Short course on Lévy Processes

by **Dr. Ester Mariucci**

Dr. Ester Mariucci will give a 2-part short course on Lévy Processes on the 31st of January and the 7th of February 2019 from 14:15 to 17:45 (room 2.14.0.47 from 14:15 - 15:45 and room 2.28.0.108 from 16:15 - 17:45). The exercise will take place on the 4th of February from 16:15 – 17:45 at room 2.25.F0.01.

Part 1: **Why do we add jumps to the Brownian motion?**

In the first part of the mini course we will focus on jump processes with independent and stationary increments, the so called Lévy processes. They form the prototype of stochastic processes in continuous time with a diffusion part plus jumps. We will see how the structure of their paths (Lévy-Itô decomposition) and the form of their characteristic functions (Lévy-Khintchine formula) are uniquely determined by three parameters: the drift (a real number), the diffusion coefficient (a positive real number) and the Lévy measure (a real Borel measure describing the behavior of the jumps).

Part 2: **Statistics for jump processes**

In the second part of the mini course, we will discuss how to estimate the Lévy measure from discrete observations of a trajectory of a Lévy process. At first, we will use the Lévy-Itô decomposition to estimate the jump part of the process in a high frequency regime, i.e. when the distance in time between the n given observations vanishes as n grows. Then, we will investigate the low frequency regime, i.e. when the trajectory of the process is sampled at a fixed rate, and estimate the Lévy measure by using a spectral approach based on the Lévy-Khintchine formula.