Infinitely Divisible Processes

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Abstract:
Infinitely divisible (ID) processes are one of the simplest models incorporating jumps in random evolution of systems. Their most natural and best understood examples are Lévy processes, which are continuous-time random walks. Lévy processes, and more generally, ID random measures, are building blocks of more complex infinitely divisible processes that can feature statistical long range dependence, time/space stationarity, and high/weak variability. Applications of such processes are found in mathematical finance, insurance, telecommunications, extreme values theory, geophysics, plasma physics, among others. In turn, the progress in our understanding of such processes depends on the interaction with several areas of mathematics, economics, and engineering, and thrives through the constant input of new ideas from these disciplines.

The lectures will give an introduction to theory, methods, and simulation of ID processes. The coverage is planned as follows.

1. Review of basic properties of ID laws
2. Large deviations and concentration inequalities
3. ID random measures, stochastic integration, and ID processes
4. Representations of ID processes: generating triplets, series representations, and integral representations
5. Series representations of Lévy processes and simulation methods
6. Stationary, stationary increment, and fractional ID processes