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Wavelets for non-expanding dilations

In this talk we we discuss the problem of existence and characterization of wavelets for non-expanding dilations. This turns out to be intimately connected with the geometry of numbers; more specifically, with the estimate on the number of lattice points of dilates of balls by the powers of a dilation $A \in GL_n(\mathbb{R})$. This connection is not visible for the well-studied class of expanding dilations since the desired lattice counting estimate holds automatically.

We show that the lattice counting estimate holds for all dilations A with $|\det A| \neq 1$ and for almost every lattice Γ with respect to invariant measure on the set of lattices. As a consequence, we deduce the existence of minimally supported frequency (MSF) wavelets associated with such dilations for almost every choice of a lattice. Likewise, we show that MSF wavelets exist for all lattices and and almost every choice of a dilation A with respect to the Haar measure on $GL_n(\mathbb{R})$.

This talk is based on a joint work with Jakob Lemvig.