Noise Sensitivity of Boolean Functions and Percolation

Date Tuesday, October 14

Time 5 pm

Location 507 Math

Abstract: Noise sensitivity was defined in a paper by Benjamini, Kalai, andSchramm (1999). A closely related notion was considered by Tsirelson and Vershik. I will describe the notion of noise sensitivity of Boolean functions and some basic results and problems related to it. A fun way to explain it (especially after 2000) is in terms of the probability that small mistakes in counting the votes in an election will change the outcome. We will consider the following:

1) The definition of noise sensitivity directly and in terms of the Fourier transform.

2)Noise sensitivity of the crossing event in Percolation (BKS 99, Schramm and Steiff 2005, and finally Garban, Pete, Schramm 2008
-http://front.math.ucdavis.edu/0803.3750 [front.math.ucdavis.edu]),
the scaling limit for the Spectral distribution (Schramm and Smirnov, 2007, GPS 2008), and dynamic percolation. (ScSt (2005),GPS (2008))

3) Noise stability of functions described by monotone depth monotone threshold circuits. (This is a conjecture; but there are some results by BKS, Peres, Mossel, O'Donnell,and others.)

4) The connection to hardness of approximation, MAX-CUT, social choice (there are various papers on these), and finally the "majority is stabelest theorem" (Mossel, O'Donnell, Oleszkiewicz 05
http://front.math.ucdavis.edu/0503.5503 [front.math.ucdavis.edu]).

If time will allow I will discuss some open problems, connection with first passage percolation, and speculations on connections with physics.