Probabilistic Operator Algebra Seminar

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Title: Free denoising

We study the free analogue of the classical statistical denoising problem. Let a and b be free selfadjoint noncommutative random variables in a tracial W^* -probability space, where a represents the signal and b the noise. Our goal is to compute the conditional expectation of a (or more generally f(a)) given a + b. To do this, we introduce a coupling between the distributions of a and a + band show that it is absolutely continuous with respect to the product measure of the marginal distributions. A similar approach applies to the multiplicative case. More generally, we consider the conditional expectation of a given P(a, b), for any noncommutative polynomial P, and show that it can be addressed using the c-freeness framework of Bozejko, Leinert and Speicher. We conclude with applications of our results to matrix denoising. Based on joint work with Maxime Fevrier (Paris) and Alexandru Nica (Waterloo).