Title: **Wavelets: Mallat’s Theorem and Applications**

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Abstract: One of the best features of a vector space is the idea of a basis, especially orthonormal bases. Every vector space has one and they are incredibly useful for both understanding and representing otherwise complicated elements. In the finite dimensional case any collection of vectors that is both orthonormal and spans the space is acceptable, no matter how crazy the vectors may look, since it is easy to understand a finite collection of vectors. However when you extend to infinite dimensions, this is no longer the case. If we wish to understand a vector space with an infinite basis, we need some concise method of describing all of the vectors. Of particular concern is the infinite dimensional space known as $L^2(\mathbb{R})$ and Mallat’s theorem will give us a way to construct a orthonormal basis that can be written as a collection of translations and dilations of a single vector, given that we already have a structure called a Multiresolution Analysis (or MRA).

Time permitting, we will also discuss the idea of wavelets as applied to numerical methods and image compression.

Refreshments will precede the talk at 3:30pm in Bond Hall 300 courtesy of Dr. Branko Ćurgus.