

Stationarity and random locations

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Abstract

We introduce a notion called “intrinsic location functional”. This is a large family of random locations including, for example, the location of the path supremum/infimum over an interval, the first/last hitting time, among many others. On one hand, it is proved that under stationarity, the distributions of intrinsic location functionals must satisfy the same very specific constraints, in spite of their different origins and nature. On the other hand, stationarity can actually be characterized by this group of conditions. That is, a stochastic process is stationary if and only the conditions hold for all the intrinsic location functionals. This provides a new approach to understand stationarity from the perspective of random locations. We further develop alternative descriptions of intrinsic location functional using partially ordered random point sets or piecewise linear functions. In the last part, I will discuss the generalization of the main results, the applications of this work and the links between this work and other areas, such as stochastic algebraic topology or queueing systems with deadlines.