Analyzing Beijing Point of Interest Data Using Group Linked Cox Process

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Abstract: We develop in this article a group linked Cox process model for analyzing large-scale data on the point of interest (POI). Our methodology is motivated by a real POI dataset, which contains more than 22 thousand POIs in Beijing urban area. These POIs have been divided into many small categories (e.g., restaurants, movie theaters, hospitals, universities and subway stations) by the digital map maker (e.g., Baidu Map). Empirical analysis provides substantial evidence that POIs across different categories could be highly correlated so that those small categories can be further grouped. To this end, we develop here a group linked Cox process model. Specifically, within each group, we model POI locations by a standard Cox process so that the POI clustering effect can be well described. Furthermore, the idea of bivariate linked Cox process is borrowed and further extended to its multivariate counterpart. Consequently, a more sig- nificant number of POI categories can be accommodated within each group. To estimate the model, a minimum contrast type method is developed, and an au- tomatically grouping method is provided. Simulation studies are conducted to validate the proposed methodology. At last, we apply our method to the afore- mentioned real dataset, and a total of 4 groups are uncovered. This leads to the discovery of some urban-planning-related features.