



Invitation to Seminar Talk

Quaternionic R transform and non-hermitian random matrices

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Host: Laszlo Erdős

Using the Cayley-Dickson construction we generalize the free probability calculus to non-hermitian random matrices. The main object in this generalization is a quaternionic extension of the R transform which is a generating function for planar (non-crossing) cumulants of the given random matrix X in the limit of infinite matrix size $N \rightarrow \infty$. The cumulants are defined as connected averages of all distinct powers of X and its hermitian conjugate X^\dagger of the type: $\langle\langle \frac{1}{N} \text{Tr} X^a X^{\dagger b} X^c \dots \rangle\rangle$ for $N \rightarrow \infty$. We show that the R transform for gaussian elliptic laws is given by a simple linear quaternionic map $\mathcal{R}(z + wj) = x + \sigma^2 (\mu e^{2i\phi} z + wj)$ where (z, w) is the Cayley-Dickson pair of complex numbers forming a quaternion $q = (z, w) \equiv z + wj$. This map has five real parameters $\Re x$, $\Im m x$, ϕ , σ and μ . We use the R transform to formulate the addition and multiplication laws for non-hermitian random matrices. For illustration we apply these laws to calculate the limiting eigenvalue densities of several products of gaussian random matrices.

Thursday, May 28, 2015, 4:00pm
Seminar Room Mondi 2, Central Building, 1st floor



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