Topologies, idempotents and ideals

Nico Spronk, Waterloo University

Abstract: A classical theorem due to Jacobs, and de Leeuw and Glicksberg, shows that a continuous representation of a topological group G on a reflexive Banach space may be decomposed into a "returning" subspace and a "weakly mixing" subspace. Furthermore, following Dye, Bergelson and Rosenblatt characterized the weakly mixing vectors as those for which the closure of the weak orbit of the vector contains zero. I wish to exhibit a generalization of these results, inspired, in part, by some work of Ruppert on abelian groups. I will exhibit a bijective correspondence between

– central idempotents in the weakly almost periodic compactification of G,

– certain topologies on G,

– certain ideals in the algebra of weakly almost periodic functions.

Given time, I will indicate some applications to Fourier-Stieltjes algebras.

Hilbert transforms, old and new stories

Tao Mei, Baylor University

Abstract: This talk will be on the L_p boundedness of the Hilbert transform. This transform is the linear map on 2-integrable functions, which keep the analytic part of the functions and reverse the sign of their anti-analytic part. In the language of Fourier analysis, the Hilbert transform is a Fourier multiplier with symbol ``-i sign (x)".

This talk will introduce some new discovery of Hilbert transforms on free groups, based on a joint work with Eric Ricard. I plan to start with the history of trigonometric functions. If time permits, I will also explain a recent work with Quanhua Xu in this direction.

Weighted Fourier algebras and their spectrum

Hunhee Lee, Seoul National University

Abstract: In this talk we will discuss about a systematic way of making the predual of group von Neumann algebra weighted keeping its essential algebraic structure. This object is called a weighted Fourier algebra and it turns out that the spectrum contains much information on the complexification of the underlying group when it is a Lie group. We will investigate various examples including SU(n), the Heisenberg group and the Euclidean motion group.

Negative quasiprobability in an operational way

Junghee Ryu, Centre for Quantum Technologies, National University of Singapore

Abstract : Negative probability was introduced by Feynman to address a mystery of quantum mechanics [1]. Since then such approach has been applied to investigate various kinds of quantum features such as quantum entanglement and superposition. However, the negativity of the probability distribution could lead to a conceptual problem on interpreting the quantity in terms of the frequency of the events occur. The meaning of the negative values in probability is not clear in an operational way. Recently, an operational quasiprobabilities (OQs) are introduced for qudits as well as optical fields states [2,3]. Here, we will discuss how the OQs deal with those problems and experimental results.

[1] R. Feynman, in Negative Probabilities in Quantum Mechanics, edited by B. Hiley and F. Peat (Routledge, London, 1987).

[2] J. Ryu, J. Lim, S. Hong, and J. Lee, Operational quasiprobabilities for qudit, Phys. Rev. A 88, 052123 (2013).

[3] J. Jae, J. Ryu, and J. Lee, Operational quasiprobabilities for continuous variables, Phys. Rev. A 96, 042121 (2017).

Duistermaat-Heckman measure and mixture of adjoint orbits of quantum states

Lin Zhang (张林)，Hangzhou Dianzi University

Abstract: In this paper, using a unifying treatment, we derive the spectral density of the mixture of adjoint orbits of quantum states in terms of Duistermaat-Heckman measure, originated from the theory of symplectic geometry. Some examples in lower dimensional space can be computed explicitly. As an application, we show that, in the two-level quantum system, the average entropy of the equiprobable mixture of three random density matrices chosen from a random state ensemble (specified in the text) is strictly larger than that of the equiprobable mixture of two random density matrices from the same ensemble. Hence, the quantum coherence monotonously decreases statistically as the mixing times n. This indicates that 'mixing reduces coherence'.

On Positive Partial Transpose Squared Conjecture

Yu Yang (杨宇)，Chongqing Technology and Business University

Abstract: Linear maps that are both completely positive and completely copositive are often called PPT binding maps. Here PPT stands for “positive partial transposition” since the Choi matrix of such a map is positive under partial transpose. The PPT squared conjecture asks whether the composition of two PPT maps is entanglement breaking. We shall talk about our proof of PPT squared conjecture if the local dimension is equal to 3. Another proof is claimed by Alexzander Muller Hermes from University of Copenhagen independently. The validity of PPT squared conjecture in the case 4-dimensional is widely believed to fail but no counterexample is given so far.