

**Data Science Seminar**  
Hosted by Department of Mathematical Sciences

- Date: Tuesday, November 26, 2017
- Time: 12:00pm - 1:00pm
- Room: WH-100E
- Speaker: Wei Yang (Binghamton University)
- Title: Random Covariance Matrix and the Marchenko-Pastur law

***Abstract***

Let  $x$  be a  $p$ -dimensional centered random vector, with some unknown covariance matrix  $\Sigma$ . Let  $x_1, \dots, x_n$  be  $n$  i.i.d copies of  $x$ , we can form

$S =$ sample mean of  $x_i x_i^T$ 's

Which is an example of a  $p \times p$  random matrix. When  $\{x_i\}_{i \in \{1, \dots, n\}}$  are realized,  $S$  is just a sample covariance matrix. If  $n$  is large,  $S$  by the Law of Large number is a good estimator for  $\Sigma$ . When the size  $n$  is limited, but  $n, p$  are comparable, the classical Marchenko-Pastur (MP) Law says that, the eigenvalues of  $S$  follows roughly the MP distribution. In this talk, we are going to use the Stieltjes Transformation (Resolvent) method to prove a version of the MP Law. The focus will be on the method of proof, a common technique in the theory of Random Matrices.

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Last update: **2019/10/31 18:45**

