# Insights from Pagerank: Evaluation on the Integration Degree of bike-sharing-Metro System

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**Abstract— The connection between bike-sharing and subway provides more flexible travel choices for urban residents, which is the result of the integration and development of the two systems. Evaluating the integration degree of bike-sharing-subway system can provide a new perspective for observing the convergence situation between public transport systems, help enterprises or transportation departments to effectively put bike-sharing into operation and dispatch management, and promote the utilization and development of public transport. Previous studies often take the bike-sharing ridership, the utilization rate of bicycles and the duration of cycling as quantitative indicators, ignoring the dynamic change of connected cycling. Actually, under the mixed relationship with subway, the mobility of bike-sharing is worth considering. In order to improve the evaluation system, we obtained the order data of bike-sharing for two weeks in April, 2021, established a weighted directed network based on the geographical flow of bike-sharing within the service area of the subway (800m buffer), calculated the weighted degree, weighted local clustering coefficient and weighted Pagerank value, in addition to made a visualization through the geo-spatial heat map. The results show that: (1) The spatial distribution of weighted degree and local clustering coefficient is similar, which reflect the density of ridership and the intensity of cycling aggregation respectively, which is often influenced by the local population density. (2) Pagerank algorithm can identify the central nodes, and the calculated Pagerank value has a strong correlation with the subway system, which reveals that the bike-sharing mobile network is centripetal to the subway station. (3) The Pagerank values around some subway stations with low population density are also high, which reflects the result that the ridership is difficult to reveal. Therefore, Pagerank value may be used as a new indicator to be included in the evaluation system of bike-sharing-subway system integration, which needs further study.**

***Keywords— Bike sharing system, Metro system, Pagerank, Integration degree***