Extracting Mobility Parameters from Ambiciti Dataset

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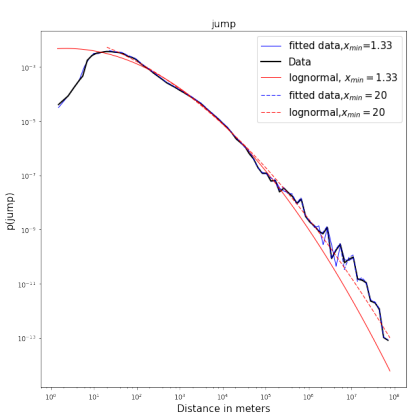
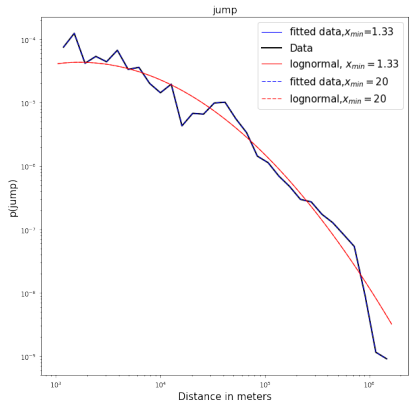
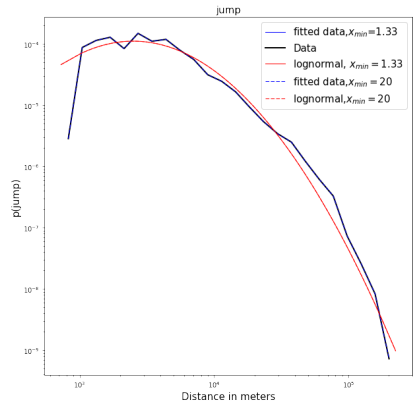
Abstract: There is a huge body of work that focuses on the understanding of human mobility characteristics utilizing various types of data. These works focus on a spatial scale to extract mobility characteristics. In our work, we study the impact of spatial granularity on different parameters of human mobility (such as: jump length, radius of gyration (R_g)). Towards this, we utilize `Ambiciti`[1] dataset that periodically collects localized noise levels near a user using a mobile application. The dataset holds 25,787,201 accurate samples collected by 5269 users from 1st July 2015 until 30th September 2017. We infer that positive lognormal distribution best fits jump length ($x_{min} = 20m$, $\mu = 5.67$, $\sigma = 2.79$) and R_g ($x_{min} = 50m$, $\mu = 9.59$, $\sigma = 2.61$) (see fig. 1a and 1d) when studied at fine grain. However, when the granularity of the samples is made coarse (associating the samples to 752 arrondissements in France and to 288 cities (arrondissements contain different cities) within Ile-de-France region), the positive lognormal distribution still fits the best, but the parameters of the distribution change. We then calculate the KL divergence to identify if there is enough divergence between the identified distributions at different scales and find that it lies between $[4.3, 6.9]$ for R_g and $[3.1, 22.9]$ for jump length. Thus, we conclude that spatial scale plays an important role in the identification of the mobility parameters.



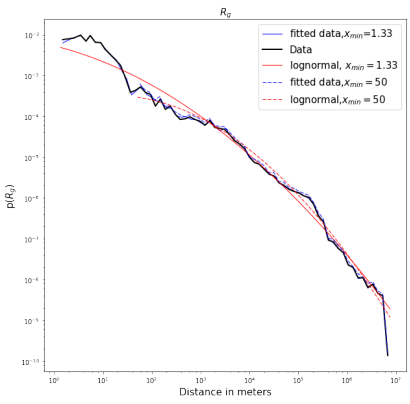
(a) Jump length: All samples



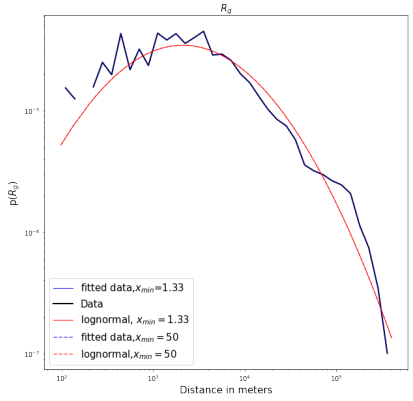
(b) Jump length: Samples mapped to Arrondissements



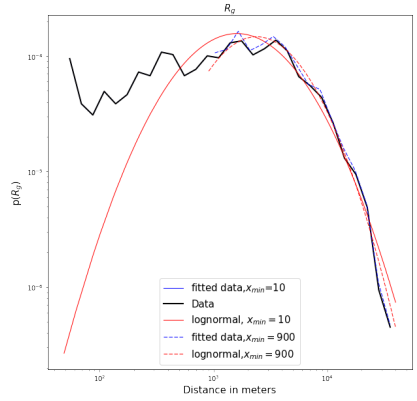
(c) Jump length: Samples mapped to Ile-de-France cities



(d) R_g: All samples



(e) R_g: Samples mapped to Arrondissements



(f) R_g: Samples mapped to Ile-de-France cities

Fig. 1: Best fit distribution for jump-length and R_G at different spatial scales with different values of x_{min}.

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[1] http://ambiciti.io