

# Urban Store Distribution Explored through Subway Network in Seoul

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## Extended Abstract

**Motivation.** Subway networks in metropolitan areas are key public transportation system due to their punctuality and high passenger capacity. The spatial distribution of urban retail establishments is therefore expected to correlate with the structural properties of the subway network. Existing research has focused largely on spatially fixed commercial entities such as shopping centers and established retail chains [1]. In contrast, mobile street vendors, whose locations are inherently flexible, and viral food shops, whose spatial clustering reflects the collective behavior of consumers driven by social media, have received little systematic attention in the context of urban network analysis. To address this gap, we examine three retail types that differ fundamentally in their business model: Starbucks stores (a global franchise started from Seattle), bung-eo-ppang (BEP, fish-shaped finger-food pastry) street vendors, and Dubai-style chewy cookie (Dujjonku, acronym in Korean) shops (recently trend-driven stores in Korea). By mapping these three types onto Seoul's subway network and comparing their spatial distributions against the closeness centrality (CC) of subway stations, we investigate whether and how businesses of fundamentally different natures respond distinctively to the same underlying urban network structure.

**Approach and Methodology.** We analyzed the Seoul subway network using CC to quantify the accessibility of each station. The geographical location data of the BEP stores were collected through the 'BEP map' service of 'Daangn,' where Daangn is a mobile platform with a name meaning 'near you' in Korean [2]. The BEP map was maintained by Daangn users voluntarily during the wintertime. The data for Dujjonku stores were obtained from the Dujjonku map platform [3], which aggregated store locations supplied by store owner unlike BEP. To analyze the distribution of stores, we first counted the number of stores within a circle centered at each subway station in the map of Seoul. Then, we repeated this process by moving all over subway stations in Seoul, and plotted the distribution of store counting. By varying the radius of the circle from 300 to 3000 m and repeating the above processes, we acquired the distribution as a function of the circle radius. With these data, Pearson correlation coefficients among stores were obtained, and Jensen-Shannon divergen (JSD) and Moran's I were analyzed with a focus on the CC of subway stations.

**Results.** The analysis reveals contrasting results among stores in spatial correlations depending on the nature of stores. Starbucks and Dujjonku show a positive correlation with CC of stations, with strong clustering in specific hotspots, such as City Hall and Gangnam-gu, where network centrality is highest. In contrast, BEP vendors exhibit a low correlation with CC, maintaining

