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EINLADUNG

zum

HABILITATIONSVORTRAG

Dr. Nicki Holighaus
(Institut für Schallforschung,
Österreichische Akademie der Wissenschaften)

“Explorations in Generalized Time-Frequency Analysis”

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Abstract: In this talk, I will introduce generalized time-frequency systems as translation-invariant systems with time-frequency localized generators. Before focusing on a specific instance of generalized time-frequency systems, the *warped time-frequency systems*, I will briefly place their study in the larger research context of my habilitation thesis. The eponymous *warping* refers to the fact that the generators of a warped time-frequency system are defined (in the Fourier-domain) by applying a diffeomorphism $\Phi: D \to \mathbb{R}^d$, the *warping function*, to the translation-invariant system $\{T_y\theta : y \in \mathbb{R}^d\}$, where $\theta: \mathbb{R}^d \to \mathbb{C}$ is a suitable *prototype function*. This facilitates the construction of systems with time-frequency resolution adapted to rather general *frequency scales*. We find that warped time-frequency systems are continuous Parseval frames, such that the associated frame analysis is a norm-preserving map onto a reproducing kernel Hilbert space of square-integrable functions. If the prototype is sufficiently time-frequency localized, we prove that the reproducing kernel is contained in a novel Schur-type Banach algebra of kernels that induce bounded integral operators on mixed-norm Lebesgue spaces for all integrability exponents $p, q \in [1, \infty]$. In this case, we can extend the frame analysis to a class of Banach spaces characterized by the time-frequency behavior of its members, so-called coorbit spaces. Under slightly stronger conditions on θ, we show that functions in the coorbit spaces are uniquely determined by discrete samples of the corresponding frame analysis. The crucial step of proving membership of the reproducing kernel in the Schur-type kernel algebra is achieved by studying integrability properties of a parametrized family of oscillatory integrals derived from the kernel. Although this analysis relies on a variation of the established stationary phase method, the latter requires some finesse before yielding estimates that satisfy our requirements. Time permitting, I will present some steps of our solution in detail.

Donnerstag, 31. Oktober 2024
15:00 Uhr bis 15:45 Uhr,
Seminarraum 15, 3 OG.
Fakultät für Mathematik,
Oskar-Morgenstern-Platz 1

Bernhard Lamel
Radu Bot