Abstract: In high-frequency financial data not only returns but also waiting times between consecutive trades (inter-trade durations) are random variables. This remark can be traced at least to papers on the application of compound Poisson processes [1] and subordinated stochastic processes [2] to finance. However, empirical analyses show that inter-trade durations do not follow the exponential distribution [3]. To take this fact into account, the compound Poisson process must be replaced by suitable semi-Markov processes: the compound renewal processes called *continuous-time random walks* (CTRWs) by physicists [4]. This course will focus on some properties of these processes and on a specific sub-class: the compound fractional Poisson processes [5]. In particular, the relationship of these processes with the space-time fractional diffusion equation will be explored.

Program:

1. Empirical motivation
2. The basic ingredients: a renewal process and a random walk
3. The role of the fractional Poisson process
   The relation with fractional calculus
   Stochastic integrals
   Back to empiricism: limitations

Bibliography:


