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The urban-tech feedback loop: A surveillance and development data-walk in South Lake Union

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ABSTRACT

In this research article, we employed an autoethnographic data-walk methodology to explore the complex relationship between urban spaces and digital data collection, using the South Lake Union neighborhood as a case study. We examined how major technology companies like Amazon, Microsoft, and various property developers leverage the dual forces of urbanization and data gathering to shape urban environments in ways that serve their interests. Our key contribution lies in uncovering the power dynamics at play, where tech companies exert significant influence over urban planning and governance, reshaping cities into spaces designed for surveillance and commodification. In areas like South Lake Union, the redevelopment into numerous small storefronts enables the granular tracking of consumer behavior, turning everyday activities into data that fuels targeted advertising and capital accumulation. We identify two central insights. First, data-walks offer a way to "story" the influence of tech corporations on urban spaces from the perspective of everyday experiences. While digital data collection is integral to capital accumulation, the process is uneven and must be viewed from various angles—including from the perspective of everyday life—to fully understand the emerging inequalities. Second, we argue that the transformation of urban environments under tech capitalism exacerbates existing social and spatial inequalities while generating new ones. The commodified surveillance of daily activities and consumption not only drives data accumulation but also reshapes the physical and social fabric of the city. This work serves as an initial step in challenging these unequal processes of surveillance-driven urban development.

1. Introduction

Cities are undergoing significant technological transformations, with scholars continuing to debate and define the future of urban spaces—whether through smart cities, digitally connected cities, or platform urbanism. These new configurations are reshaping how data is collected, circulated, valued, and utilized. Increasingly, urban (re)development involves the integration of interconnected sensors into the built environment or in our devices, monitoring both people and the physical world. Further, platform services are extending their reach into urban spaces, from ride-share waiting areas (Attoh et al., 2019; Stehlin et al., 2020) to short-term apartment rentals that diminish available housing stock (Ferreri & Sanyal, 2018; Wachsmuth & Weisler, 2018). Recent scholarship has focused on how urban platforms are reshaping the interplay between data, infrastructure, and everyday life (Barns, 2020; Richardson, 2020a; Rodgers & Moore, 2020).

At the core of these urban platforms are smartphone users and the tech firms they are connected to. Barns (2020) observes that cities are increasingly mediated by smartphone applications and the data they generate, with tech firms constructing platforms to capture and commodify this data. The concept of "platform urbanism" reflects the growing influence of digital platforms in shaping the design, experience, and governance of urban spaces (Barns, 2020, p. 19). These platforms are now central to both the production of urban environments and the global economy. Seven of the world's ten largest firms by market capitalization are technology companies engaged in the platform economy or developing technologies that drive it—Apple, Microsoft, Meta (hereafter Facebook), Alphabet (hereafter Google), Amazon, NVIDIA, and TSMC.[1] Notably, five of these companies are concentrated on the US West Coast in the San Francisco Bay Area and greater Seattle (Kenney & Zysman, 2020).

How do mundane activities get traced, and how are the resulting

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[1] Alibaba and Tencent also often appear in the top ten firms my market capitalization but did not in the last revision of this paper.

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data used? How do these data feed into the production and capture of value? How are cities reconfigured by platform capitalism to the benefit of large tech firms? Scholars often study urban platforms as intermediaries in multi-sided markets (Zuboff, 2019, p. 93) related to companies and urban spatial agglomerations (Barns, 2020; Langley & Leyshon, 2017; Richardson, 2020b; Richardson, 2020c). Most analyses focus on processes of capitalization in platforms, focusing predominantly on the valuation of data (Sadowski, 2019) or of the platform company (Kenney & Zysman, 2020; Langley & Leyshon, 2017). For McMillan Cottom, platform urbanism is an extension of already existing logics of racial capitalism, moving past the novelty of the digital to reveal the underlying processes of predatory inclusion and digital obfuscation (McMillan Cottom, 2020).

Critiques of platform capitalism and its exploitative systems are well-supported. Our aim is to expand the study of the mechanisms and processes of data collection (primarily via smartphones), aggregation (in corporate-managed databases), valuation (through advertising and other channels), and usage (for creating user profiles, segmentation, and further data agglomeration) by incorporating a more human-centered, narrative-driven approach. We take a critical look at how everyday actions and spaces, often overlooked, play a crucial role in the operation of tech firms and their reshaping of urban environments (Barns, 2020; Leszczynski, 2020). Using a data-walk (see Powell, 2018a, 2018b)—an autoethnographic approach centered on technology—we illuminate the power dynamics between tech companies and the built environment, and how the surveillance of daily activities ultimately re/produces social and spatial inequalities. Drawing on O'Niell's (2022) observation that walking has long been used as a method of urban intervention and resistance, we connect our approach to a broader tradition of walking methodologies aimed at identifying and demystifying networked technologies and communications infrastructures in urban space. As O'Niell notes, the process of walking produces knowledge that can be used to re-assert agency within the mediated city, allowing for critical engagement with tech firms.

This paper seeks to expose the symbiotic relationship between cities and data, emphasizing how urban spaces both shape and are shaped by digital data collection practices. Through the data-walk, we aim to achieve four key objectives. First, we trace the ways in which data is surveilled and captured through everyday activities in urban environments. Second, given the opacity with which large technology firms protect their platforms and processes, we draw on industry literature to theorize how this captured data is utilized within these platforms. Third, we explore how urban redevelopment projects facilitate the processes of data capture and use, aligning urban transformation with the expansion of platform economies. Finally, we demonstrate how these processes create a feedback loop between urban consumption and the digital economies that rely on this data.

Seattle's South Lake Union (SLU), redeveloped largely to serve the interests of technology capital, serves as our case study to interrogate the growing influence of tech giants like Amazon, Facebook, and Google in urban governance (Barns, 2020; Barns et al., 2017; McNeill, 2016). Drawing on the literature concerning the political economy of urban development and the commodification of data, we argue that tech firms extract value from urban spaces through surveillance capitalism and algorithmic consumer segmentation (Zuboff, 2019). We critically examine how emerging forms of urban development, under platform capitalism, might be reimagined or resisted to better accommodate the diverse needs and desires of the multiplicity of subjectivities and bodies that inhabit digitally mediated urban spaces.

2. Data, the urban, and walking-as-method

2.1. Data and platform urbanism

In this context, we distinguish between platform urbanism, platforms, and technology capital firms. A platform refers to a technological product or service, such as Instagram, while a tech firm is the entity that owns and operates the platform, like Meta, the parent company of Facebook, Instagram, and WhatsApp. Following the work of Srnicek (2017) and Barns (2020), platform urbanism is defined as the central role of data and platforms in the economy, particularly in their dependence on urban spaces. Our analysis concentrates on two key insights drawn from the platform urbanism literature.

The first key observation is the growing significance of data production and valuation in the platform economy, where data flows are critical to capital accumulation. Data traces, trails, and metadata are employed to categorize consumers and deliver targeted advertisements, thus embedding consumption into everyday life (Edelman, 2021; John et al., 2018). This datafication for profit trend relies on enriching users' location-based activities with additional data to increase their market value. As van Dijck (2014, p. 199) notes,

> "… the digital transformation of sociality spawned an industry that builds its prowess on the value of data and metadata—automated logs showing who communicated with whom, from which location, and for how long. Metadata—not too long ago considered worthless byproducts of platform-mediated services—have gradually been turned into treasured resources that can ostensibly be mined, enriched, and repurposed into precious products."

This generalized trust in corporate control over vast amounts of personal data raises significant ethical and political questions (Pasquale, 2016), as concerns around privacy, transparency, and responsibility are often sidelined in the pursuit of profit (Zuboff, 2019).

The second key observation positions the city as a crucial digital frontier. Urban spaces are not just the backdrop where datafication and extraction occur but are essential for both gathering data and extracting its value. Location data, along with social interactions and consumption patterns, is either inferred or supplemented by additional sources, providing invaluable information for marketers to craft targeted advertisements. Thus, the digital frontier is inherently urban, rooted in the social relations of consumption.

The central role of the city in facilitating social interaction and consumption data suggests that urban spaces may be deliberately engineered to enhance opportunities for data collection, surveillance, and commodification. Specific forms of urban (re)development, driven by platform companies and tech capital, are increasingly shaped with these goals in mind.

> "But what would happen if a whole city became dependent on the phone? Not simply a city's population, which may indeed own more mobile phones than cars. What if the kind of interfaces we use to navigate our phones—the apps that we interact with to go about our daily lives—became more and more interwoven with the services we make use of as we go about our lives? *What's more, what if the companies that make those apps were to become not just digital companies, but serious players in the building of cities, and in the management of infrastructure*? Of course, this isn't just a speculative question…" (Barns, 2020, pp. 76–77 emphasis added).

Drawing on Marx and Engels' observation that capitalism reshapes the world "after its own image" (Marx & Engels, 2006, p. 12), we observe how the speculative demand for data and the expansion of platform urbanism transform urban spaces for the benefit of technology capital. As Barns notes, the re-engineering of cities into platform ecosystems attracts speculative capital, seeking to scale platforms and enhance their data-generating capacities (2020, p. 100; see also Levenda & Tretter, 2020). This is especially evident in tech hubs like San Francisco and Seattle, where large firms now wield considerable influence over urban governance (Harris, 2019; León & Rosen, 2020; McNeill, 2016). The centrality of profit-driven platform services in daily urban life, such as transportation and labor, raises concerns about their impact, especially as digital expansion targets marginalized users through predatory inclusion (McMillan Cottom, 2020).

For instance, micro-mobility firms like Uber are not solely focused on transportation; one important of their primary labor lies in the production of mobility data to be used in training datasets for machine-learning or toward the eventual automation of transport labor (Attoh et al., 2019). These firms frequently refuse to share data with the cities they operate in (Monahan, 2020), reinforcing inequalities in mobility and labor access (Jin et al., 2019; León & Rosen, 2020). As Stehlin and Hodson describe, the "data capital bloc" prioritizes data, platform engagement, and network effects over cooperation with local governments or service provision (Stehlin et al., 2020, p. 7). Understanding data flows and value extraction on platforms is essential to grasp how technology capital both shapes and is shaped by urban space.

At the most basic level, the city offers a dual opportunity for tech firms: to gather surveilled consumption data and to advertise to users based on this newly processed information. While differentiated tastes are essential for targeted advertising, Harvey (2000) points out that differentiated consumption becomes the primary means of expressing and distinguishing lifestyle. As Lowe et al. (1995) succinctly puts it, "lifestyle is [reduced to] the social relations of consumption in late capitalism" (p. 67). Once consumers display lifestyle and consumption preferences, capitalists exploit this by "locking workers into certain conceptions of lifestyle, consumer habits, and desire," thereby making it easier to secure compliance within labor processes while simultaneously capturing distinct market niches (Harvey, 2000, pp. 112–113). The use of both volunteered and surveilled data for market segmentation reflects the production of various ideal consumer types, targeted for advertisements based on the data collected about them. Historically, geodemographics focused primarily on residential factors—such as income, household size, and purchasing habits—to segment consumers. These segments were used to target groups with similar tastes. However, with the ubiquity of smart devices, a near-instantaneous exchange of data between consumer and producer is now possible, mediated through data brokers or advertising platforms (Berman, 2011).

2.2. Converging logics of data colonialism and the platform urbanism

The places people visit for shopping, dining, recreation, or work help build a detailed profile of consumer preferences. Urban space usage becomes data for marketing segmentation, facilitated by smartphone apps, operating systems, and websites. Despite rising awareness of data commodification, the distinction between surveilled and volunteered data has become nearly irrelevant due to the power imbalance between app users and the tech firms that exploit this arrangement (Thatcher, 2017). Location data from smartphones now plays a crucial role in shaping consumer preferences. Demographic information has traditionally been used to predict future behavior, but with the rise of location-based data, there is a clear "shift away from demographics to individualized targeting" (Tufekci, 2014). This form of targeting relies on data gathered from the activity of individual users, many of which are peripheral to the platform in use and not directly tied to market transactions.

For example, Instagram collects location data even though it is not essential for image sharing. Tech firms enrich this data by cross-referencing it with other sources, such as associated accounts (Instagram, WhatsApp, Facebook), private data aggregators (e.g., home/work locations, income, marital status), and public profiles (Atrakchi-Israel & Nahmias, 2022; Becker et al., 2017). Using advanced algorithms, they predict unknown characteristics like gender or political affiliation. Firms can then offer specific targeted ads based on individual actions such as "visited Trophy Cupcakes" or more complex combinations like "purchased a cupcake and is active on Instagram."

The feedback loop between consumption and urban form is driven by data flows reinforcing the preferences and behaviors of "ideal" users—typically higher-income, often male (Mahmoudi, 2017; Perry, 2020; Rangarajan, 2018; Reskin & Roos, 1990). As consumers respond to targeted ads, they validate the advertising campaigns. This process is similar to how urban theorists describe the homogenization of urban spaces through gentrification (Cowen, 2006). Location data, whether surveilled or volunteered, becomes valuable when linked to consumption patterns, allowing advertisers to move beyond demographics to predict behaviors based on actual actions. This enhances the importance of collecting and analyzing consumptive behavior data, emphasizing both online and in-store activities.

Tech firms capture surveilled and volunteered consumer data and use it to rent out their platforms to advertisers, such as Google and Facebook, or for internal advertising purposes, like Amazon. When companies like Vulcan Development, Amazon, and Microsoft wield significant influence over urban development—as seen in Seattle—they benefit from expanding consumer choices. This is where the interests of tech platforms and urban mixed-use development align. New consumption sites generate valuable data on consumer preferences. Storefronts—grocery stores, cultural venues, boutiques, and restaurants—serve as key spaces for urban consumption. Contrary to popular belief, offering more choices often lowers the cost of goods and services for urban consumers, even before factoring in savings from reduced travel costs in denser areas (Cortright & Mahmoudi, 2016; Couture & Handbury, 2015; Handbury & Weinstein, 2011; Hottman, 2014).

Storefronts are crucial to location data, shaping how urban spaces are valued and designed. Expanding storefronts and favoring small boutiques over big-box retailers allows for more granular data on consumer preferences. A visit to a big-box store creates one data point, while shopping at multiple specialized stores—such as a vegan cupcake shop and a farmers market—provides richer data on consumer tastes. This enables fine-tuned, individualized ad targeting. Again, the commodities in these storefronts often align with the preferences of affluent consumers, mirroring gentrification patterns linked to tech-driven urban redevelopment (McElroy, 2019; Walker, 2018). As such, storefronts in vertical mixed-use developments serve as tests for individualized preferences, but the data they generate generalizes wealthy consumption practices to broader populations.

Following the Great Recession, tech firms built lavish campus headquarters to keep employees productive. Google, Apple, Facebook, and Microsoft campuses feature amenities like dining, gyms, and laundry facilities. Facebook's campus famously resembles a Disney-themed Main Street with restaurants, shops, and services. In contrast, Amazon has integrated its headquarters into the city with the help of Vulcan Development, with South Lake Union becoming both a workspace and urban campus. Here, boutique businesses provide the same convenience as suburban corporate campuses. Vertical mixed-use developments allow employees to live and work in the same area, contributing to data generation on consumer preferences, particularly among tech workers from Amazon, Google, and other nearby firms.

2.3. Speculative data traces

The exact methods tech firms use to surveil and extract data are often opaque, though there is growing literature on their extractive practices. This section examines tech firms' motives for data collection and speculates on the types of data they gather. Alphabet's subsidiary Google is one of the most pervasive firms. Initially a search company, Google has built an entire ecosystem of hardware and software to monetize freely provided user information, such as search terms and clicks. With a 75 % global market share in phone operating systems and 25 % global market share in email services, Google has extensive access to users' daily lives, capturing both mobile activity and email identity.

Even without using a Google browser, browsing the internet—on mobile or desktop—generates a vast amount of data. Security researchers have shown how users are fingerprinted and tracked across sites, sometimes even sharing profiles or other data without user consent, even on seemingly safe sites (Manjoo & Bremer, 2019). Google's ecosystem can collect location data from various devices without

explicit permission (Nakashima, 2021), alongside behavioral data on app usage, purchases, and ad interactions. Additionally, Google surveils users through its hardware, such as watches, alarms, cameras, and doorbells, which integrate with the built environment. The data Google collects about user activity is automatically grouped together to produce a stories about user behavior. Figure 1 demonstrates one such narrative summary from Google's location history based on a the data-walk in South Lake Union discussed in section 3.

Facebook's acquisitions of WhatsApp and Instagram were aimed at eliminating competition and consolidating its hold on social media. This integration allowed Facebook to create unified advertising profiles for users across platforms (Isaac, 2019). For example, photos taken with a device camera often store location metadata, and even with this feature disabled, the Instagram app still tracks the photo's location and shares it with Facebook (Burgess, 2020). Researchers found that Facebook and Instagram share more user data than many other apps, including purchase history, location, contacts, search and browsing data, and even financial information (Cuthbertson, 2021).

As a vast tech conglomerate, Amazon collects customer data through a variety of brands and products, from Kindle and Alexa to its stake in self-driving car companies and subsidiaries like Audible, IMDb, and Twitch. This extends to its retail empire, which now includes Amazon Fresh and Whole Foods grocery delivery. While Amazon may not always collect real-time location data, it tracks purchasing behavior through activities such as its credit card transactions. Amazon's strategy is to offer a wide range of choices and then analyze customer selections to refine its offerings. As with Google, Amazon's devices—Alexa assistants, cameras, and doorbells—also collect data, integrating seamlessly into the built environment and delivery network.

Location data collected from a unique device, typically associated with an individual, is continuously monitored by various companies. T-Mobile, for example, tracks device location through mobile antennas and sells this data to aggregators, though the accuracy is inconsistent. Replica, a firm using cell carrier data from Google's Sidewalk Labs, generates movement models and sells them to governments and non-profits (Kaye, 2020). Other companies develop software embedded in mobile apps that tracks users for both commercial and government purposes (Tau, 2020). These apps, often provided for free, collect vast amounts of location data, which is then sold to aggregators. Users frequently ignore notifications about such data collection, even when apps are tracking them in the background. Companies like SafeGraph use this data to produce real-time foot traffic insights at locations like storefronts or points of interest (SafeGraph, 2020). The value lies not in the raw data, but in aggregating it with other users' data or cross-referencing it with other platforms like Facebook, Gmail, or Amazon to track individuals comprehensively. A seemingly innocuous app like Tank Wars could contain one of these tracking packages, a common feature of apps on Google and Apple platforms.

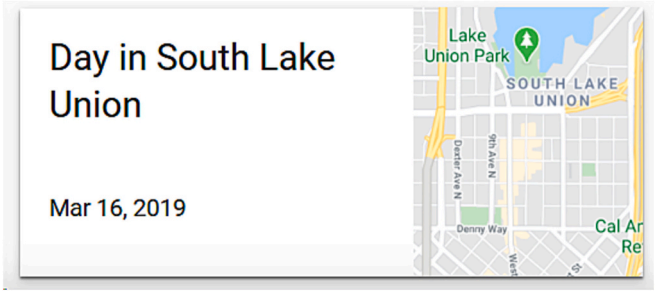

Fig. 1. One small example from Google of the many forms of behavioral surplus that may be generated from the Google and Android data-walk narrative.

3. Context and method in the city of data

3.1. Seattle's South Lake union

We perform the data-walk in Seattle's South Lake Union (SLU) district because of the outsized role that tech firms have had in shaping the city, providing a potential prototype for future tech-firm development. Further, there has been a remarkable amount of change in South Lake Union since 2000. There have been two significant rezoning initiatives, which involved changes to land-use regulations that determine how different areas of the neighborhood can be developed or used. These efforts have reshaped the area's layout, removing much of the industrial legacy of the area and allowing for dense residential and commercial. The rezoning was met with an influx of investment from tech firms and investment firms associated with Amazon and Microsoft (Balk, 2016; Dunham, 2018). In many ways, this new SLU (Fig. 2) exemplifies the type of urban development described in the creative class literature (Markusen, 2006) or an aestheticized land use intensification (Scott, 2011). The intersections of the creative class and land use intersect as "the corporate spaces of the central city are increasingly integrated with more consumer-oriented facilities such as gallerias, shopping malls, music centers, museums, art galleries, conference facilities, sports stadia, and so on. These amenities are principally at the service of the upper fraction of the labor force, and, by making the central business district yet more enticing to this fraction, they add their weight to the glamour of the city and further encourage gentrification of adjacent residential neighborhoods" (Scott, 2011, p. 309).

The increased presence and heavy-handed role of technology capital in shaping redevelopment has also been a growing trend in cities along the west coast of the US (León & Rosen, 2020; McElroy, 2019, 2020; Walker, 2018). SLU has been primarily redeveloped by the real estate division of Vulcan, the investment and philanthropic organization of Microsoft co-founder Paul Allen. Vulcan has primarily focused on redeveloping office spaces, with much of this development being sold to Amazon (Martinez & Pryne, 2012). Between 2000 and 2020, Vulcan has redeveloped most of its 60-acre portfolio (43 acres) into 8.1 million SF developed with 2029 residential units (or about 16 % of all housing units in SLU, see Table 1) (2020; Vulcan Real Estate, 2018, 2020). Vulcan plays a direct role in purchasing and developing property in SLU, advocating for the streetcar project, negotiating with the City on height limits and FARs, affordable housing provisions, and even advancing Paul Allen's vision of "thoughtful development" (Harris, 2019). Vulcan and Amazon's presence facilitated infrastructural changes. For example, the

Table 1
Changes from the American Community Survey in the roughly 9-year period of Census Tract 72 and 73, comprising 1.9 km^2 (0.73 $mile^2$). Storefront data from 2005 and 2019. Median Household Income is household weighted across the two tracts and normalized to 2018 US Dollars.

	South Lake Union		Seattle	
	ACS 2005–2009	ACS 2014–2018	ACS 2005–2009	ACS 2014–2018
Population	7916	17,805	594,005	708,823
% Non-Hispanic White	66.1 %	55.5 %	68.6 %	64.5 %
% Non-Hispanic Asian	10.5 %	23.2 %	13.2 %	15.2 %
% Non-Hispanic Black	10.0 %	6.3 %	7.5 %	6.8 %
% Hispanic / Latinx	8.9 %	7.3 %	5.9 %	6.6 %
Med. Household Inc. (2018 USD)	$ 39,704	$ 106,721	$ 58,990	$ 85,562
Housing Units	5730	12,396	277,014	323,446
% Rental	83.3 %	80.1 %	50.40 %	53.90 %
Storefronts*	244	336		

municipal utility, Seattle City Light, spent more than $350 million to provide a new substation and to underground distribution networks for SLU and the adjacent Denny Triangle (Beekman, 2019). These developments then further spur the increase in value of Vulcan's real estate holdings, as well as Amazon's properties.

While the main focus of this paper is not the gentrification and displacement in SLU, we sought to understand the magnitude of change using data from the American Community Survey (ACS) 5-year sample from 2009 and 2018 (the most recent available) and two Census Tracts that comprise roughly the 2 km^2 (less than 0.75 $mile^2$) of South Lake Union (US Census Bureau, 2010, 2019). We embark on this exercise to show how the built environment of SLU changed in terms of housing units and storefronts because storefronts, as we show, play crucial roles in contributing to new interactions which provide new sources of data for tech conglomerates. During this period, the number of housing units more than doubled while remaining a rental-dominant area compared to the city as a whole. Using a historical business listing from 2005 and 2019 (Infogroup, 2020) and a method for identifying storefronts in "categories of businesses that primarily serve the day-to-day needs of individuals and households" (Cortright & Mahmoudi, 2016, p. 4), we measured an increase of 92 new storefronts in the 2 km^2 area, drastically increasing the number of choices consumers have. Using data on Amazon office locations (Amazon.com, 2020; Rosenberg, 2019), we show office locations alongside the storefronts in Fig. 3 to demonstrate the concentrations of storefronts near or on the same block as Amazon buildings.

The transformation of the urban environment has been accompanied by significant demographic changes. Table 1 summarizes these shifts, with perhaps the most striking being the near tripling of median household income, while the population more than doubled. Given the lagged nature of the 5-year ACS data, these changes are likely even more pronounced at the time of publication. Remarkably, in less than a decade, the neighborhood moved from having a median household income $20,000 below Seattle's city average to being $20,000 above it—an increase of nearly $70,000. Before Amazon's development, the area had above-average concentrations of Hispanic/Latinx and Black residents, which fell below the city average afterward. Additionally, the growth in housing units during this period accounted for 15 % of all new housing in an area that comprises less than 1 % of Seattle's total land area.

This rapid urban development has generated increased tension between Amazon and Seattle's lower-income residents, as evidenced by recent protests and activism. As neighborhoods like SLU have been developed, issues such as rising poverty, houselessness, gentrification, and displacement have taken center stage. City council member Kshama Sawant has become a prominent advocate for the "Amazon Tax," which seeks to fund COVID-19 relief, social housing, and a localized Green New Deal (Sawant, 2020). Sawant's activism underscores the visible inequalities in Seattle, particularly in areas like SLU, where Amazon's capital investments—marked by new office buildings and public art displays—serve as stark reminders of the widening economic divide.

As Sawant puts it, "a handful of corporations and billionaires have almost complete control over political outcomes in the city" (McCartney, 2019). Her critique highlights the growing influence of corporate power wielded by tech companies in shaping urban development, making clear the stakes for Seattle's lower-income communities in the face of unchecked capital investment.

3.2. Methods: Data-walking as (digital) method

Within this context, we explore South Lake Union (SLU) using the method of a data-walk, inspired by Powell's (2018a, 2018b) "data walkshop" approach. Similar to Powell's use of photography, note-taking, and mapping, our approach engages with a processual method of observing and reflecting on how data shapes urban spaces. This method emphasizes the ongoing, dynamic nature of the research process (Powell, 2018a, 2018b; Jarke, 2019, 2021; see also von Benzon et al., 2021; Leszczynski & Kong, 2023). Rather than focusing solely on how presences are implicated in urban datafication, as is common in many data-walks (c.f. Hunter, 2016), our approach centers on understanding the pervasive extraction of data embedded in everyday actions. By doing so, the data-walk highlights the flows between everyday life, urban form, and the tech firms that mediate these interactions through digital platforms.

The data-walk method, and walking as a broader methodology, offer powerful tools for visiting, observing, and reflecting on both the digital and physical aspects of urban spaces. Jarke (2019, p. 5) underscores that "what makes such walks an interesting and important tool for engaging (critically) with data is their embeddedness in everyday urban life." Powell (2018a) similarly emphasizes the utility of "data-walks" in revealing the often-invisible infrastructures and processes that shape cities. This draws inspiration from Greenfield and Kim's (2010) "networked walkshop," which explores spaces where information is collected, displayed, and acted upon. In a related sense, van Es and de Lange (2020, p. 279) note that "datawalks combine purposive physical walks through the (urban) landscape with being specifically attuned to observe and reflect on the variety of processes and infrastructures of datafication as situated in time and space." Thus, the data-walk is part of a broader tradition of walking-based methodologies.

Walking-based methods are also used to critically engage with urban transformation and digital infrastructure. Silver et al. (2020) employ walking-tours to examine possibilities for addressing capitalist urbanization. O'Neill (2022) highlights the utility of walking to trace elements of physical internet infrastructure and the corporate structures that underpin them. O'Neill further argues that walking enables critical reflection on the relationship between the built environment and tech firms, offering a way to challenge the "techno-solutionist narratives" promoted by Big Tech (2022, p. 153).

Building on these approaches, our version of the data-walk is both iterative and intentional in examining how data is generated, collected, and commodified within the urban landscape. By combining walking with digital ethnography, we trace how everyday movement through urban space—seemingly mundane acts—becomes part of a broader assemblage of data collection, processing, and capitalization. Using autoethnographic methods (Chang, 2016; Margolis & Pauwels, 2011), we recorded smartphone usage, consumption patterns, locations, and routes through detailed pen-and-paper field notes and diaries. This method aligns with existing scholarship on consumption and commodification (c.f. Chin, 2007; Lee & Ruck, 2022), photo diaries (c.f. Chaplin, 2011), accessibility (c.f. Jarke, 2019), and movement through urban environments (c.f. Larsen, 2014).

In the following section, we narrate the data-walk in the first-person (as performed by one of the authors), focusing on everyday actions, the urban form, and the platforms of tech firms to uncover the data traces produced by these activities (Flyverbom et al., 2017; Thatcher, 2014). In doing so, we respond to Fields et al.'s call to "story" and "proxy" urban platforms to better understand the material politics of platform urbanism and to highlight "data as it moves (or finds itself obstructed) between social actors, institutions, and sites" (Fields et al., 2020, p. 465).

We conducted the data-walk with the perspective of tourists familiar with the area, but without any specific pre-set intentions—except for a couple purchases as revealed in the narration—allowing the experience to unfold organically. During the walk, the author engaged with apps from Amazon, Facebook, and Google at least once. The walk was carried out by one of the authors, who intentionally used public transportation to arrive at the site and planned to depart via a ride-share service. Each time the author interacted with their smartphone and, they recorded the time, location, the app used, and the specific action performed within the app (e.g., checking social media, ordering a service, or navigating the city). Similarly, anytime a purchase was made, they recorded the time, location, establishment, and method of payment. In addition to logging these digital and consumptive interactions, field notes were

taken every 10 min to record observations about the surroundings, including the number of people present, the types of buildings and establishments in the area, and the perceived level of activity on the street.

These recorded interactions and observations were later analyzed collaboratively by the research team both in their note form and on their respective platform where possible (e.g., Instagram posts). The analysis involved comparing the recorded data to existing industry literature regarding data collection practices. We examined what types of data are captured through these everyday actions, identified which companies likely have access to this data, and speculated on how this data might be used by these platforms, based on known practices documented in industry reports and academic sources.

For field notes, the data-walk entails being attentive to at least three processes. First, it requires attentive observation of urban space and actions in the built environment. Exploring and observing cities is an important method for urban qualitative research. Scholars have long considered walking as a method for studying place (Massey & Meegan, 2015; Murphy, 2011; Pierce & Lawhon, 2015), including the rhythms of social and economic life (Middleton, 2009; Wunderlich, 2008), and a sense of community in a particular neighborhood (Jung, 2014). In general, walking is used to explore space, place, and mobility in a city (Middleton, 2011; Yi'En, 2014). Much of this is self-guided, immersive experience that researchers use as a tool to better understand their research context (Pierce & Lawhon, 2015). Other times, walking is used as a method to collect data from research collaborators (or participants) using diverse ways of engaging with urban space and data collection (from photovoice to geo-tagged soundbites) (Aoki & Yoshimizu, 2015; Duignan & McGillivray, 2019; Pezzullo, 2009). These methods situate walking as an observational and experiential form of data collection, often to elicit responses from residents about how a place has changed over time (Aoki & Yoshimizu, 2015; Middleton, 2009; Pezzullo, 2003). We build on these literatures, to narrate the use of the built environment from the perspective of a middle-class white male and avid smartphone user.

Second, a data-walk requires attention to the digital infrastructures and data collection processes in and through the urban environment. Many walking methodologies involve digital technologies, data collection devices, GPS trackers, digital cameras and recorders, or smartphone apps to guide users/participants, but fewer use walking to trace how data is collected about you without you being aware of it, how it is used, and how large companies benefit from this extraction and subsequent agglomeration, circulation, and use. An emerging literature has explored ways to understand connections between infrastructure and the city through walking and participatory tours (Burrington, 2016; Jarke, 2021; Powell, 2018b; Wiig, 2013). These are examples of exploring the digital mundane, what Leszcycznski (Leszczynski, 2019, p. 4) refers to as *visiting*: "As a constellation of methods, *visiting* serves to render the spatial geographies of networked connectivity visible, orients an attunement towards often ignored and/or unnoticed landscapes of digital infrastructures, and situates the possibilities of quotidian digitally-mediated interaction within the mundane architectures and built environments of assemblages that we refer to as 'the internet'."

Third, the data-walk requires attention to how data is used and processed. Data related to social media use, purchases, location, and other smartphone log data are particularly important, as they create an archive about your actions both in urban space and simultaneously on smartphone apps. The combined ethnographic perspective of the data-walk considers the relationship between these kinds of personal data and space: How is movement mediated by digital infrastructures? Are some movements privileged and preferred? Why? Are you encouraged to patronize certain stores, or visit certain spaces by targeted advertisements and social media recommendations? These are questions that typify critical data studies and digital geographies scholarship (Boyd & Crawford, 2012; Elwood, 2020; Elwood & Leszczynski, 2018; Rose et al., 2014). This literature not only implicates big data in knowledge production, epistemology, and ideology but also increasingly on privacy, transparency, and surveillance.

4. The data-walk: Storying digital platforms

My Link light rail train stopped at King Street Station in Seattle. I took my headphones off as I got off the light rail. I was excited that I'd get to get a little bit of a walk in after traveling to Seattle and had marked The Seattle Pinball Museum as "Places To Go" in Google Maps. I am familiar with Seattle, but I couldn't exactly remember how to get to the museum, so I used my phone to find directions from "My Location" ultimately deciding on taking the King Street route—despite it being 1 min longer—so I could sneak buy Hing Hay Park. I was relieved to see the confirmation from Google Maps that it was open, despite going to their website to find out the museum's hours. After spending an hour or so in awe of pinball machines I decided to take a picture of one of the pinball machines and post it to Instagram. I left and rode the Rapid Ride *E*-Line bus—my ticket on the Transit GO Ticket app was still valid—toward South Lake Union.

The ride was short, but I already had my phone out so reverted to my digital twitch of opening Instagram. I had previously seen an ad for socks that I had wanted to purchase, and one of the ads appeared in my feed. I decided to see if I could do it now while I was en route, so I added 6 socks to my cart. I entered my email address and the app asked for the last 4 digits of my phone number. I complied and got a code via text. I typed the code into the checkout and even though I did not have an account with the company that I sought to purchase socks from, my address and payment information appeared prefilled in the checkout process. While curious I didn't know where the information came from, I was happy I didn't have to put in my credit card information. I checked out. I noticed a notification on my phone from Amazon that said that, based on my shopping history, I may be out of Fudge Mint Cookies and if I buy now then I won't run out. I was visiting family in Seattle, so did not need to make that purchase now, but seeing the Amazon app reminded me I had meant to purchase a USB harddrive to store some data for a project at work. I had already found one I liked, and decided to use my time on transit and purchased the harddrive and had it sent to my house. I was already logged into the Amazon Shopping app so the entire process was straightforward. I looked up and wasn't quite at Denny Park yet, so my digital twitch kicked in again and I started up a game of Tank Wars. A few minutes later, I was at my stop. I hurriedly turned the screen off and shoved the phone in my pocket.

My stop was just near Denny Park and the first order of business was to get coffee then a midday snack. I walked to Elm Coffee Roasters on 9th street and paid cash for my black coffee in the coffee thermos I brought with me. I then walked to nearby Fresh Flours for lunch. My phone buzzed, alerting me that Google Pay is accepted at that location, and not having enough cash, I simply used Google Pay with my default credit card at the contactless register. The interaction required no interaction with the cashier. I rummaged through Instagram again while I scarfed down my Kale Turnover. Nothing new of note since I last checked, but I randomly hearted several posts from people I followed. My main draw for the day was still a few blocks away, the Museum of History and Industry at Lake Union Park. I paid for admission with my credit card and marveled at Seattle's aerospace industrial history for the next couple hours. As I was walking around, my phone alerted me that someone was ringing my doorbell in Baltimore. My Google video doorbell allowed me to talk to the person ringing my doorbell, but I ignored it because as I was leaving the museum, a seaplane was about to make it's landing in Lake Washington. Perfect. I snapped a few photos.

The day became older and I was unprepared for the turn in weather. The REI nearby would be a perfect pitstop for a raincoat. I wanted to stop along the way at the infamous Trophy Cupcakes for a quick treat. At Trophy Cupcakes, I already had my phone out because I had paid with Google Pay and as I began to snack on my cupcake, I decided to take a photo for posterity and quickly share it to X (formerly Twitter) and Facebook. I quickly made a diversion to REI, to buy a lightweight shell

and paid with my Amazon credit card. I then left to get some work done as planned at Mr. West Cafe Bar. Always seeking more caffeine, I ordered another coffee and chatted with the cashier. I then sat down with my laptop. While my laptop did its fuss to connect to a new wifi access point, I posted several of my photos on Instagram and tagged the park and the South Lake Union neighborhood as my locations.

Several hours later, with my work done, I realized I needed to quickly get home and remembered my intention to pick up some olive oil and fresh bread. I headed up Westlake Avenue back toward Whole Foods on Denny Way. Whole Foods was running a discount for Amazon Prime members on bakery goods that day, so at the self-checkout, I scanned my Prime membership QR code from my phone's Whole Foods app and used Google Pay to pay for the items contactless on my Amazon credit card.

It was now rush-hour and I opened up my Lyft app to get a ride to where I was staying. Lyft instructed me to walk a few blocks over to Boren Avenue North, a dedicated ridesharing pickup and dropoff zone, to meet my driver. My memory of Boren Avenue a decade earlier resembled the top of Fig. 2, but today looked something like the bottom of Fig. 2 with cranes on all sides of me. I got my phone out to snap a quick photo and sent it to my infrastructure group chat on WhatsApp. I sent a quick text to my family to let them know I was on my way back. As I got into my Lyft, I opened the Google News app to stay up to date. My day in the greater SLU neighborhood was officially over. Later that night, I saw a notification on my phone prompting me to add my photos from Lake Union Park so that others could see those photos when they looked up the Park in Google Maps. I dismissed the notification. A separate notification asked me if I knew the Seattle Pinball Museum and was willing to answer a few questions. Curious, I opened it up thinking that if I answered questions about the museum, it might help them stay in business. I answered questions about parking, the availability of food, and whether it was a good place to meet people.

5. Discussion

The narratives presented above illustrate how everyday actions are transformed into data, which is then collected and utilized by large platform companies. The data-walk allows us to "see" the sites (Fig. 4 and Fig. 5) where data is surveilled and converted into raw material, which algorithms later refine into targeted advertising products. Tech firms rent access to these finely segmented consumer profiles, offering advertisers the ability to reach specific audiences through views and impressions. Both surveilled and volunteered data serve as inputs to this system, driving processes of capital accumulation by increasing consumption through personalized advertising. In line with the interests of tech firms, SLU's redevelopment —marked by large numbers of small, diverse types of storefronts—facilitates the collection of detailed consumer behavior and location data, which tech firms seek to better segment their users and advertisers seek to refine their targeting efforts. The layout of these small retail spaces allows for the geo-tracking of consumer interactions, enabling more granular insights into consumer preferences.

Fig. 2. Images from Google Maps Street View looking north along Boren Ave N from Thomas St toward Lake Union in June 2008 (above) and May 2019 (below) google (Google, 2020).

Each action in our data-walk generates data that is cross-referenced, combined, and enriched with other information about the same user, then compared with data from other users. This data becomes the raw material for a new product: the sale of advertising space on platforms, segmented into highly specific consumer markets.

Other companies rent this advertising space to accelerate the sale of their commodities and services. Users encounter these advertisements through Facebook ads, sponsored Instagram posts, Google search results, Amazon product suggestions, and personalized "Just For You" lists. When an individual logs into the same account across multiple devices, a multitude of data points is collected as surveillance and ad targeting follow the user across platforms. Ads can appear on a range of devices such as laptops, desktop computers, Amazon Kindles, Apple iPhones, Microsoft Surfaces, and Google tablets. While advertising is a key component of tech firms' business models, it is important to recognize that these companies are not merely "technology" firms; they are reshaping the built environment in profound ways.

For the author who conducted the walk, it wasn't until the process of analyzing the data with co-authors and constructing Figs. 3 and 4 that they began to feel both invisible—just one among millions of users—and simultaneously exposed, unable to maintain privacy in their daily activities. This realization led the author to reflect on past travel and consumption, questioning what data tech companies had collected on them over the past decade and how that data may have been used to justify various forms of urban redevelopment. More pointedly, the author began to wonder how the choices made during the data-walk were influenced or guided by prior consumption patterns, either their own or those of others. In this way, the data-walk revealed the interconnectedness of data collection, platform use, and urban development, illustrating how platforms can produce qualitative changes in the city (Attoh et al., 2019; Leszczynski, 2020; Mahmoudi et al., 2020; Rose, 2020).

In the midst of Amazon's expansive main campus development in an old industrial warehouse district in SLU, the data-walk serves as a tool to examine how capital shapes the built environment in its own image—an extension of the urban process (Harvey, 1978), which integrates accumulation practices rooted in data surveillance and capture. We argue that the data-walk helps illuminate how data capture is embedded in software, enacted through hardware, and materialized in the built environment as a form of tech-led redevelopment. Through the data-walk, we aim to make these processes legible, mapping how platforms and technology capital actively shape the city (e.g., Vulcan and Amazon). Fixed capital investment in the form of office buildings is integral to corporate operations, but the decision to expand corporate headquarters in downtown Seattle represents a broader strategy to transform the city into a tech campus—one designed for affluent tech workers to live, work, and recreate.

The data-walk also serves to "story" platform urbanism from the perspective of everyday users, particularly the ideal users—tech workers and their families, who are predominantly upper- and middle-class. In SLU, this manifests as a neighborhood reshaped to cater to a tech urban

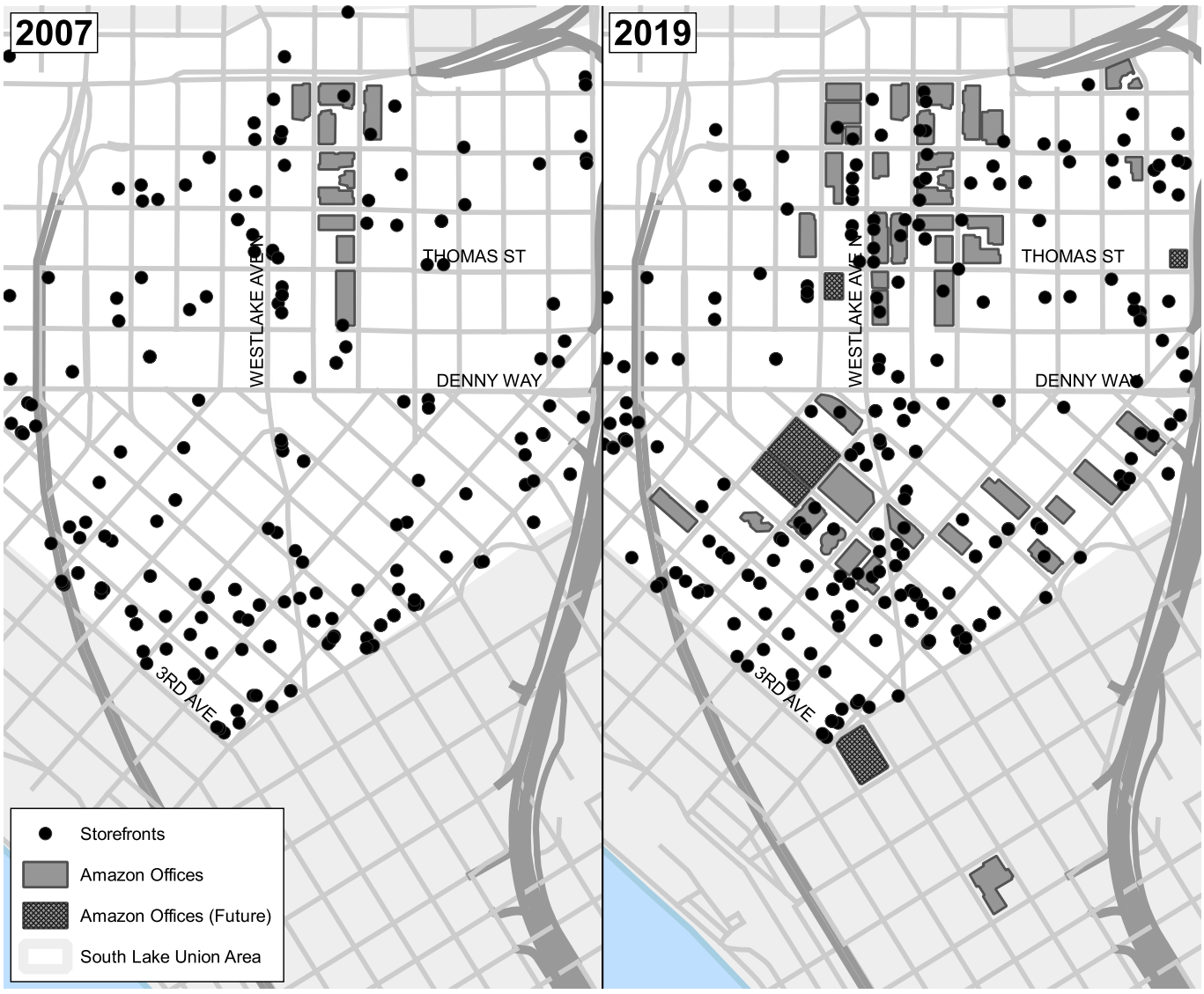

Fig. 3. Amazon office buildings in South Lake Union with storefronts in 2007 (left) and 2019 (right). The 2007 map comprises storefronts in 2005 to better depict "before" Amazon—capturing the area prior to the demolition and construction for Amazon buildings (Amazon.com, 2020; Rosenberg, 2019). There was an increase of 92 storefronts to total 366 in 2019 (see Table 1).

elite. The data collected about consumers feeds into this tech-driven urban process, favoring those who are able to consume and whose consumption patterns are legible to tech firms, captured within digital registers. Platforms introduce another filter on this data, as the inputs are biased toward individuals who actively use these platforms. This creates an obscured, uneven data collection process that reinforces the preferences of these platform users, directly influencing the urban landscape. This influence is visible in the types of stores (e.g., Whole Foods versus Safeway), recreational spaces (private yoga studios versus public parks), and transit infrastructure (ride-share versus public transit), as well as other urban services increasingly mediated by platform companies. These patterns reveal who these spaces are designed for and who they aim to attract. SLU's "hipster urbanism" is built on the exclusionary practice of "reclaiming" downtown spaces, often displacing existing residents and tenants (Cowen, 2006). In this case, exclusion occurs through both displacement and the prioritization of wealthier users' data, validating a built environment tailored to their tastes. Yet, this exclusion is dialectically linked to inclusion, driven by capital's relentless expansion, a dynamic made clear through the urban development practices of tech firms.

As McMillan Cottom (2020, p. 443) argues, "the platform-mediated era of capitalism that grew from Internet technologies specializes in predatory inclusion. Predatory inclusion is the logic, organization, and technique of including marginalized consumer-citizens into ostensibly democratizing mobility schemes on extractive terms." This form of inclusion grants access to users in a way that facilitates the racialized consumptive preferences of hipster urbanism while simultaneously devaluing the preferences or practices of the users whom they seek to gain access to. These dynamics of exclusion disregard alternative futures and speculative possibilities that a range of scholars have called for (Castells, 1978; Corbin, 2018; Kern, 2020; Summers, 2019, among others).

We take seriously the critique posed by numerous scholars that capital-centric examinations, as a means to understand oppression, injustice, and uneven development, may preclude alternative visions and reinforce existing power structures (Gibson-Graham, 2006; McKittrick, 2006; Werner et al., 2017). Our goal here is to demonstrate the human component of data gathering and urban platforms—the ways in which everyday urban life intersects with the logic of data accumulation and how, if left unchecked, these processes reinforce existing power dynamics.

The data-walk in this study reflects the experience of an imagined

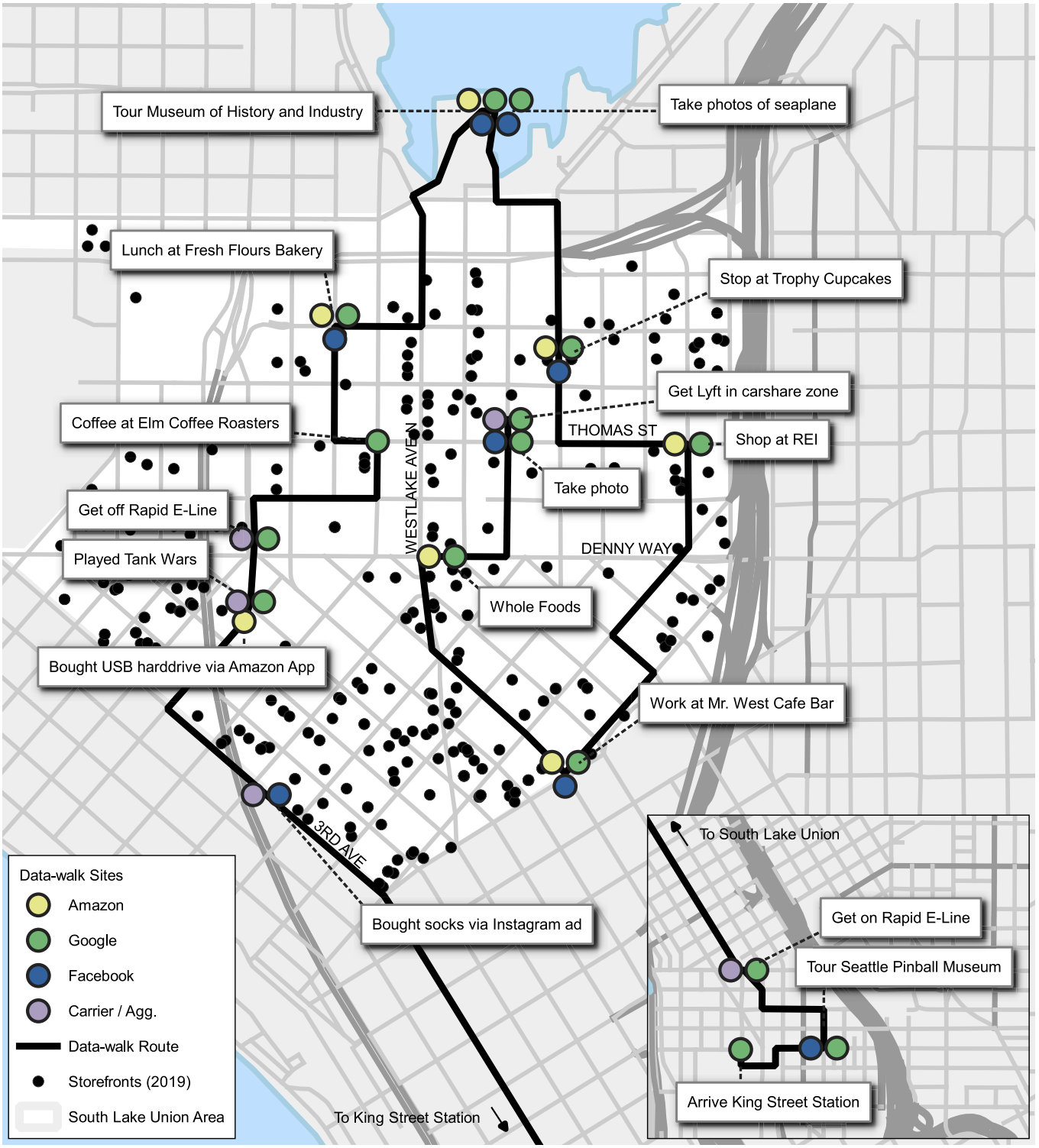

Fig. 4. The route for the data-walk depicting places of digital surveillance and data capture alongside storefronts. South Lake Union Area highlights Census Tract 72 and 73 which we use for analysis in Table 1.

ideal subject, one that mirrors the redevelopment of SLU. Future research should explore how marginalized and poor urban residents navigate the city in ways that are likely to challenge advertising algorithms. Investigating diverse digital footprints requires careful attention to the myriad bodies and subjectivities that derive use-value from urban space, platforms, and smartphones. Focusing on social difference will reveal a more nuanced picture of platform urbanism and provide deeper insights into the inequalities and uneven development that shape the city.

6. Conclusion

We sought out a theoretical intervention, to understand the symbiotic nature of data and cities. We used the data-walk to observe how we are being observed, by whom, attentive to the everyday actions that people take and the ways in which those actions become commoditized

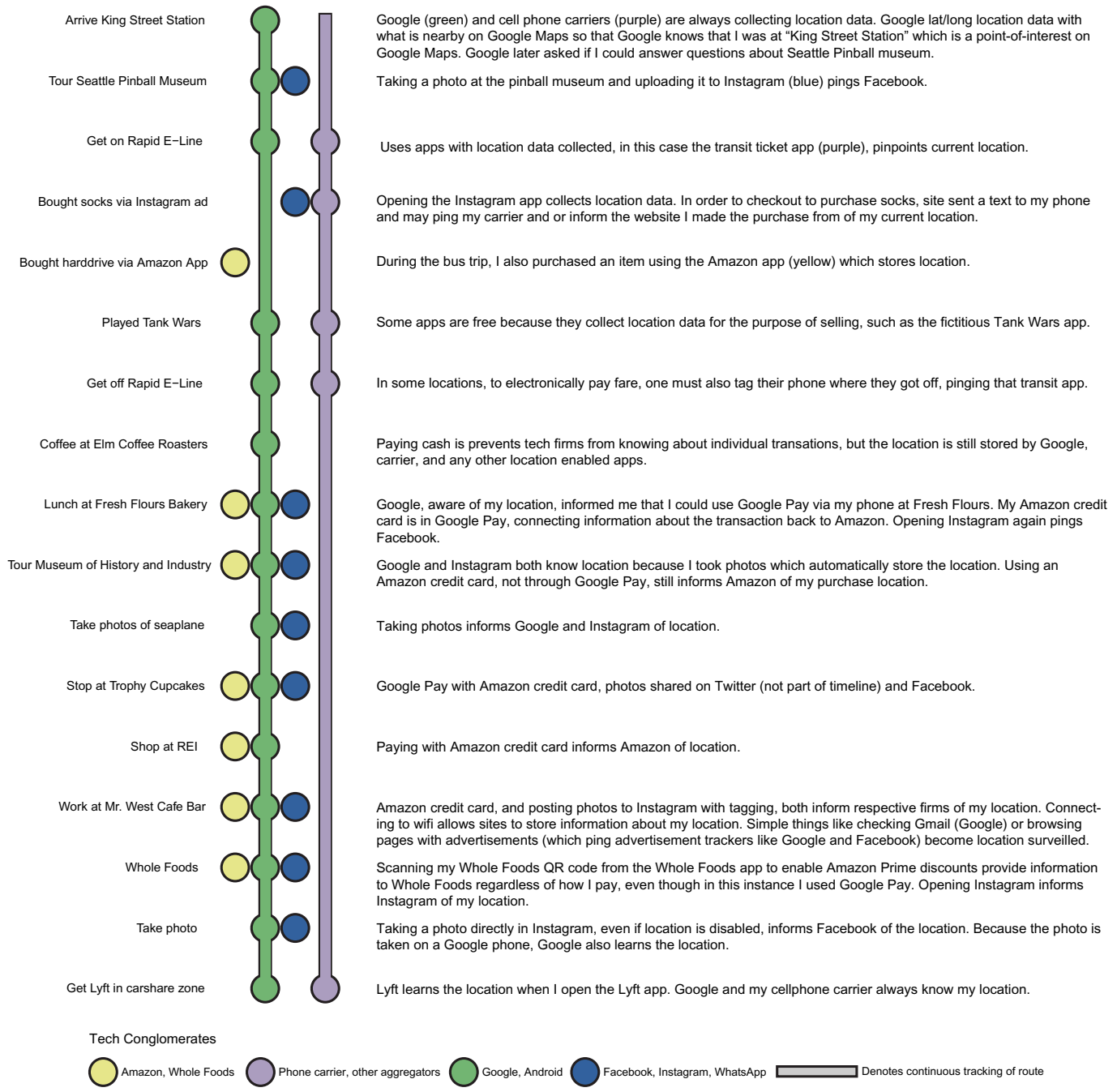

Fig. 5. The route for the data-walk with each of the groups of tech firms.

for digital capital. This necessitated an analysis that extended beyond our individual experiences, incorporating the perspectives of various data collectors embedded within the infrastructure of urban platforms. Our focus was on the co-production of platform urbanism and the lived realities of everyday urban life, emphasizing the entangled relationship between digital technologies, urban development, and the commodification of human behavior.

To do this, we drew upon three interconnected literatures. First, we explored the literature on walking as methodology in geography as a mode of observation of space and place with attention to new scholarship that connects digital technology and infrastructure. Second, we explore how this walk translates into digital space and the data collected. We walk through urban space through the lens of digital observers, attentive to how tech firms observe us—through surveillance and through volunteered data—acknowledging the uneven power distribution between users and tech firms which make possible data observation to secure new data flows.

By conducting the autoethnographic data-walk, we traced, first, how digital data collection transforms the built environment and alters residents' and users' experiences of place and, second, how this observational data is connected to data that is either volunteered or surveilled via smartphones. Our key contribution lies in demonstrating how tech companies benefit from the feedback loop between consumption, data accumulation, and urban development. Platforms like Amazon, Google, and Facebook profit from observing and capturing consumer behaviors, which are then fed back into the design of urban space. This feedback loop is both symbiotic and reinforcing: the data collected on consumption patterns influences how urban spaces are developed to cater to "ideal" users—typically affluent—while the structure of the city further shapes consumption through targeted ads and platform-driven

behaviors. Seattle's South Lake Union serves as an exemplary, prototypical model of this dynamic, illustrating how tech capital reconfigures urban space through alliances with property developers like Vulcan Real Estate and Microsoft.

Tech capitalism thrives on a perpetual feedback loop of data appropriation and commodification, made possible by the normalization of surveillance and datafication. We advanced two central arguments from our data-walk in SLU. First, we contend that the data-walk is a powerful tool for "storying" platform urbanism by grounding the abstract processes of data capture, commodification, and use in the everyday practices of movement and consumption. The digital traces of our smartphone-mediated lives are central to capital accumulation, and yet, these practices are fragmented, partial, and uneven. Platform capitalism is not monolithic or all-encompassing, and the experience of data-walks differs vastly between tech professionals and service or gig workers. To fully understand the inequalities that emerge from platform urbanism, it is necessary to expand the data-walk methodology to include diverse perspectives and subjectivities.

As Harvey (1978) noted, "capital represents itself in the form of a physical landscape created in its own image," and our second argument demonstrates how tech capital reproduces the city "in its own image" (Marx & Engels, 2006, p. 12). Herein lies our second contribution. We demonstrate how the city is reproduced through the feedback loop of data and consumption, where a surveillance-driven urban experience commodifies everyday life to promote consumption aligned with the tastes of middle- and upper-class residents. The physical landscape of the city, designed to meet the preferences of these "ideal" consumers, entrenches the power of large tech companies in urban governance and development. This dynamic, driven by the dual processes of uneven urban development and unequal data production, highlights the material and digital inequalities embedded in platform urbanism. The data-walk revealed how locations and activities—such as taking a photo, visiting a store, or using ride-share services—are commodified by platforms, feeding back into urban development while enriching tech capital.

We make these contributions as a first step to envision ways to disrupt the feedback loop that produces our built environment.

CRediT authorship contribution statement

Dillon Mahmoudi: Conceptualization, Data curation, Formal analysis, Methodology, Visualization, Writing – original draft, Writing – review & editing, Investigation, Validation. **Anthony Levenda:** Conceptualization, Methodology, Writing – original draft, Writing – review & editing, Formal analysis, Investigation, Validation. **Alicia Sabatino:** Formal analysis, Investigation, Visualization, Writing – original draft, Writing – review & editing, Validation.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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