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FAKULTÄT FÜR MATHEMATIK
Dekan Univ.-Prof. Dr. Radu Ioan Boţ

Einladung zur öffentlichen Defensio

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Thema der Dissertation

Operator Quantization and Deformation on the Heisenberg Modules

Abstract:
This dissertation explores the connection between Heisenberg modules over noncommutative tori–a well-studied object in noncommutative geometry–and the theories of operator-quantization along with Banach bundles associated to the deformation of C^*-algebras. This investigation is motivated by deep results in Gabor analysis.
The well-known fact that Heisenberg modules over higher dimensional noncommutative tori may be viewed terms Gabor frames allows us to establish the deformation of Banach bundles of Heisenberg modules over noncommutative tori. Furthermore, we show that the generated Banach space of this bundle of Heisenberg modules implements the Morita equivalence between the generated C^*-algebras of bundles of twisted group C^*-algebras coming from lattices in the time-frequency plane. Furthermore, building on the deformation results of Feichtinger and Kaiblinger on Gabor frames, we show that the constructed bundle of Heisenberg modules generalizes the Gabor frame stability results of Feichtinger's algebra to Heisenberg modules.
Recall that to each lattice in the time-frequency plane there is associated a Heisenberg module. We provide a detailed description of the adjointable maps of these Heisenberg module. Building on the observation that these adjointable maps are those that commute with all time-frequency shifts of the given lattice, i.e. operator-translation in variant in the language of quantum harmonic analysis. Using techniques from C^*-algebras and von Neumann algebras associated to Heisenberg modules, we show that every lattice operator-translation invariant map may be characterized as operator-periodization of finite rank operators with generators coming from the Heisenberg modules. We also introduce the related notion of operator-modulation invariant operators of
a lattice, and show that these operators can also be characterized as Fourier-Wigner operator-periodizations of finite-rank operators by generators of the Heisenberg module.

Prüfungssenat

Univ.-Prof. Mag. Dr. Andreas Cap
(Vorsitz, Universität Wien)

Prof. Dr. Franz Luef
(Norwegian University of Science and Technology)

Prof. Dr. Sven Raum
(Universität Potsdam)

Prof. Dr. Martijn Caspers
(TU Delft)

Zeit und Ort

Montag, 27. Jänner 2025, 09:15 Uhr

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