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# Spatial Visitation Prediction of On-Demand Ride Services Using the Scaling Law

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**Abstract**

The scaling law is a functional relationship between two quantities. The distributions of a wide variety of phenomena approximately follow scaling laws over a wide range of magnitudes, e.g., travel distance, spatial density, visitation frequency, etc. The spatial visitation frequency was confirmed following such empirical distributions, too, providing us a possibility for the spatial visitation prediction. This paper analyzes the scaling laws of dynamic spatial visitation frequencies using real on-demand ride service data from the platform of DiDi in Hangzhou, China. We predict the ranking of grids in terms of the densities of both points of interest (POIs) and different types of services provided by the platform (i.e., e-hailing taxi, DiDi Express, and Hitch). There are two main findings in the paper: Firstly, an exponential form of the scaling law does exist for the frequency-ranking relationship with the DiDi dataset, which hasn't been discussed in the research area of on-demand ride services. Secondly, the spatial visitation prediction model is proposed to explain the importance of POIs variables and service variables in different time periods. The results show that the weighting of variables is positively related to its attractiveness. The findings indicate that our model has good interpretability while predicting spatial-temporal arrivals with a high accuracy.

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