CS 2429F – Fall 2014
Course Presentation

1 Picking your Topic

Please send me an email or make an appointment by October 1, with your proposed topic and paper(s) that you will present. Include in your email who you will be working with or if you plan to work alone. Two people will be expected to cover the topic in more depth, and will have a longer time for the presentation (approximately 90 minutes for 2 people, 45 minutes for one person.) You are welcome to suggest a different topic than those that I list below but if you do so, please come and talk with me.

After your topic is approved, I will give you a date for your presentation. Your presentation may include slides (powerpoint or whatever you choose), and should include lecture notes.

2 Suggestions for Topics/Papers for Presentation

I am not expecting you to read and cover all of the papers within each topic. However I am listing the "original" ones that introduced the connection, and more recent ones. If you think you are interested in a topic but need help navigating through the literature (to pick one or two papers to focus on) please come and talk with me. I would expect that you would understand a bit about the basic connection and then also cover a more recent paper on the topic.

(1.) The log-rank conjecture.

Shachar Lovett Recent Advances on the Log Rank Conjecture, Bulletin of EATCS 2014.

Gavinsky, Lovett En Route to the log-rank Conjecture: New Reductions and Equivalent Formulations

Nisan, Wigderson. On Rank vs Communication Complexity

Ben-Sasson, Lovett, Zewi. An additive combinatorics approach to the log-rank conjecture

Shahar Lovett. Communication is bounded by root of rank. STOC 2014.

Thomas Rothvoss. A direct proof for Lovett's bound on the communication complexity of low rank matrices. arXiv.org

(2.) Communication Complexity and Data Structures.

Video Lecture (by Kasper Larson) Communication Complexity and Data Structures https://www.birs.ca/events/2014/5-day-workshops/14w5164/videos

Miltersen. Cell Probe Complexity - A Survey. In Advances in Data Strutures, 1999.

Miltersen, Nisan, Safra, Wigderson. On data structures and asymmetric communication complexity. JCSS 1998.

Mihai Patrascu. "Towards Polynomial Lower Bounds for Dynamic Problems"

Patrascu. Unifying the Landscape of Cell Probe Lower Bounds. FOCS 2008.

Chattopadhyay, Edmonds, Ellen, Pitassi. "A little advice can be very helpful." Soda, 2011 Video lecture on this paper by Arkadev Chattopadhyay https://www.birs.ca/events/2014/5-day-workshops/14w5164/videos

(3.) Communication Complexity and Distributed Computing

Video Lecture by Rotem Oshman The Role of Communication COmplexity in Distributed Computing https://www.birs.ca/events/2014/5-day-workshops/14w5164/videos

Braverman, Ellen, Oshman, Pitassi, Vaikuntanathan Tight bounds for set disjointness in the Message Passing Model

Chattopadhyay, Radhakrishnan, Rudra Topology Matters in Communication, ECCC tech report, also to appear in FOCS 2014.

(4.) Communication Complexity and Proof Complexity

Goos, Pitassi Communication Lower Bounds via Critical Block Sensitivity arXiv.org

(5.) Communication Complexity and Extended Formulations

Tutorial on the subject: http://people.csail.mit.edu/moitra/docs/tutorialf.pdf

Video talks by Prasad Raghavandra:

https://www.birs.ca/events/2013/5-day-workshops/13w5010/videos

https://www.birs.ca/events/2014/5-day-workshops/14w5051/videos

Fiorini, Massar, Pokutta, Tiwary, deWolf Linear vs semidefinite extended formulations: exponential separation and strong lower bounds, Stoc 2012

Thomas Rothvoss The matching polytope has exponential extension complexity, STOC 2014.

Braun, Fiorini, Pokutta, Steurer Approximation Limits of Linear Programs (Beyond Hierarchies)

(6.) Communication Complexity and Circuit Depth Lower Bounds

Karchmer, Wigderson Monotone circuits for connectivity require superlogarithmic depth

Goos, Pitassi Communication Lower Bounds via Critical Block Sensitivity

(7.) Communication Complexity and Streaming

Video Lecture by David Woodruff Lower Bounds for Data Streams https://www.birs.ca/events/2014/5-day-workshops/14w5164/videos

Alon, Matias, Szegedy. The Space Complexity of Approximating the Frequency Moments, STOC 1996.

(8.) Communication Complexity and Game Theory

See the last section of the following survey article for a brief overview of several applications of communication complexity in game theory.

Chattopadhyay, Pitassi The Story of Set Disjointness.

(9.) Communication Complexity and Property Testing

Video Lecture by Joshua Brody Property Testing Lower Bounds via Communication Complexity https://www.birs.ca/events/2014/5-day-workshops/14w5164/videos

(9.) Information Complexity

This is a rather large recent topic. Here are some papers although there are really a lot of papers on this subject!

Mark Braverman and Anup Rao. "Information Equals Amortized Communication."

Mark Braverman. "Interactive information complexity." STOC 2012.

Amit Chakrabarti, Yaoyun Shi, Anthony Wirth, and Andrew Yao. "Information Complexity and the Direct Sum Problem for Simultaneous Message Complexity." FOCS 2001.

Ziv Bar-Yossef, T. S. Jayram, Ravi Kumar, and D. Sivakumar. "An information statistics approach to data stream and communication complexity." Journal of Computer and System Sciences, Volume 68, p. 702-732, June 2004.