

ORIGINAL ARTICLE

Exploring the potential of social media in urban analysis

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Abstract

The mobility of people in the city forms various patterns that change over time according to the needs of the inhabitants. The question is how the relationship and mutual influence between social media and urban development are based on the urban variable model, according to the needs of urban residents. The study aims to determine the relationship between social media and the intensity of its influence as a neglected element in urban planning. In this study, geolocated data from the Tehran-based social media platform “Nazdika” were collected and analyzed to understand how digital activities intersect with urban mobility and inform spatial development. Employing a 10 × 10 analysis method, the urban area was divided into 10 significant regions based on historical, functional, and socio-cultural centrality, allowing for systematic cross-sectional assessment. Data processing combined the use of geographic information system mapping and qualitative content analysis to identify patterns of human movement, concentrations of digital interactions, and their influence on physical urban space. The results show that the primary core of the city is the first and most attractive place in the city to attract audiences on social media, and it is an axis of the city's development from virtual to real space. The methodological focus on a single local platform is discussed as both a limitation and an opportunity for in-depth, context-specific insight.

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1. Introduction

The rising penetration of digital technologies in urbanization has radically altered human mobility patterns, social relationships, and urban growth dynamics. In recent years, urban analytics has increasingly encompassed land use and transportation concerns with novel concerns for health, environmental sustainability, and digital technology adoption for urban applications (Chi & Mak, 2021; Li & Pan, 2024). The expansion of advanced analytical tools is reinforced by studies that demonstrate the role of digital technologies in reshaping urban management practices with innovative data-based approaches to improve urban resilience and sustainability (Elena, Singh, *et al.*, 2024). The adoption of advanced analytical tools has enabled continuous monitoring of urban mobility patterns, efficient urban health risk assessment, and involvement in

smart urban initiatives that enhance community well-being (Elena, Prakash, *et al.*, 2024). Urban growth and planning are increasingly adopting newer sources of digital data not just to monitor but to prevent problems in urban environments proactively. For example, studies reflecting on the massive implications of big data analytics for urban planning highlight ways in which cities can utilize these technologies to manage serious concerns, such as transportation, accommodation, and resource management, efficiently (Dmitrieva *et al.*, 2024; Kandt & Batty, 2021). The prevalence of digital technology in urban cases reflects the deployment of smart city models wherein data-based insights drive decision-making processes and foster innovation in smart urban solutions to meet changing populations (Elena, Prakash, *et al.*, 2024; Esmaeilpoorarabi & Yiğitcanlar, 2023). Social media platforms today record huge and heterogeneous space and behavioral data, creating new prospects for urban studies that were beyond urban planners' and researchers' reach previously. Their digital footprints enabled researchers to explore urban phenomena in near real-time and grasp changing trends of urban life with greater detail than ever before.

Integrating social media analytics with urban studies can transform how we plan, manage, and live in cities. However, it remains methodologically and contextually challenging to tap these massive digital datasets for useful knowledge for urban policy, as cities all over the world differ enormously in adoption of technologies, models of governance, and patterns of social behaviors.

Despite the growing literature on the intersection between social media and urban planning, relatively few empirical studies that comprehensively relate digital activity to real-world human mobility with localized, data-oriented approaches exist to date. Specifically, the processes by which user-created social media can be utilized to discover movement patterns to improve management strategies for urban areas are relatively lacking in non-Western environments. To help bridge the gap, our study centers on Tehran as a semi-critical and little-researched case for urban areas.

2. Literature review

Theoretical understandings of urban society have changed considerably over the past century, informing the analytical and normative models employed in modern urban studies. Pioneering theorists, such as Ebenezer Howard with his "Garden Cities" vision of urban society (Kagawa *et al.*, 2012), Jane Jacobs with community-led, participative urbanism (Chiang, 2005), Manuel Castells and his revolutionary network society theory (Papa *et al.*,

2015), and Torsten Hägerstrand with his innovative time-geography scholarship (Keegan, 2022) all contributed seminal work to the topic. These seminal models endure to date, giving birth to continued explorations of digital network and social media influences upon urban growth that are increasingly gaining prominence in research agendas.

The intricate dynamics of human mobility, urban planning, and the growing influence of digital technologies form an essential foundation for recent advances in urban research. Across the globe, cities have become renowned for specific points of interest—landmarks, vibrant districts, or major activities—that attract people and shape tourism flows (Beiró *et al.*, 2016; Huang & Wong, 2015). The spatial distribution of these attractions typically follows historic trajectories ingrained in the urban fabric, which are often determined by commerce, sociability, or cultural symbolism. Understanding how these movement patterns evolve is crucial for fostering resilience and adaptability in urban systems. Recent studies emphasize that achieving urban resilience—cities' capacity to absorb shocks and adapt sustainably—requires multidimensional frameworks. These must synthesize personal motives and routines with collective and systemic trends (Dorostkar & Najarsadeghi, 2022a; Liao *et al.*, 2019; Y. Wang & Taylor, 2018). However, much of the literature continues to focus on exogenous factors, such as transportation systems and land use, while often overlooking endogenous drivers, including social motivations, information exchanges, and the cognitive processes affecting migration and urban behavior (Roy *et al.*, 2019; Wu *et al.*, 2014). Recognizing and modeling human mobility patterns is critical for mapping flows and understanding behaviors that significantly impact both built and social environments. The complexity of human mobility is highlighted by the interplay between natural behaviors, such as exploring versus returning, which indicates essential properties within societal contexts that can influence mobility patterns (Barbosa *et al.*, 2018; Cornacchia *et al.*, 2020). Contemporary models can monitor activity across numerous scales, ranging from personal patterns to broad collective behaviors that specify several features, such as congestion or activity in public spaces (Cui *et al.*, 2018; Porcher & Renault, 2021). A complex combination of factors determines why points in cities are popular, ranging from economic and social opportunity, cultural significance, and political functions, to climatic position and social distance perceived by people (Chan, 2020; Kwon *et al.*, 2020; Xu *et al.*, 2020). Identifying and describing these "urban magnets" is crucial to planners aiming to maximize access, functionality, and arrangement of cities. In this respect, social media transformed how citizens communicate and knowledge flows in cities.

Innovations in technologies immensely expanded the availability and granularity of urban data (Abbasi *et al.*, 2017; Jiang *et al.*, 2018). Social media platforms are currently new sources of data that enable near real-time monitoring of human mobility, activity with respect to place, and perception of urban hotspots (Dorostkar & Najarsadeghi, 2022c; Huang *et al.*, 2020; Longley & Adnan, 2015; S. Wang & Stefanone, 2013).

China's historical evolution of social media offers unique lessons for urban studies. The rollouts of Sina Weibo in 2009 and, more importantly, WeChat in 2011 marked a seminal moment of digital activism across urban China, when Chinese platforms overtook their Western counterparts and became multifunctional super-apps that combine communication, urban services, and mobile payments (Yan & Schroeder, 2019). Mobile internet penetration rate, state policy, and fast-paced urbanization were all driving forces behind such adoption and enabled WeChat and Weibo to materialize not only as major tools for everyday communication but also to drive participatory urban governance, urban mobility control, and real-time datasets for smart cities initiatives (Cao, 2024; Yu *et al.*, 2022). Inherent to this evolution of platforms is its strong correlation with the massive use of digital and physical infrastructure of contemporary Chinese cities, rendering China a world leader in utilizing social media for urban governance, civic engagement, and digital economy (Cao, 2024; Yan & Schroeder, 2019).

Among these, social media, such as Twitter—defined by their publicly accessible nature and geotagging capabilities—offer rich sources for studying urban dynamics, having themselves been used to analyze changes in activity and sentiment throughout urban space (Heine *et al.*, 2021; Miyazawa *et al.*, 2019; Terroso-Sáenz *et al.*, 2016). The impact of social media is not merely one-way or altogether positive. While allowing for high-end mapping and analysis, it might also foster novel urban challenges, such as facilitating congestion in busy districts (overtourism), spreading misinformation in crises, or reinforcing negative images of certain neighborhoods (Choe *et al.*, 2020). Moreover, social media-derived data challenge mainstream epistemologies of urban planning by presenting different, crowd-sourced, and real-time understandings of city life that either supplement or contradict mainstream knowledge production practices. For example, Najarsadeghi and Dorostkar (2022b) demonstrated how complex social media analyses might identify triangular mobility patterns of urban nightlife, better reflecting contemporary flows than previous models. The advent of ubiquitous digital data flow is radically reshaping conceptualizations of and management practices for urban phenomena, requiring

novel theoretical, analytical, and ethical models (Miyazawa *et al.*, 2019). Despite remarkable progress in cities across Europe, North America, and East Asia, there has been a clear lacuna in recent literature regarding empirical, data-driven investigations of digital mobility and urban dynamics in non-Western cities, specifically in the Middle East and Iran.

Most of these studies have not investigated how context, cultural considerations, and local digital practices affect social media–urban development relationships in cities, such as Tehran. By filling this gap, it can contribute to strengthening urban studies globally, besides promoting sound policy-making at local levels.

With these omissions in existing literature, particularly in non-Western and Middle Eastern cities, our study aims to offer fresh empirical insights into how social media data can shed light on modern mobility patterns and urban policy to date. In response, the ensuing research question and hypothesis are advanced below:

2.1. Research question and hypothesis

This study is directed by the primary inquiry: “What function does social media serve in influencing the trajectory and nature of urban development trends to meet the evolving requirements of urban inhabitants?” The principal hypothesis posits that social media platforms function as active agents rather than merely passive communication instruments; they significantly shape patterns of human mobility, spatial decision-making processes, and the emergence of modern urban dynamics.

3. Data and method

In this study, data were carefully collected from the Iranian social media platform, Nazdika, thereby facilitating precise geolocating of social activities through an online geographical mapping tool. We employed a case study methodology, focusing on Tehran's inner urban neighborhoods, serving as a relevant and local example. While it is primarily tasked with providing a detailed, contextually nuanced analysis, findings are structured to contribute to broader comparative discussions operating within the field of urban studies.

A major challenge in this study was obtaining high-quality, unaltered data that adequately reflect the prevailing dynamics of the urban area with respect to social media. Social media platforms provide necessary, practical wisdom at a city level, offering a fresh and complementary means of understanding contemporary urban conditions. Nevertheless, the derivation of these data requires proficiency in dealing with software nuances and skilled technical expertise with related analytical tools.

To examine the gathered data, a framework referred to as 10×10 analysis was utilized, which signifies a spatial grid-based approach tailored for the systematic assessment of urban activity patterns. The central urban zone of Tehran was divided into 10 principal regions, selected based on several criteria, such as historical relevance, functional significance, socio-economic attributes, population density, and cultural importance. These criteria ensure that the chosen regions collectively represent the heterogeneity of Tehran's urban landscape while highlighting areas that are the most pivotal in influencing citywide patterns and urban mobility frameworks. For each delineated region, geolocated social media data sourced from Nazdika were collected and analyzed in a cross-sectional manner, allowing for organized comparisons throughout the city. This methodology facilitated the identification of hotspots of digital activity, the evaluation of relationships between online participation and physical urban characteristics, and the analysis of trends across both micro- and macro-spatial dimensions. Within the 10×10 analytical framework, location-based social media data were scrutinized regarding the historically and functionally significant urban sites, thereby effectively mirroring the fundamental structure and dynamic activities of Tehran's urban landscape.

For analytical processing purposes, ArcGIS (Environmental System Research Institute, Inc., United States of America) was employed to extract, visualize, and perform spatial cross-section analysis of geolocated datasets. Content analytic procedures, coupled with simple statistical tools, were applied to detect activity hotspots, examine values of correlation between digital engagement and space, and interpret behavioral patterns of interest to urban planners. Special-purpose analytical software enabled a novel reassessment of these datasets, revealing complex interrelationships between digital social activity and urban form. This method detects digital activity hotspots to examine correlations between online engagement and perceptible urban features, and to investigate patterns on both macro- and micro-spatial orders of analysis. Special-purpose analytical software enabled a 1st-time assessment of these datasets, revealing complex interrelationships between digital social activity and urban form. With respect to the 10×10 analysis, location-based social media datasets were examined regarding the historically and functionally significant urban sites, essentially documenting the fundamental urban structure and activity dynamics of Tehran.

Concurrently, contemporary urban research has increasingly integrated machine learning (ML) and artificial intelligence (AI) methodologies to facilitate

extensive urban analytics. These innovations enable the automated identification of intricate spatial patterns, the predictive analysis of human movement, and provide adaptable frameworks for immediate urban management and strategic planning. This progression in urban studies aligns with emerging tendencies that indicate a substantial transformation in urban management systems attributed to advancements in AI (Ebrahimpour *et al.*, 2020; Rane *et al.*, 2024; Yigitcanlar *et al.*, 2020). While this research employed traditional spatial and qualitative techniques that are appropriate for context-specific assessments, the incorporation of AI/ML methodologies, such as deep learning, natural language processing, and cluster analysis, signifies a promising avenue for deriving deeper insights from urban social media data. The capability of ML algorithms to execute clustering and recognize patterns can significantly enhance the comprehension of urban dynamics, as demonstrated by recent investigations highlighting the considerable impact of these methods on urban resilience and sustainability (Haolei *et al.*, 2024; Pritchard *et al.*, 2016).

The incorporation of spatial grid analysis in conjunction with localized social media data signifies a methodological advancement that is rarely employed in research concerning Middle Eastern urban areas, thereby offering new perspectives to both regional and global urban analytics.

Overall, this approach provides a robust and replicable template for integrating social media analytics into urban studies. Across the geolocated correlation of online activities with the functional and spatial characteristics of urban spaces, the study reveals social media's ability to function as both a source of data and an analytical lens for understanding contemporary urban dynamics. It highlights the role of digital data in informing urban planning and management, offering insights that complement conventional approaches and enable responsive and evidence-informed decision-making in rapidly evolving urban environments.

Noteworthy is that for its primary digital source of data, this study only draws upon geolocated data from the Nazdika platform. It provides a rich, contextualized, and detailed level of analysis that has a strong specificity to Tehran's local digital environment but is seriously limited in how far findings can be transferred across other social media platforms or urban sites. Nazdika was chosen for its prevalence of adoption, availability of space-located data, and visibility among Tehran's urban population. Future research can further enhance the generalizability and robustness of the findings and inferences by leveraging diverse digital sources.

For this study, geolocated data from the Nazdika platform were systematically collected from January to September 2024, with a focus on posts specifically referencing locations within Tehran's central urban area. Data were obtained using API access, and each post was cross-validated for spatial and temporal accuracy. To ensure data quality, duplicate and irrelevant records were removed, and only posts with clear location references and sufficient metadata were included. In total, over 1,200 unique posts were analyzed. Analyses were performed using ArcGIS for spatial mapping, alongside qualitative content analysis and basic descriptive statistics, ensuring the findings are both reliable and reproducible.

4. Findings

The investigation focused on the spatial distribution and intensity of social media engagement throughout Tehran, employing a 10×10 analytical framework that systematically classified user interactions by type of activity and urban environment (Figure 1). An initial grid-based spatial analysis was performed across all 22 districts of Tehran. Based on this spatial distribution of social media activity, ten districts characterized by high centrality and significant traffic—showcasing elevated levels of digital engagement—were subsequently chosen for in-depth analysis in this research. This empirical approach highlighted that both individual and collective activities—such as work, education, leisure, and shopping—are predominantly concentrated in the city's historic and commercial center. The interplay between digital behaviors and urban geography becomes particularly pronounced in this context, as social media not only mirrors but also reinforces actual patterns of urban movement and differentiation.

At the micro level, Figure 2 showcases representative posts and mapped activities, demonstrating how user-generated content is spatially anchored and visualized within Tehran's urban landscape. This evidence underscores the operational value of digital traces for urban planning, revealing how trends and behavioral influence flow from central, high-density nodes outward into neighboring areas. User experiences and community-shared narratives on social media establish a new, dynamic basis for analyzing movement across the urban fabric. This parallels emerging approaches in Chinese urban informatics literature. Globally, as cities strive to enhance livability and efficiently address diverse needs, integrating indigenous social media data into planning offers innovative and highly adaptable solutions. As a locally grounded and methodologically advanced case, the present analysis not only enriches research on Tehran but also provides a replicable framework for comparative studies

across rapidly urbanizing contexts in Asia and beyond. Quantitative analysis demonstrated that more than 30% of the analyzed posts focused on Tehran's historic center, specifically around major attractions, such as the Grand Bazaar and City Park, while edge districts accounted for less than 10% each. For example, a typical Nazdika post demonstrated center activity thusly: "There's so much going on down in downtown Tehran today—markets are busy and public plazas are bustling." This pattern definitely reveals that digital activity, and presumably urban activity, is concentrated heavily in the central core. These types of findings suggest that the effectiveness of investments in cities and policy efforts would be enhanced if the high-population social and digital nodes are prioritized.

Notably, such a space-explicit, data-driven analysis utilizing endogenous social media indicators represents a new contribution to the urban studies of Iran, whereby previous studies have seldom counted intra-city digital trends with similar accuracy.

Subsequent spatial analysis employing the 10×10 analytical framework indicated that roughly 60% of all geolocated posts were concentrated within the ten most central urban grid cells. Engagement was particularly elevated in proximity to commercial and cultural landmarks, including the Grand Bazaar and City Park. Among all categories—work, education, leisure, and shopping—"shopping" and "leisure" exhibited the most significant central clustering (Figure 1). Peripheral and outer grid cells represented markedly lower levels of activity across all domains.

This innovative, multidimensional, grid-based framework for spatially classifying digital activities offers an enhanced degree of detail for urban analysis in Tehran, signifying a methodological advancement that has seldom been observed in previous studies on urban environments in Iran.

With a detailed analysis of social media data in the primary and dense core of Tehran, it was determined that urban planning in the central part of the city was crucial. On the other hand, social media can show the initial circle of urban planning, which represents the initial knowledge before taking action in the city, to urban planners and managers, as well as providing real-time knowledge for urban planning actions. A momentary knowledge of the city in its present state can be proposed and operationalized as a missing link in urban plans. The data collected in this study revealed that in the experimental and local sample of this article, the smaller and denser the area under study, the more social media data will be present in that area. With the increasing amount of social media data generated, that urban area is more well-suited

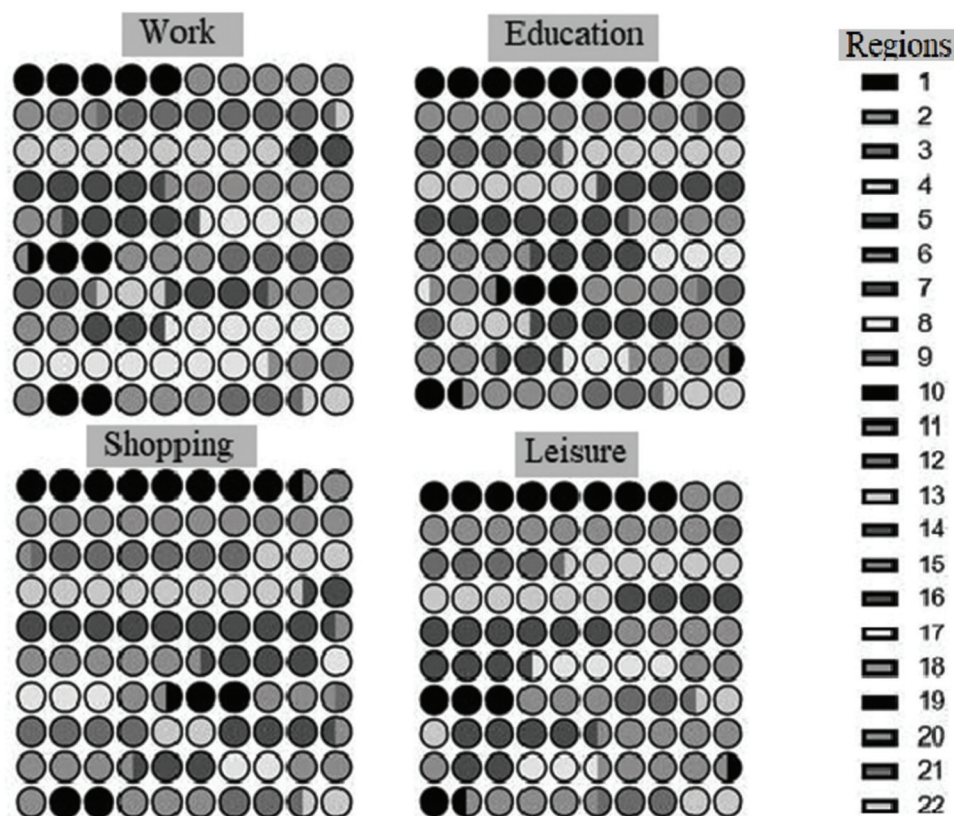


Figure 1. Within the organizational framework of Tehran, the city is divided into 22 municipal districts. A 10×10 spatial grid analysis of social media activity across four categories (work, education, leisure, and shopping) was applied to all districts. The analysis revealed a concentration of activity in the central nucleus, where the darker cells correspond mainly to ten highly active central regions. These central districts were therefore identified as the primary focus of this study.

Source: Diagram by the authors' analysis based on Nazdika's data.

for urban planning from economic, social, cultural, and environmental dimensions.

4.1. Comparative perspective with evidence from Chinese cities

A comparative analysis using international scholarly sources elevates the importance of these findings. Concurrent research centered on Chinese metropolitan areas has revealed comparable trends of spatial concentration in social media engagement. For instance, a particular study indicated that in Beijing, digital interaction and the frequency of geotagged social media contributions were consistently most pronounced in central urban locations. Similarly, another investigation demonstrated that in Shanghai, urban mobility—as indicated by location-based social media data—reached its zenith in cultural and commercial hubs, highlighting that digital traces frequently reinforce and mirror the physical centrality and appeal of these urban environments (Chen *et al.*, 2024). The alignment of results between Tehran and notable Chinese cities implies that the interconnection between social

media patterns and urban centers constitutes an emerging urban phenomenon that crosses regional and cultural divides (Caprotti & Cowley, 2019; Kennedy *et al.*, 2015). Integrating this comparative viewpoint not only bolsters the global significance and applicability of the present study but also establishes a groundwork for expansive transnational urban network research. Furthermore, the integration of this comparative viewpoint also advocates for the incorporation of digital analytics in forthcoming urban planning endeavors (Chen *et al.*, 2024; Langemeyer *et al.*, 2018).

This study was primarily qualitative in nature, focusing on spatial cross-sectional analysis, mapping, and interpretive content evaluation of geolocated social media data. Although some basic statistics on post frequencies by region were calculated, more advanced numerical or statistical tests (such as regression analysis or predictive models) were not incorporated, largely due to the exploratory objectives and data limitations. Future research with access to larger and more granular datasets could

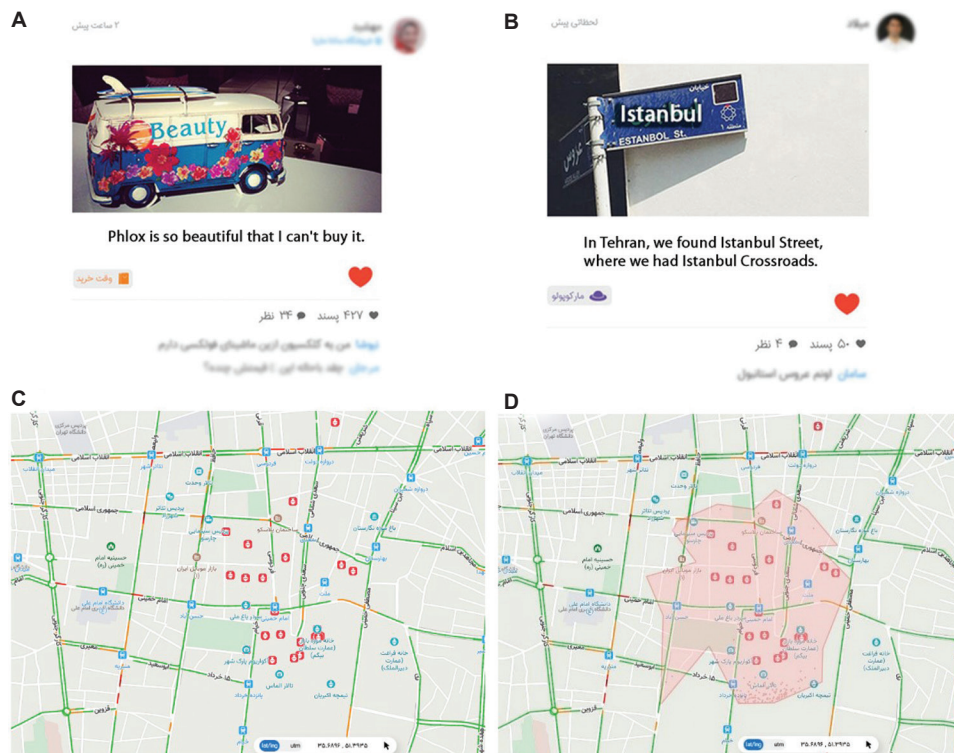


Figure 2. Nazdika's social media data and its implementation on location. (A) User-generated post on Nazdika related to leisure activity. (B) User-generated post on Nazdika related to shopping activity. (C) Example of the geographical locations of activities captured on Nazdika. (D) Example of the geographical range of activities captured on Nazdika. (This figure shows two sample posts from the Nazdika social media platform, geolocated and displayed on a city map using analytical tools developed for this study.) The example demonstrates how spatial information from user-generated content is integrated and spatially analyzed to reveal patterns of urban activity.

Source: Screenshots and maps from the authors' analysis based on Nazdika's data.

employ such quantitative techniques to further validate and expand on these findings.

5. Discussion

An extensive analysis comparing findings from major Chinese cities provides a significant international context to this research. Urban studies of China in recent times, particularly in Beijing and Shanghai, have uniformly shown that historic and economic centers are focal points for social media usage and digital engagement. Such studies illuminate how dominant spatial hierarchies are maintained and further reinforced in cyber realms—implied by concentrations of geotagged updates and digitally brokered interactions in urban centers. These patterns reflect the perpetual importance of tangible urban nodes to both daily mobility and cyberspace. Data from Tehran shows a remarkably similar tendency: Digital activity and urban engagement are largely concentrated in the city center core. This parallel finding from Chinese and Iranian urban realms suggests a more universal rule that heavily trafficked, historically or commercially significant regions are focal digital points for urban experiences throughout the world.

The major contribution of this study is the application of an innovative 10×10 spatial grid technique to the localized social media data of Tehran, yielding novel empirical findings on interplays between digital and physical environments in a non-Western megacity setting. The technique expands the horizon of urban analytics, breaking out of regular parameters, and fills a major lacuna in comparative urban studies.

Importantly, the case of Tehran contributes to the diversity of the global discourse on urban analytics. While cities in China have led the way in social media-based urban studies, the unique digital environment and socio-cultural characteristics of Tehran enhance the international significance of these research outcomes. Utilizing evidence from both comparative and localized frameworks, this investigation substantiates the function of social media as both a reflection of and an influence on urban spatial configurations, population movement, and the interpretation of urban life. By highlighting the policy and planning implications of indigenous social media analytics, this study illustrates that locally generated digital datasets can facilitate adaptive, evidence-driven

urban governance, particularly in municipalities across the Global South. The findings bolster the assertion that digital footprints now act as practical and dependable indicators for urban administrators and policymakers. The incorporation of insights and methodologies from both Chinese and Iranian urban scholarship will allow cities to progress toward genuinely data-informed and globally aware urban management.

According to the outcomes of the 10 × 10 analysis, regions 1 and 19 exhibit the highest inclination to engage with their urban surroundings and are recognized as hubs for social media interaction. Subsequently, the central districts of the city, serving as the core of Iran's capital, maintain a close association with social media activity. Across examinations conducted at the preferred location in Tehran, Iran, as an empirical case, it was established that a significant correlation exists between social media utilization and urban planning in relation to behavioral patterns and human mobility. The present investigation, concentrating on a laboratory sample within the city of Tehran and its central core, aimed to elucidate the connection between social media and urban planning as influenced by human mobility. Consequently, this study holds international relevance and applies to trans-territorial investigations, providing insights that may be of interest to scholars in other nations exhibiting similar conditions.

In terms of its contribution to global knowledge and the academic literature, the present research can be perceived as a shift in perspective concerning urban environments, transitioning from a tangible viewpoint to a digital one, wherein social media is regarded as a vital tool for urban intelligence in cities worldwide. This paradigm shift from physical to digital enables the justification of employing sophisticated instruments to better comprehend the prevailing urban circumstances and lays the groundwork for future global studies. This research aims to address the existing deficiencies in various cities globally, concerning the utility of social media insights in urban decision-making and planning, thereby serving as levers for the formulation of urban policy, while also functioning as a case study on real human movements within the city. In contrast to earlier investigations, particularly those centering on Chinese urban environments, this study not only reaffirms the pronounced influence of social media on urban spaces and human mobility but also broadens the scope of these findings by offering evidence derived from an alternative socio-cultural and geographical framework. Studies from China have shown that several platforms, such as WeChat and Weibo, are utilized for population movement analysis, community involvement in participative planning, and

urban dynamics prediction. Most of these studies either focus on technical analyses or are limited by the unique features of Chinese megacities.

This research aims to bridge a huge gap by exploring how human activity and social media activity in Tehran reflect, deviate from, or complement patterns realized in major Chinese urban areas. By situating its findings in light of prevailing literature, this study demonstrates the broader applicability and validity of social media analytics across regions of urban planning, while simultaneously highlighting local contextual importance in mediating these digital-physical interactions. In this regard, such a comparative angle promotes a better understanding globally and provides a basis for future cross-cultural studies of urban intelligence. Furthermore, this study's findings indicate that the urban center of gravity represents the most prominent and attractive locations for garnering attention on social media and hence acts as a nucleus of growth. On the other hand, the findings reverberate from virtual to real-life locations.

Digital (virtual)–physical (actual) space interactions in modern cities have become increasingly seen as multidimensional and two-way in nature. Online mobilizations and interactions essentially relate to perception, usage, and even transformation of urban space that is authentic from a physical standpoint, while changes to the physical urban landscape are immediately reflected and reassessed digitally. Such a continuous two-way feedback loop between real-world and cyberspaces is transformative in mediating economic, social, and cultural dynamics of modern cities while making urban planning more interactive and data-driven than before. The lack of sufficient attention to the existing city's situation as a lever for city planning hinders urban planning. Given the close relationship between social media and urban planning in shaping citizens' perception and behaviors, it is possible to advance urban development from various aspects and effectively communicate these insights to urban managers and policymakers. This action is an effective way to enhance the welfare of citizens and compromise with the city and urban sustainability.

The comparative examination with Chinese urban areas contributes significant international context and enhances the applicability of the findings; however, it is recognized that additional investigations employing analogous quantitative datasets from diverse contexts would serve to further substantiate and elaborate on these outcomes. Subsequent cross-national research endeavors ought to focus on the collection and analysis of equivalent quantitative social media and mobility data to enhance global generalizations.

6. Conclusion

This research provides substantial empirical support indicating that the incorporation of localized social media analytics into urban studies not only elucidates spatial dynamics of both digital and physical activities but also reveals less-examined mechanisms that influence mobility and development in modern urban environments. By focusing on Tehran as a pivotal case study, the results both validate and broaden global theories regarding the relationship between digital technology and urban settings. The significance for policy formulation and planning is evident in the demonstrated utility of social media data as a flexible decision-support tool, which facilitates more adaptive, responsive, and contextually aware urban governance. Although there are still methodological constraints, this study establishes a novel benchmark for future investigations, particularly those involving multi-platform, cross-national, and policy-focused analyses aimed at bridging the enduring divide between data innovation and routine urban management.

Overall, this study makes a contribution to urban informatics by showing that socially contextualized social media analytics can constitute a useful and trusted basis for urban theory, policy-making, and comparative studies across different countries of the contemporary digital age. A major limitation of this study lies in its reliance on a single local network and its qualitative focus. Future studies should combine datasets involving several platforms, different cities, and longitudinal analyses to validate and refine these findings.

The results of this study highlight the potential for urban planners and municipal administrators to significantly improve their decision-making processes through the systematic analysis of digital traces derived from social media platforms. This type of data provides a dynamic and present perspective on public requirements, mobility patterns, and novel urban issues, thereby enabling the formulation and implementation of interventions that are more timely, adaptive, and accurately representative of citizen behavior and sentiments.

6.1. Practical recommendations

From the findings of this research, a number of practical recommendations are proposed for the effective utilization of social media data by urban planners and local authority administrators. The recommendations serve the purposes of strengthening evidence-based decision support, reinforcing citizen involvement, as well as reinforcing the responsiveness of urban strategies in the face of rapidly evolving metropolitan contexts.

(i) Geolocated social media data should be regularly

integrated by urban planners and municipal managers into their decision-making procedures to obtain real-time information about public opinion, mobility currents, and rising urban demands.

- (ii) Local governments are encouraged to develop digital participation platforms and actively engage with citizen-generated content to strengthen bottom-up, evidence-based policy-making.
- (iii) Combining social media analytics with present urban planning tools (e.g., geographic information systems, transit models) can enhance the responsiveness and adaptability of interventions, especially in fast-paced, changing metropolitan areas.

The recommendations made underscore the potential of social media data to serve as a powerful asset for adaptive and evidence-informed urban governance while highlighting the importance of merging digital and conventional modes of participation to attain sustainable urbanization. When put in action, such strategies can bring together digital and conventional modes of planning to yield adaptable, equitable, and sustainable urban interventions.

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Conflict of interest

The authors declare that they have no competing interests.

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Writing – review & editing: Mahsa Najarsadeghi, Hamid Majedi, Zahra Sadat Saeideh Zarabadi

Ethics approval and consent to participate

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Consent for publication

Not applicable.

Availability of data

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