The Hong Kong University of Science and Technology

Department of Mathematics

<u>Seminar on Applied Mathematics</u>

The Fundamentals of Compressive Sensing
Lecture 3 & 4

by

Prof. Simon FOUCART
Texas A&M University

<u>Abstract</u>

Lecture 3: The Usefulness of a Modified Restricted Isometry Property
This lecture will start by reviewing the proof of the restricted isometry property (RIP), arguably the most prominent tool in the theory of Compressive Sensing. In its classical version, the RIP features ℓ_2-norms as inner and outer norms. The modified version introduced here features the ℓ_1-norm as the inner norm, while the outer norm depends a priori on the distribution of the random entries populating the measurement matrix. The modified version holds for a wider class of random matrices and still accounts for the success of sparse recovery via basis pursuit and via iterative hard thresholding. In the special case of Gaussian matrices, the outer norm actually reduces to an ℓ_2-norm. This fact allows one to retrieve results from the theory of one-bit Compressive Sensing in a very simple way. Extensions to one-bit matrix recovery will be mentioned.

Lecture 4: Uniform vs Nonuniform Recovery and Optimality
This lecture draws attention to the difference between uniform and nonuniform guarantees in sparse recovery. We give a number of nonuniform results concerning ℓ_1-minimization and we introduce partial Fourier matrices in passing. We also show that the uniform results from Compressive Sensing are essentially optimal. This relies on a close connection with the geometry of Banach spaces, in particular with properties of the unit balls of ℓ_1-spaces.

Date: *Thursday, 21 December 2017*

Time: *10:00a.m. – 12:00noon*

Venue: *Room 5510, Academic Building*
                      (near Lifts 25 & 26), HKUST

All are welcome!