverman's publications for pdf)

6 Proof complexity and Stochastic games

1. Atserias and Maneva. Mean-payoff games and propositional proofs.

2. Huang, Pitassi. Automatizability and Simple Stochastic Games. ICALP 2011. (Found on my homepage.)

3. Beckmann, Pudlak, Thapen. Parity games and propositional proofs. ACM Transactions on Computational Logic. Volume 15:2(17), 2014.

7 Algebraic Proof Systems

1. Clegg, Edmonds and Impagliazzo. Using the Groebner basis algorithm for find proofs of unsatisfiability. STOC 1996.

2. Beame, Impagliazzo, Krajicek, Pitassi, Pudlak. Lower bounds on Hilbert's Nullstellensatz and propositional proofs. FOCS 1994. (Also journal paper available.)

3. Pitassi. Algebraic Propositional Proof Systems. 1996 Survey article (on my webpage)

4. Pitassi, Tzameret. Algebraic Proof Complexity: Progress, Frontiers and Challenges. SigLog News. Also ArXiv: https://arxiv.org/pdf/1607.00443.pdf

8 Other

1. Raghavendra, Rao, Schramm. Strongly Refuting Random CSPs Below the Spectral Thrshold. STOC 2017.