Probabilistic Operator Algebra Seminar

Organizer: Dan-Virgil Voiculescu

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Title: *Spectral truncations in noncommutative geometry and operator systems*

We extend the traditional framework of noncommutative geometry in order to deal with spectral truncations of geometric spaces (i.e. imposing an ultraviolet cutoff in momentum space). In our new approach the traditional role played by C^*-algebras is taken over by so-called operator systems. Essentially, this is the minimal structure required on a space of operator to be able to speak of positive elements, states, pure states etc. We consider C^*-envelopes and introduce a propagation number for operator systems, which we show to be an invariant under stable equivalence and use to compare approximations of the same space. We illustrate our methods for concrete examples obtained by spectral truncations of the circle. These are operator systems of finite-dimensional Toeplitz matrices and their dual operator systems which are given by functions on the circle whose Fourier series have only a finite number of modes. It turns out that the cones of positive elements and the pure states spaces for these operator systems possess a very rich structure which we analyze including the metric aspect, i.e., the distance on the state space associated to the Dirac operator. We also show that both truncations converge to the circle (in the Gromov-Hausdorff sense).
(Based on joint work with Alain Connes)