CS 2429F – Winter 2014
Course Presentation

1 Picking your Topic

Please send me an email or make an appointment by Jan 22, with your proposed topic and paper(s) that you will present. 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 should include slides (powerpoint or whatever you choose), and should also include lecture notes. You should present the main proof in detail, and then lead a general discussion on the method, its strengths and weaknesses, and potential for stronger results.

Below I have listed the original reference. However you should discuss your topic with me and also search the web; many of these results are classics in the field, and therefore great lecture notes and simplified presentations are available that could be very helpful for planning your lecture.

2 Suggestions for Topics/Papers for Presentation

(1.) Other applications of switching lemma. [Linial, Mansour and Nisan] "Constant Depth Circuits, Fourier Transform and Learnability"

(2.) Other applications of switching lemma: upper bounds for AC0-SAT. [Impagliazzo, Matthews, Paturi] "A Satisfiability Algorithm for $AC0$"

(3.) Formula size lower bounds.

(4.) Polynomial method and Parity not in $AC0[p]$, $p \neq 2$ [Razborov, Smolensky]

(5.) Circuit Depth Lower Bounds via Karchmer-Wigderson; Monotone depth lower bounds (Mika Goos)

(6.) On proving $NC1 \neq P$ via KRW direct sum. [Karchmer, Raz, Wigderson] "Superlogarithmic depth lower bounds via the direct sum in communication complexity" [Gavinsky, Meir, Wigderson] "Toward better formula lower bounds: An Information Complexity approach to the KRW Composition Conjecture"

(7.) On proving $P \neq ACC$ via Yao/Beigel-Tarui and NOF communication complexity.

(8.) On separating $NEXP$ from $P/Poly$ and the nearly equivalent problem of proving $P = BPP$. $NEXP \neq ACC$ [Williams]. (Robert Robere)

(9.) Lower bounds for linear size, log depth circuits [Valiant]

(10.) Lower bounds for log-depth circuits for matrix multiplication and matrix rigidity; [Lokam], [Valiant]

(11.) Barriers to Proving P versus NP and related separations: natural proofs and algebraization. [Razborov, Rudich] "Natural Proofs" [Aaronson, Wigderson] "Algebrization: A New Barrier in Complexity Theory"