DALHOUSIE MATHEMATICS COLLOQUIUM

Monday March 25 2019, 3:30 pm, Chase 319

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A new discretization scheme for the construction of frames and wavelets

Series expansions obtained by sampling the orbit of a vector generated by the action of a representation naturally arise in the context of signal processing, wavelet theory, sampling theory, and time-frequency analysis. This discretization problem can be stated as follows. Given a unitary representation of a locally compact group, what are conditions under which it is possible to sample the orbit of a vector for the construction of reproducing systems such as Riesz bases, frames, and Parseval frames? In the context of signal analysis, it is also important to construct frames with some additional properties:boundedness, small support, continuity, fast decay, and (when there is a smooth structure) various degrees of differentiability. At this point, there is a wealth of discretization schemes available in the literature. For example, the Coorbit Theory of Feichtinger and Gröchenig and its various generalizations have proved to be powerful tools in wavelet, time-frequency, and shearlet analyses. However, these theories do not come for free. Very often some integrability or other stringent conditions such as irreducibility are imposed. In concrete situations, these restrictions can significantly narrow the scope of these theories. In this talk, we will present a new research program providing a scheme which not only completely lifts these conditions, but which also puts an emphasis on explicitness and construction.