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**Wojciech Czaja, Ilya Kavalero** and **Weilin Li\*** ([weilinli@cims.nyu.edu](mailto:weilinli@cims.nyu.edu)). *Time-frequency Scattering Transforms: Theory and Applications*.

Inspired by the success of deep learning, Mallat introduced the wavelet scattering transform and showed that it provides a useful representation of data. In contrast to his wavelet (time-scale) approach, we develop a Gabor (time-frequency) theory. To do this, we introduce the concept of a uniform covering frame, which is a generalization of traditional Gabor frames. When a uniform covering frame is incorporated into a scattering network, we obtain the Fourier scattering transform. This non-linear operator extracts time-frequency characteristics in a hierarchal manner by cascading convolutions with functions from a uniform covering frame and the complex modulus. It satisfies several provable properties that justify its use as a feature extractor for classification. We demonstrate how to use this for the classification of hyper-spectral data. (Received August 27, 2018)