# RANDOM MATRICES

The seminar serie on Random Matrices will start from an elementary level and it will be suited to a general audience and also to the first year graduate students. The topics will be the following.

(1) Hermitian Random Matrices. Orthogonal Polynomials. Hankel Determinant and Toda Lattice. $1/N$ expansion and graph enumeration.
**Boris Dubrovin**, February 9, February 16, February 23.

(2) Kontsevich Integral and KdV equation.
**Andrea Raimondo**, March 2 and March 9.
*References*
*Itzykson, C.; Zuber, J.-B. Combinatorics of the modular group. II. The Kontsevich integrals. Internat. J. Modern Phys. A 7 (1992), no. 23, 5661- 5705.*
*Kontsevich, M. Intersection theory on the moduli space of curves and the matrix Airy function. Comm. Math. Phys. 147 (1992), no. 1, 1-23.*

(3) Distribution of the spectrum of eigenvalues of random Hermitian matrices: gap probability distribution, sine kernel, Airy kernel, and Tracy-Widom distribution.
**Tamara Grava** March 16.
*References*
*Tracy, C.A.; Widom, H. Distribution functions for largest eigenvalues and their applications. Proceedings of the International Congress of Mathematicians, Vol. I (Beijing, 2002), 587- 596, Higher Ed. Press, Beijing, 2002,*
*Tracy, C. A.; Widom, H. Level-spacing distributions and the Airy kernel. Comm. Math. Phys. 159 (1994), no. 1, 151 - 174.*

(4) Unitary Random Matrices. Toeplitz determinant and Ablowitz Laddik equation.
**Stefano Romano** March 23 and March 30.
*References*
*Adler, M.; Van Moerbeke P. Integrals over classical Groups, Random permutations, Toda and Toeplitz lattices. arXiv:math/9912143.*
*Masato Hisakado, Unitary Matrix Models and Painlev III. arXiv:hep-th/9609214.*

(5) Moments of the Riemann zeta function and unitary random matrices.
**Antonio Moro**, April 6 April 13 and April 20.
*References*
*Keating, J. P.; Snaith, N. C. Random matrix theory and $\zeta(1/2+it)$. Comm. Math. Phys. 214 (2000), no. 1, 57 - 89.*

(6) Combinatorial probability, random matrices and integrable systems.
Tamara Grava, May 4 and May 11.
*References*
*Baik, J.; Deift, P.; Johansson, K. On the distribution of the length of the longest*

*increasing subsequence of random permutations. J. Amer. Math. Soc. 12 (1999), no. 4, 1119 - 1178.*