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Statistical and dynamical properties of the bike mobility

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The human mobility is a fruitful research field in the framework of Complex Systems to study the existence of universal statistical laws that could be related to microscopic individual behavior. The main question concerns the possibility of developing a Statistical Mechanics for understanding the empirical observations at macroscopic level. Planning urban mobility is one of the key issues for the life quality and the sustainability of the environmental impact of the future cities. The development of a multimodal mobility is one of the possible solutions, which requires the integration of different transportation networks in order to satisfy the complex mobility demand and the constraints imposed by the urban structure.
The bike mobility could play a fundamental role in this framework. The Bellamossa initiative of the Bologna Municipality allows to collect detailed georeferenced information on single trips performed by cyclists in the urban area of Bologna. Bellamossa is a game driven by an app on smartphones, which records the time and GPS positions every 2 sec. of each trips declared by a user according to different mobility categories: we focus our analysis on pedestrian and bike mobility. The number of participants during 2017 was 10^4 individuals, that perform 1500 trips per day using the bicycle from April to September. Each trip is anonymized so that it is difficult to follow the mobility of single individuals during a day. After reconstructing the trajectories on the road network of Bologna, we consider the problem of inferring the individual mobility demand that is satisfied by the bicycle and characterizing the dynamical features of the observed paths. We detect the mobility demand associated to the main attraction areas and the circadian rhythms of the city and the mobility subnetwork associated to the preferred paths of cyclists. We extend to the bike mobility the methodologies we have developed to study the private car mobility in order to prove the existence of a hazard function that measure the perceived convenience to use the bicycle and the difference dynamical features of the observed paths (i.e. the information entropy) according to their length and to the different origin-destinatio

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