

## **Emerging Joint Time-Frequency Analysis Techniques for Vibrations Applications**

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Traditional Fourier analysis has been an important tool in scientific and engineering applications for many years. However, it does not readily capture non-stationary and local features, which are inherently present in many dynamic phenomena. The lecture will focus on modern time-frequency analysis techniques for capturing localized effects and evolutionary frequency content by using wavelets and other related techniques. These techniques can be construed as “mathematical microscopes” and allow representation of complex problems with gradually increasing degree of detail and resolution. These techniques will be presented with a historical perspective and in context with several engineering applications; they will be used for analyzing both recorded ground accelerograms and linear/nonlinear seismic responses of benchmark structures. However, they are applicable as well to a plethora of other themes. Related general topics and options for non-local analysis in vibration problems via non-integer order differential calculus will be also discussed.