UNIVERSITY OF MICHIGAN
Department of Mathematics

Seminar & Events Bulletin: Analysis/Probability Learning Seminar

01-01-2013 to 06-30-2013

Thursday, January 24, 2013	
4:10pm-6:00pm	**Analysis/Probability Learning Seminar** -- Mark Rudelson (University of Michigan) *A simple proof of Paouris' inequality* -- 4096 East Hall

Thursday, February 07, 2013	
4:10pm-5:20pm	**Analysis/Probability Learning Seminar** -- Alexander Powell (Vanderbilt University) *Consist reconstruction and some geometry of random polytopes* -- 4096 East Hall

Thursday, February 14, 2013	
4:10pm-6:00pm	**Analysis/Probability Learning Seminar** -- Elena Yudovina (University of Michigan) *The scaling of the Hardy-Littlewood maximal inequality with dimension* -- 4096 East Hall

Thursday, February 21, 2013	
4:10pm-6:00pm	**Analysis/Probability Learning Seminar** -- Fedor Nazarov (Kent State University) *Estimates for the number of real zeroes of random polynomials* -- 4096 East Hall

Thursday, March 28, 2013	
4:10pm-6:00pm	**Analysis/Probability Learning Seminar** -- Pierre Youssef (Paris-Est Marne-la Vallee University) *On some column selection problems and applications* -- 4096 East Hall

Thursday, April 04, 2013	
4:10pm-6:00pm	**Analysis/Probability Learning Seminar** -- Roman Vershynin (UM) *Density of eigenvalues of random matrices (after Erdos, Schlein and Yau)* -- 4096 East Hall

Thursday, April 18, 2013	
4:10pm-6:00pm	**Analysis/Probability Learning Seminar** -- Elisabeth Meckes (Case Western Reserve University) *TBA* -- 4096 East Hall

Thursday, May 23, 2013	
4:10pm-5:20pm	**Analysis/Probability Learning Seminar** -- Raja Giryes (Technion, Israel) *The analysis cosparse model for signals and images* -- 4096 East Hall

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Abstracts

Analysis/Probability Learning Seminar
Thursday, January 24, 2013, 4:10pm-6:00pm
4096 East Hall
Mark Rudelson (University of Michigan)
A simple proof of Paouris' inequality

We present a simple proof of Paouris' large deviation inequality, which was recently found by Adamczak, Latala, Litvak, Oleszkiewicz, Pajor, and Tomczak-Jaegermann. The inequality of Paouris, which states that most of the volume of a convex body is contained within its inertia ellipsoid, became recently one of the major tools of convex geometry.

Analysis/Probability Learning Seminar
Thursday, February 07, 2013, 4:10pm-5:20pm
4096 East Hall
Alexander Powell (Vanderbilt University)
Consist reconstruction and some geometry of random polytopes

This is a more technical continuation of Wednesday's Analysis/Probability seminar.

Consistent reconstruction is a linear programming approach for estimation problems involving bounded noise (for example, the problem of reconstructing a signal from a set of quantized linear measurements). We prove new mean squared error bounds for consistent reconstruction in the setting of random frames and under the uniform quantization noise model. In particular, we prove that the mean squared error for consistent reconstruction is of the optimal order C/N^2 where N is the number of measurements, and we prove bounds on the associated dimension dependent constant C. For comparison, in the case of unit-norm tight frames with linear reconstruction (instead of consistent reconstruction) the mean squared error only satisfies a weaker bound of order 1/N. Our main results involve an analysis of random polytopes and of associated coverage processes on the sphere. This is joint work with Tyler Whitehouse.

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Analysis/Probability Learning Seminar
Thursday, February 14, 2013, 4:10pm-6:00pm
4096 East Hall
Elena Yudovina (University of Michigan)
The scaling of the Hardy-Littlewood maximal inequality with dimension

The Hardy-Littlewood maximal function is an important tool in real and harmonic analysis. We will try to understand how the volume of the points where the maximal function is large scales with dimension. A long-standing question has been to determine whether there is a dimension-independent upper bound. In a recent breakthrough, the scaling was completely characterized for the maximal function associated to the cube. One half of the breakthrough (which we will not discuss now) is a two-month-old paper of Bourgain. We will present the other half, following the argument of Aubrun. Although the question comes from analysis, the construction will use probabilistic ideas and Brownian motion.

Analysis/Probability Learning Seminar
Thursday, February 21, 2013, 4:10pm-6:00pm
4096 East Hall
Fedor Nazarov (Kent State University)
Estimates for the number of real zeroes of random polynomials

Consider a random polynomial P(x) of degree n>1 with independent symmetrically distributed i.i.d. real coefficients. We will show that the average number of its real zeroes does not exceed C log n where C is an absolute constant.

Analysis/Probability Learning Seminar
Thursday, March 28, 2013, 4:10pm-6:00pm
4096 East Hall
Pierre Youssef (Paris-Est Marne-la Vallee University)
On some column selection problems and applications

Given U an nÃ—m matrix, the aim is to extract a large number of linearly independent columns of U and estimate the smallest and the largest singular value of the restricted matrix. For that, we give two deterministic algorithms: one for the restricted invertibility principle dealing with the smallest singular value, and one for the norm of coordinate restriction problem dealing with the largest singular value. Merging the two algorithms, we are able to extract a well-conditioned block inside U, improving a previous result due to Vershynin. We give some applications of this result, among them a deterministic algorithm to get the best known result on the Kadison-Singer conjecture.

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Analysis/Probability Learning Seminar
Thursday, April 04, 2013, 4:10pm-6:00pm
4096 East Hall
Roman Vershynin (UM)
Density of eigenvalues of random matrices (after Erdos, Schlein and Yau)

In a sequence of recent papers, Erdos, Schlein and Yau proved a local semicircle law and a delocalization of eigenvectors for general symmetric random matrices (with iid entries above diagonal). We will work out some techniques that they developed for this purpose. Specifically, I will show how to upper bound the number of eigenvalues in a given small interval with high probability (a "Wegner estimate").

Analysis/Probability Learning Seminar
Thursday, April 18, 2013, 4:10pm-6:00pm
4096 East Hall
Elisabeth Meckes (Case Western Reserve University)
TBA

Analysis/Probability Learning Seminar
Thursday, May 23, 2013, 4:10pm-5:20pm
4096 East Hall
Raja Giryes (Technion, Israel)
The analysis cosparse model for signals and images

The cosparse analysis model has been introduced recently as an interesting alternative to the standard sparse synthesis approach. In this talk I will point to the differences between the two models and the advantages and disadvantages that the analysis framework introduce for signal and image processing. A general recipe for generating analysis algorithms from existing synthesis ones will be presented, together with theoretical guarantees for several such "converted techniques". The impact of these results on the sparse synthesis framework will be discussed as well, highlighting a new view to what seems to be already classical results in sparse approximation theory. I will conclude with some open problems still unanswered.