Department of Mathematics,
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Math 295 - Mathematics Colloquium

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Hypergroup stationarity of random fields

Abstract:

Traditionally weak stationarity of a random field $\{X(t) : t \in \mathbf{T}\}$ over an index space $\mathbf{T}$ is defined with respect to a translation operation in $\mathbf{T}$. But this classical notion of stationarity does not extend to related random fields, as for example to the field of averages of $\{X(t) : t \in \mathbf{T}\}$. In order to equip this latter field with a stationarity property one introduces a generalized translation in $\mathbf{T}$ which arises from a generalized convolution structure in the space $M^b(\mathbf{T})$ of bounded measures on $\mathbf{T}$. There are two fundamental constructions providing such (hypergroup) convolution structures on the index spaces $\mathbf{Z}_+$ and $\mathbf{R}_+$, in terms of polynomial sequences and families of special functions, respectively.

In the present talk emphasis will be put on polynomially stationary random fields $\{X(n) : n \in \mathbf{Z}_+\}$ which were studied for the first time by R. Lasser and M. Leitner about 20 years ago. In the meantime the theory has developed interesting applications such as regularization, moving averages and prediction.

For square-integrable radial random fields over graphs, J.P. Arnaud has coined a notion of stationarity which yields spectral and Karhunen type representations. These fields are related to polynomially stationary random fields over $\mathbf{Z}_+$, where the underlying polynomial sequence generates the Cartier-Dunau convolution structure in $M^b(\mathbf{Z}_+)$. An analogous approach related to special function stationarity of random fields over $\mathbf{R}_+$ seems promising, but requires further progress.

Host: Patrick J. Fitzsimmons

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