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**IFSs with overlap: families of orthogonal exponentials
and invariant measures, Part 1. (Preliminary Report)**

We consider Iterated Function Systems (IFSs) on the real line consisting of two contractive affine transformations, $\tau_0(x) = \lambda x$ and $\tau_1(x) = \lambda(x + 1)$ where the parameter $\lambda \in \mathbb{R}$. Each such IFS induces an invariant measure μ_λ with support on the compact attractor X_λ of the IFS. Much recent research has been done to study the measure μ_λ by examining the harmonic analysis of the Hilbert space $L^2(X_\lambda, \mu_\lambda)$, particularly when the attractor X_λ is a fractal with non-integer Hausdorff dimension.

In this sequence of two talks, we will describe some results in the cases for which the IFS has overlap. This causes the attractor set to be a compact interval in $\mathbb{R}$, but the overlap makes the measure difficult to work with. This talk will illustrate that there exist families of orthogonal exponentials in the Hilbert space, but that none of these families is an orthonormal basis.

This is joint work with Palle Jorgensen at the University of Iowa and Karen Shuman at Grinnell College.