ICTS Colloquium

Title : A universality theorem in random matrix theory

Speaker : Manjunath Krishnapur, Indian Institute of Science, Bangalore

Date : Monday, March 20, 2017

Time : 3:00 pm

Venue : Emmy Noether Seminar Room, ICTS Campus, Bangalore

Abstract : A log-gas in potential V is a system of n points on the real line with joint density \exp{-\beta H(x_1,..,x_n)} where H(x_1,...,x_n)=sum_i V(x_i) + \sum_{i<j}\log|x_i-x_j|. Here V is a nice function (eg., V(x)=x^{2p} for some p) and \beta>0 is a fixed number. The question of interest is the behaviour of the random variable \max{x_1,...,x_n}. When \beta=0, this reduces to the classical extreme value theory. But the story is completely different when \beta>0.

For \beta=2 and V(x)=x^2, it was first solved by Tracy and Widom in a landmark paper and then generalized to \beta=2 and general V by methods of integrable systems and Riemann-Hilbert problems (Pastur-Scherbina, Deift, many others). These methods do not work for other values of \beta.

In this lecture, we describe one approach to the study of the maximum by constructing tridiagonal random matrices whose eigenvalues are distributed according to the log-gas. Building upon earlier works of idea of Trotter, Dumitriu, Edelman, Sutton, Virag, Rider, Ramirez, Valko, we show that there is universality in V for every \beta. This is joint work with Brian Rider and Balint Virag.