

SEMPARIS – Séminaires en région parisienne

<http://string.lpthe.jussieu.fr/semparis/>

Cours

Vendredi 27 Novembre 2015, 10 :00

IPHT, Salle Claude Itzykson, Bât. 774, Orme des Merisiers

Domaines : cond-mat—hep-th—math-ph—physics

Titre : *Introduction to Random Matrix Theory and its various applications*
(2/5)

Orateur : **Satya Majumdar** (LPTMS)

Résumé : *Outline of the course :*

- 1) *Brief historical introduction to RMT : 1applications.*
 - *Discussion of basic properties of matrices, different random matrix ensembles, rotationally invariant ensembles such as Gaussian ensembles etc.*
 - 2) *Gaussian ensembles : derivation of the joint probability distribution of eigenvalues, starting from the joint distribution of matrix entries.*
 - 3) *Analysis of the spectral properties of eigenvalues : given the joint distribution of eigenvalues, how to calculate various observables such as :*
 - *Average density of eigenvalues — Wigner semi-circle law*
 - *Counting statistics, spacings between eigenvalues etc*
 - *Distribution of the extreme (maximum or minimum eigenvalues)*
 - 4) *Two complementary approaches to study spectral statistics :*
 - *Large N (for an $N \times N$ matrix) method by the Coulomb gas approach : saddle point method*
 - *Finite N method : for Gaussian unitary ensemble : orthogonal polynomial method (essentially quantum mechanics of free fermions at zero temperature).*
 - 5) *Tracy-Widom distribution : prob. distribution of the top eigenvalue. Its appearance in a large number of problems, universality and an associated third order phase transition.*
 - 6) *Perspectives and summary.*
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