

# The Nature of Neighborhoods: Using Big Data to Rethink the Geographies of Atlanta's Neighborhood Planning Unit System

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Neighborhoods have long held a central place in the analysis and planning of urban spaces. Despite this centrality, the exact definition of a neighborhood, as well as how and where to draw its boundaries, has remained unclear. Although these questions have generated significant academic debate, they have arguably little effect on people's everyday lives or decision-making processes. Atlanta, Georgia, represents a different case, however, because of the city's system of neighborhood planning units (NPU), which has shaped the city's planning and political processes since the mid-1970s. Despite significant changes within the city's intraurban geography since the 1970s, however, the geography of the NPU system has remained largely unchanged. As such, this article attempts to harness the potentials of big data to rethink the nature and geographies of Atlanta's neighborhoods. Drawing on archival documents, historic maps of the city's neighborhoods, and new sources of big data, this article explores the evolution of Atlanta's neighborhoods from the 1960s up to the present day. In particular, our analysis highlights the fundamentally fuzzy, fluid, and relational nature of neighborhoods, both in the ways in which neighborhoods are defined by political and administrative entities and through the everyday lives of residents. Ultimately, this work calls into question the idea of the neighborhood as a natural, preexisting, discrete, and static spatial unit and points to the utility of using new sources of data and analytical techniques for revealing this underlying relationality. *Key Words:* big data, neighborhoods, regionalization, sociospatial theory, urban geography.

邻里在城市空间分析与规划上长期处于核心位置。尽管具有核心性，但邻里的确切定义，以及如何、在何处划定邻里的界线，却仍然不甚清晰。即便这些问题已引发重大的学术辩论，但却对人们的日常生活或决策过程影响甚微。乔治亚州的亚特兰大，却因该城市的邻里规划单元系统（NPUs）而呈现出截然不同的案例，该系统自1970年代中叶开始便形塑了该城市的规划与政治过程。尽管该城市内部的地理自1970年代开始发生显著变迁，但NPU系统的地理却仍大幅维持不变。于此，本文试图驾驭大数据的潜能，以重新思考亚特兰大邻里地理的本质。本文运用档案文件、该城市邻里的历史地图，以及大数据的崭新来源，探讨亚特兰大邻里自1960年代至今的演化。我们的分析同时通过邻里由政治和行政单位以及居民的每日生活所定义的方式，特别强调根本上模糊、流动且关系性的邻里本质。本研究最终质问邻里作为自然、既存、分离且静止的空间单元之概念，并指向运用数据的崭新资源和分析技术来揭露此一支撑的关系性之效用。关键词：大数据，邻里，区域化，社会空间理论，城市地理学。

Los barrios o vecindarios han ocupado durante mucho tiempo un lugar central en el análisis y planificación de los espacios urbanos. Pese a esta centralidad, la definición exacta de un barrio, lo mismo que cómo y dónde dibujar sus límites, siguen siendo poco claros. Aunque tales cuestiones han generado debate académico importante, podría decirse que han tenido poco efecto en la vida cotidiana de la gente o en los procesos de toma de decisiones. Sin embargo, Atlanta, Georgia, representa un caso diferente, debido al sistema de unidades barriales de planeamiento de la ciudad (NPUs), que ha configurado sus procesos políticos y de planificación desde mediados de los años 1970. A pesar de los cambios significativos que se han dado en la geografía intraurbana de la ciudad desde los 1970, sin embargo, la geografía del sistema de las NPU ha permanecido en gran medida sin cambios. Dicho eso, este artículo intenta aprovechar los potenciales de los big data para repensar la naturaleza y geografías de los barrios de Atlanta. Con base en documentos de archivo, mapas históricos de los barrios de la ciudad y nuevas fuentes de big data, el artículo explora la evolución de los barrios de Atlanta desde los años 1960 hasta el presente. En particular, nuestro análisis destaca la naturaleza fundamentalmente borrosa, fluida y relacional de los barrios tanto en los modos como los barrios son definidos por entidades políticas y administrativas como a través de las vidas cotidianas de los residentes. Finalmente,

este trabajo pone en duda la idea del barrio como una unidad espacial natural, preexistente, discreta y estática, y apunta a la utilidad de usar nuevas fuentes de datos y técnicas analíticas para develar esta relacionalidad subyacente. *Palabras clave:* barrios, big data, geografía urbana, regionalización, teoría socioespacial.

As cities become ever more central to our understandings of the contemporary human condition, and attempts to plan for it, so, too, do cities become subject to ever more diverse forms of scrutiny. With the advent of emerging sources of so-called big data, it has become possible to analyze a wider array of urban social and spatial processes than is possible with conventional sources of census data alone and at finer spatial and temporal scales than would otherwise be possible. Whether in the form of geotagged social media data, smart cards used for accessing public transit, or 311 systems for cataloging municipal maintenance requests, these new sources of data potentially allow for a richer understanding of urban life that complements longer-standing ways of analyzing and understanding cities through data.

These new sources of data are typically employed, however, in a way that produces, more than just reflects, urban space and sociospatial relations. That is, even though these new sources of big data allow for a greater degree of flexibility in their spatial epistemologies, analyses of these data still often default to using the received spatial categories of administrative or statistical geographies as units of analysis. Because these more conventional geographic delineations—such as that of the neighborhood, with the census tract as a rough proxy—are both familiar to us, as well as being the scale at which other kinds of social data are aggregated and made public, these geographies continue to have a powerful hold on the way we come to know cities.

This process is not new, though. Indeed, as one practitioner of the emerging field of urban data science remarked at a recent workshop, “The history of urban science is the history of neighborhoods.” That is, geographic constructs such as the neighborhood have long had a structuring effect on the way social scientists have thought about, and ultimately intervened in, urban processes. From the early Chicago School of urban sociology and its focus on natural areas of the city to the development of factorial ecologies as a refinement of these approaches, all the way up to genesis of the neighborhood effects school of research, the somewhat fuzzy ways in which neighborhoods or other sub-urban geographies have

been defined have played an important constraining role in our study of urban space. Ultimately, these different successive strands of research have served to reify the urban neighborhood as a kind of discrete spatial unit with distinctive characteristics and a determinative effect on the social life of those within it. Rather than seeing neighborhoods as being produced through social relationships and processes, this work falls into the trap of spatial fetishism, of seeing inherently spatial processes as preceding, and ultimately determining, the social itself (Soja 1980).

Although some of these established paradigms have turned to big data as a way of supplementing or strengthening their existing research programs, our work is not about designing more efficient or accurate metrics for cities and urban neighborhoods using big data or developing ostensibly universal laws by which cities operate (Bettencourt and West 2010). Instead, this article attempts to harness the potentials of big data to rethink the nature of these spaces in the first instance, to call into question the conventional ways in which we have partitioned urban space for the purposes of producing knowledge about it and governing it. Although geographic information systems (GIS) and quantitative geography have long been critiqued for their singular reliance on a Cartesian understanding of space like the one that underpins dominant understandings of neighborhood (Sheppard 1995; O’Sullivan, Bergmann, and Thatcher 2018), this article demonstrates that big data offer meaningful potential for bringing together GIS and quantitative methods with relational understandings of space and place that have dominated human geography over the last two decades or more.

Using an extensive database of geotagged tweets, the rest of this article sets out to reimagine and redraw neighborhood boundaries in Atlanta, Georgia, based on the everyday mobilities of urban residents. Because Atlanta has enshrined its definitions of neighborhoods into the city’s planning process since the early 1970s via its neighborhood planning unit (NPU) system, it provides a compelling case for understanding the dialectic of stability and change in neighborhood boundaries over time and demonstrating how emerging sources of big data can provide a contemporary perspective on how these spatial

delineations do or do not accord with the lived geographies of urban residents and their everyday activities. Using Atlanta as a test case, we hope to demonstrate that big data can help to construct alternatives to conventional sociospatial imaginaries that promote the stigmatization of certain neighborhoods, as well as to demonstrate the fundamental interconnection of places that are often assumed to be wholly separate and apart from one another.

First, the article reviews the way neighborhoods have been conceptualized within different schools of thought in geography and other relevant social sciences, emphasizing the potential for a more relational understanding of neighborhoods to be operationalized later in the article. Second, the article provides a brief history and overview of Atlanta's NPU system. Finally, the article turns to using geotagged tweets as the basis for a redrawing of Atlanta's neighborhoods and NPUs. By combining this big data-based analysis with an analysis of historic maps of Atlanta's neighborhoods and their evolution, this section seeks to explore the tensions between a static, Cartesian understanding of urban neighborhoods and a more fluid, processual, and relational understanding and the potential for these new sources of data to advance such a theoretical project of rethinking the spatial ontology and epistemology of the neighborhood. This redrawing exercise is not, however, meant to argue that neighborhoods do not matter. Indeed, this analysis is meant to demonstrate that neighborhoods very much matter but that in many cases, our received understandings of what constitutes a given neighborhood are incredibly partial and that alternative understandings of neighborhood might matter more in some contexts.

## Rethinking the Neighborhood

Even after a century of focus, the concept of neighborhood remains one with an imprecise definition. Although definitively operating at a submetropolitan level, there is no consensus about what precisely it is that defines a neighborhood. In practice, such definitions can be even more elusive, with neighbors—or even members of the same family or household—having different conceptions of where one's neighborhood boundaries lie. This fuzziness is so pervasive that Galster (2001) likened the debate about the nature of neighborhoods to the legal understanding of

pornography: "A term that is hard to define precisely, but everyone knows it when they see it" (2111). The rest of this section reviews some of the prominent ways in which neighborhoods have been conceptualized among geographers and other spatially oriented social scientists throughout the last century, how these various definitions of neighborhood are operationalized in practice, and the role of new data sources and mapping technologies in enabling new approaches to understanding neighborhoods.

## Theorizing the Neighborhood

Most commonly since its emergence as a key concept within the social science literature, the neighborhood has been understood as a kind of spatial container. Beginning with the Chicago school of urban sociology, neighborhoods were seen as "moral regions" with distinct characteristics from other such regions, as a kind of fundamental organizing unit for urban space (Park 1915). Although this view is most often seen in Burgess's (1923) concentric zone model of the city, it is just as evident in the Chicago school's mobilization of the biological metaphors of neighborhood "ecologies" and "natural regions" (Zorbaugh 1926; Park 1936).

This understanding of neighborhoods came to dominate the urban social sciences throughout the twentieth century, leading to a consolidation of what Madden (2014) called "the Westphalian neighborhood imaginary." For Madden, this view of the urban space "portrays the city as fully divided among different neighborhoods pictured as non-overlapping and of clear outline, almost as sovereign republics. Just as the vision of the world chopped into sharply demarcated, bounded nation-state units reflects (and produces) a distorting, ideological image, so too does the vision of the city chopped into sharply demarcated, bounded neighborhood units" (Madden 2014, 473). Crucially, though, he argued that this naturalistic way of understanding urban space ultimately tends to be ahistorical, functionalist, and depoliticizing, failing to recognize the multiple ways in which the question of what and where neighborhoods are is an intensely political question that transcends the ostensible fixity of the neighborhood itself.

In response to this bounded, mutually exclusive conception of neighborhoods, there has been a growing chorus of work focused on articulating a broadly relational understanding of neighborhoods. Influenced

in large part by Massey's (1991) invocation of a global sense of place, this relational perspective seeks to put the ostensibly bounded, self-contained neighborhood within a broader set of social and spatial relations, instead seeing neighborhoods as contingent, overlapping, and even spatially discontinuous, only ever a temporary result of particular social and spatial flows and trajectories that might be reassembled in different ways moving forward (cf. Pierce, Martin, and Murphy 2011). Although Massey undoubtedly plays an important part in providing the language for such a relational view, similar perspectives were circulating even earlier. For instance, Hunter (1979) offered a kind of proto-relational view of the neighborhood when he argued:

To try to understand the neighborhood solely by focusing on its internal structure and dynamics is to end up with carefully documented descriptions, but a persistent failure to grasp the causal explanations of the processes that create the variety of neighborhood forms and constrain the conduct of neighborhood life. If one does not view the neighborhood within its context, in short, one ends up with description, not explanation. (269)

That is, our understanding of the neighborhood requires that we actually go beyond the neighborhood itself to understand the translocal connections that constitute the neighborhood as such.

### Delineating Neighborhoods

Although the question of what the essential nature of a neighborhood is has persisted, this question has often been turned into a perhaps even thornier question of how one might operationalize these different conceptions. Given the variety of characteristics that are accepted—albeit to varying degrees—as constitutive of a neighborhood, how do we then identify these neighborhoods in particular concrete cases? How do we distinguish one neighborhood in a given place from its neighbors?

Arguably the most common way of operationalizing neighborhood geographies is through official statistical geographies, such as the census tract in the United States. Because these units are the smallest scale at which most social data are made publicly available, any research on neighborhoods that relies on official statistics tends to be limited to these predefined areas. The reality of these spatial units is that they have no necessary connection to the lived geographies of the

neighborhoods themselves and such neighborhood boundaries often encompass multiple tracts. Even in those places where neighborhoods might be administratively defined, the administrative and statistical geographies need not be in accordance with one another. As Sperling (2012) argued:

The singular and strict use of block groups, census tracts, or ZIP Codes as proxies for neighborhood, however, are often inappropriate and can result in flawed findings, poor public policy decisions, and even situations in which families or businesses are disqualified from place-based government programs. Perceptions of neighborhoods are social constructs and context dependent. Yet social science literature is replete with an unquestioning use of these geographies to measure neighborhood effects, despite evidence that the use of alternative spatial scales and techniques can deliver very different results. (219)

That is, the fact that statistical geographies operate in a recursive, mutually reinforcing relationship with the Westphalian understanding of neighborhoods as bounded containers, while also being divorced from the actual conceptions of neighborhoods held by residents, can present substantive conceptual and methodological problems for researchers. As Flowerdew, Manley, and Sabel (2008) showed, using different definitions of neighborhoods at nonconventional scales can change whether or not a so-called neighborhood effect is observable. As Jones and Pebley (2014) demonstrated, failing to account for people's everyday mobilities and activity spaces by looking only at one's immediate residential context provides an impoverished view of both the spatiality of the neighborhood and how spatial context influences a variety of social outcomes. Furthermore, acknowledging that neighborhoods are not only modifiable in their spatial size but also over time can present further difficulties to creating consistent and reproducible neighborhood geographies (Sperling 2012; Taylor 2012; Kwan 2018).

### Histories of Regionalization

The search for this kind of ostensibly objective methodology for delineating places from one another can find lineages in the longer history of regionalization methods within geography. Although regionalization is not entirely unique to geographic research—indeed, in the abstract, all it means is the classification and categorization of geographic territories—the



specific methods and approaches have very much been tied to the discipline of geography. In particular, regionalization approaches emerged out of geography's so-called quantitative revolution in the 1950s and 1960s, not only as one potential realm in which computational analysis could be useful but also as a particular area of study that would help make geography a more scientific discipline (cf. Schaefer 1953; Bunge 1966; Harvey 1969).

This question of delineating regions or submetropolitan neighborhoods using quantitative and computational methods has nonetheless occupied geographers and other spatial social scientists for some time. Some of the earliest research on regionalization focused on the identification of so-called formal regions, or places that are uniform and homogeneous, grouped together based on their similarity according to a series of given variables. Consolidated under the banner of social area analysis (Shevky and Bell 1955) and later factorial ecology, this line of research is often associated with the quantitative revolution due to the work of Berry (1961, 1971; Berry and Kasarda 1977). That being said, the search for such regions is in many ways a synthesis of the discipline's quantitative-nomothetic and Hartshornian regionalist-idiographic traditions, seeking to find consistency in these landscapes while also being limited to a largely descriptive analysis of regions, rather than an analysis of the underlying processes that produce these regions as such.

Although the formal definition of a region approximates the dominant vision of neighborhoods, of greater interest to this research is the application of regionalization methods to the search for functional regions. Functional regions are those areas defined by the substantive interactions or linkages between different locations. That is, functional regions group together places that interact more with each other than with other locations outside of the region. Although often applied to the more conventional subnational understanding of the region prominent within geography at the time (Nystuen and Dacey 1961; Garrison and Marble 1964), some studies of functional regions were focused at the urban scale, delineating submetropolitan neighborhoods based on transportation or telecommunications networks (Hemmens 1966; Goddard 1970). Hemmens's (1966) dissertation on Buffalo is particularly interesting in that its regionalization output, based on travel data, operationalizes a rudimentary understanding of relational space.

Whereas most regionalization efforts hold the assumption that regions must be contiguous, Hemmens's work identifies spatially discontinuous neighborhoods, acknowledging that the functional connections between places are not necessarily dependent on immediate spatial proximity or contiguity, an insight that we attempt to extend in our analysis here.

It is important to note, however, that for all of the enthusiasm around and applications of regionalization methods, there was some recognition at the time, even among advocates, that these methods were incredibly partial (cf. Grigg 1965; Lankford 2010). This acknowledgment of the fuzziness and subjectivity in regionalization processes is applicable not only to the epistemological and ontological positions of the researcher undertaking regionalization research—that is, that any regionalization output is shaped by the concerns of the analyst producing it—but also of the spatiality of the regions themselves. As Gale (1976) suggested, the failure of regionalization algorithms to acknowledge the existence of anything beyond nonfuzzy boundaries and constrained single membership means that these algorithms also fail to reflect the underlying ontology of the region as we know it. Together, these statements point toward what we might call an early postpositivist approach to regionalization that is not in search of an incontrovertible truth about regions or neighborhoods but rather employs regionalization as a useful, and at times necessary, heuristic device for generalizing spatial patterns. In the absence of identifying an inherently optimal classification of regions or neighborhoods, this approach suggests that we should seek out many different classifications simultaneously, allowing the particular purpose, context, and rationale for study to identify the most appropriate result but always with an eye toward using these methods of ways of thinking about space in new ways.

### New Forms of Data-Driven Neighborhood Delineation

More recently, however, a number of projects have attempted to take advantage of crowdsourced geographic data precisely to capture the otherwise noncodified geographies of neighborhoods. One notable example is the Bostonography project (Woodruff 2013), which is based on crowdsourced inputs of users' mental maps. Although initially structured around drawing the boundaries of established neighborhoods, the project has since shifted

to allowing users much greater leeway in identifying points or areas of interest. The resulting maps demonstrate the fundamental fuzziness in these definitions, simultaneously highlighting those areas where there is (near) consensus on the definition of a given neighborhood, as well as those places where there is significant contention about what a given area is called and where its boundaries are.

More commonly, researchers have taken to the wealth of user-generated geographic data created through social media to produce similarly fuzzy understandings of neighborhood boundaries. The Neighborhood Project (Chisholm and Cohen 2019) mines Craigslist housing advertisements for the names of city neighborhoods and then maps how these different neighborhood designations are used in different places, often in overlapping and spatially discontinuous ways. Similarly, Cranshaw et al.'s (2012) Livehoods project uses Foursquare check-ins as a way of demonstrating the social connections between different kinds of establishments, and Arribas-Bel's (2015) "spoken postcodes" compares Amsterdam's long-established postcode neighborhood geographies to the ways that Twitter users inhabit and move through different parts of the city. Shelton et al.'s (2015) examination of the 9th Street Divide in Louisville also uses geotagged tweets to show that a predominantly poor and African American neighborhood conventionally conceived of as separate and isolated from the rest of the city is actually quite meaningfully integrated into the rest of the city, overlapping with more conventionally affluent and white spaces.

One thing that each of these examples of neighborhood redrawing have in common is that their reimagining of neighborhood boundaries has little impact on how people live their lives in these places. As Crampton (2006) argued, "Drawing lines on maps can seem an arid academic exercise" (747). Whereas many of the aforementioned works have demonstrated that neighborhoods remain important for how they convey a sense of place or allow residents to stake claims on particular places, the precise structure of these neighborhoods—whether a boundary between two neighborhoods is drawn straight down the middle of a street or zigs and zags to capture some places while intentionally excluding others—does not really affect people's everyday lives or decision-making processes. Atlanta, however, is different because of how popular understandings of neighborhood boundaries became formalized and

aggregated together into NPUs, which play an influential, if disputed and sometimes problematic, role in the city's planning process. That is, in Atlanta, the way in which neighborhoods have been delineated from one another—a process that was sometimes arbitrary and sometimes a tool of racism and social control—has important ramifications for who gets to have input into particular urban policy and planning decisions.

## A Brief History of Atlanta's Neighborhood Planning Unit System

Despite being generally heralded within planning circles as a model for integrating neighborhood-based citizen participation into planning processes, Atlanta's NPU system has scarcely been subjected to critical scrutiny since its inauguration more than fifty years ago. Indeed, where the NPU system appears in the scholarly literature, it is often according to a common origin story that describes how the NPU system was created in 1974 as one of newly elected Mayor Maynard Jackson's first major initiatives to provide a more direct means of representation and participation for black citizens in Atlanta as the city entered a new era of black political power and representation (cf. City of Atlanta 2019).

This version of the NPU's origin story is whiggish, at best, though, and ultimately disguises the political contestations and negotiations that gave rise to the contemporary NPU system. Although Maynard Jackson's election as Atlanta's first black mayor in 1973 did indeed owe partially to his harnessing of the nascent neighborhood movements occurring around the city in the preceding years (Parko 1975), the NPU system was not simply Jackson's brainchild, nor was it simply proposed and implemented immediately on Jackson's taking office. It was instead an adaptation of an idea that been floating around Atlanta's planning and policymaking circles for at least a few years, and one that was certainly not well-received by all involved parties, especially on the city council, resulting in extensive negotiations and contestations over its formulation and implementation.

## Contesting the Neighborhood Planning Unit Concept

The City of Atlanta's 1967 *Social Report on Neighborhood Analysis*, published a year before

Jackson had even formally entered the political arena, points toward a program of neighborhood-based citizen participation in planning much like the one eventually enshrined in the NPU system. Although the report ultimately defers on the creation of any concrete mechanisms for ensuring such participation in favor of a more ad hoc participation process, it does represent something of a forerunner to the eventual NPU system. The report itself was based on a division of the city “into 23 areas that are fairly homogeneous ... organized by census tracts ... [and thus] only approximat[ing] the traditional boundaries of neighborhoods or combinations of neighborhoods” (City of Atlanta 1967, B2–B4). Several years later in August 1973, during the mayoral primary that pitted Jackson against incumbent Sam Massell and former congressman Charles Weltner, Weltner proposed a similar notion of devolving power to neighborhood groups through neighborhood city halls and citizen’s advisory councils (Linthicum 1973). Although few other details are available about either Weltner’s vision or that of the 1967 report, it is at least evident that the idea of neighborhood-based planning had been on the agenda for some time before its eventual adoption under Jackson’s watch with the 1974 Neighborhood Planning Ordinance.

Although the issue of when and by whom the NPU idea originated might be somewhat pedantic, it is perhaps most important to recognize that throughout the genesis of the NPU system in the years after the passage of the neighborhood planning ordinance, the idea of neighborhood planning units as such was incredibly contentious. Most notable, a number of sitting city council members saw the addition of a new kind of supplementary political geography into the city’s planning apparatus—one that, by design, would not accord with the existing city council district boundaries—as a threat to their political power. Proponents of the neighborhood planning program accused their fellow council members of putting a desire for “political fiefdoms” ahead of the city’s need for “rational planning units” (Merriner 1975b).

In the end, the fight over the NPU system was waged for well over a year, from the spring of 1974 at least through the spring of 1975, although it remains unclear based on archival evidence when precisely the council came to an agreement about the matter. The contention around the NPU system was so great that within just a couple of years of its

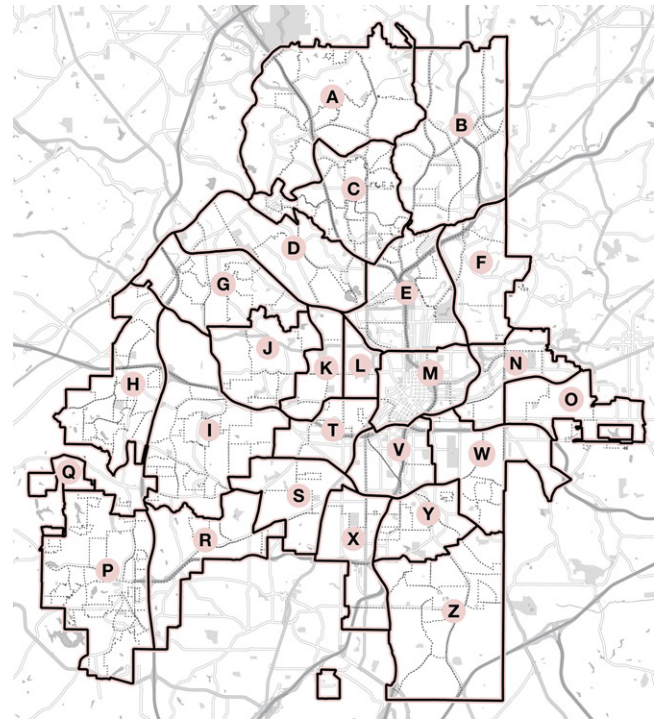


Figure 1. Atlanta’s neighborhood planning units.

implementation, the program was already under significant attack within the city, both from its original detractors and from proponents of the system who felt like it was not living up to its potential (Martin and Holmes 1978; Russakoff 1978; Saporta 1982; Anderson 1985; Fosskett 1992; Wheatley and Isaf 2015). This fight suggests, however, the great importance of geography to the questions of planning and citizen participation that Atlanta was grappling with in the 1970s. Although neighborhoods are often used as a kind of default scale for grouping and understanding sub-urban areas, settling on neighborhoods as the geography at which Atlanta’s citizen participation would be organized was anything but a straightforward, rational process. Indeed, the creation of an incongruent system of administrative geographies through the addition of the NPU system was meant to reshape and redraw the lines on the map as well as the structures of power within the city itself.

### Defining Atlanta’s Neighborhoods and NPUs

Although the geographies of Atlanta’s citizen participation were indeed contentious, the neighborhood was ultimately accepted as the scale at which



such a process would be organized. This leaves open, however, the important question of how the city actually decided what constituted a neighborhood, how boundaries were drawn between neighborhoods, and how constituent neighborhoods were then aggregated into the system of NPUs (see [Figure 1](#) for a map of Atlanta's NPUs).

The official definitions for a neighborhood and NPU were approved by the city council on 2 April 1975, although the council declined to approve the official neighborhood boundaries at that time because a revised map was not available ([Merriner 1975a](#)). The city defined a neighborhood as "a geographic area either with distinguishing characteristics or boundaries in which the residents have a sense of identity and a commonality of perceived interest, or both," and an NPU as "a geographic area composed of one or more contiguous (connecting) neighborhoods, which have been defined by the Department of Budget and Planning and approved by the City Council for the purpose of developing neighborhood plans," although these definitions had been in informal use in earlier planning documents produced by the city (cf. City of Atlanta [1974](#), 27). Although the official definition of an NPU left open the possibility of an NPU comprised of only a single constituent neighborhood, no NPU actually holds this designation. According to then Planning Commissioner Leon Eplan, who had arguably the most formative role in the creation of the NPU system ([C. Campbell 1996](#)), the rationale and process for grouping neighborhoods into NPUs was the following:

The Bureau of Planning prepared a city-wide map showing 177 so-called "neighborhoods" in Atlanta. These areas were predominantly residential clusters, or sometimes small commercial nodes, with clearly defined boundaries and names. Some were quite large in size, while others were very small. ... With only a limited planning staff for the planning and participation program, and with so many neighborhoods to service, it became necessary to bundle the neighborhoods into larger units. Neighborhoods were placed together when they were physically close and appeared to have similar interests or characteristics. ... Identifying the appropriate name for each neighborhood was deemed essential. Establishing and maintaining neighborhood identity was central to the NPU process, to ensure that residents would identify with their communities and derive a sense of place and pride from living there. (Eplan [2014](#), 99)

That is, Eplan framed the necessity of grouping neighborhoods into NPUs as one based at least partially on resource constraints within city government but also framed within a notion of creating coherent neighborhood communities that could be grouped together with adjacent neighborhoods of similar character while also remaining distinct.

These disagreements, although perhaps minor, point toward the inherent fuzziness when discussing the definition of neighborhoods, whether in a more general sense or regarding the NPU system in particular. Not only are neighborhoods subjective—what constitutes a neighborhood for one person might be different from that of his or her neighbor or a person who lives across town ([Coulton et al. 2001](#))—but they are also subject to considerable change over time. Whether due to demographic shifts, changes in social networks or social standing, political institutions, or new developments in the built environment, individual perceptions of neighborhood surely evolve over time. It is important to note that despite the stated attempts at constructing coherent neighborhoods and groupings thereof, early official documents from the city on the NPU system recognized precisely the fact that neighborhoods are not the bounded, coherent, and stable entities that they are often assumed to be.

One of the city's key tools in promoting the nascent plans for neighborhood planning after the adoption of the new city charter was a pair of booklets titled, *How to Do Neighborhood Planning* and *The Value of Neighborhood Planning*. The latter argues at one point that "Each of Atlanta's neighborhoods is different from the others, but one element is common to them all. It is change—continuous change" (City of Atlanta [1973](#), 5). Indeed, as the following analysis demonstrates, archival maps of Atlanta neighborhoods used in various planning documents in the 1960s and 1970s allow one to see this continuous change made manifest in how the city government represented these neighborhoods (see [Figure 2](#)). Even further, nearly two decades after the implementation of the NPU system, the city undertook an update of its official records of neighborhoods and their boundaries to reflect this dynamism ([Hiskey 1991](#); [Cordell 1992](#)). Yet, in spite of this fact, the boundaries of the NPUs themselves have seen only very minor adjustments since their inception, with the exception of those stimulated by land annexations at the city's fringe, which resulted in





**Figure 2.** Dis/agreement in historical neighborhood geographies over time. (A)–(D) Four different sets of historic neighborhoods from 1963, 1973, 1973, and 1975, respectively. To highlight discrepancies between these different neighborhoods, (E) overlays the four different sets on top of each other. (F) Uses the Jaccard index to quantitatively summarize the (dis)agreement between sets for different locations.

the creation of NPU-Q in the city's southwest in the mid-2000s. Indeed, those adjustments to neighborhood boundaries that took place in the 1990s were limited to changing such boundaries within each NPU, in effect ensuring that the stability of the aggregate NPU boundaries would not be disrupted by such an exercise. This fact runs counter to an argument made later in the *The Value of Neighborhood Planning* booklet, that "Planning is not a once-and-done process. A plan must be kept current, reflecting circumstances which could not have been anticipated when the original Plan was prepared" (City of Atlanta 1973, 19). Given that the city has recognized on multiple occasions the need for these boundaries to be reconsidered, our contention is that perhaps the idea of planning as anything but "a once-and-done process" ought to be applied to the geographies of planning as well, in this case the geography of the NPUs.

## Remapping Atlanta's Neighborhoods Using Big Data

In this section, we take up this task of mapping continuity and change in Atlanta's neighborhood geographies, using both historical maps of the city's neighborhoods and an extensive database of geo-tagged tweeting activity within the city over several years. Rather than soliciting the direct contributions of residents' mental maps as in Coulton et al. (2001) or E. Campbell et al. (2009), this research uses the aggregate, everyday mobility patterns of Twitter users in the city of Atlanta as a proxy for their "lived" neighborhoods. That is, in our redrawing of these boundaries, we are searching for the functional neighborhoods as defined by people's movements through and use of urban space, rather than the more common conception of formal neighborhoods united by a homogeneity in population and landscape. Through this shift from formal to functional neighborhoods, we are able to provide not only a more contemporary view of Atlanta's neighborhood geographies but also a more relational understanding of these neighborhoods that emphasizes their connectivity and mutual constitution rather than their separation, isolation, and distinctiveness.

## Data and Methodology

This analysis follows a growing trend of using geo-tagged social media data as a proxy for people's aggregate daily mobility patterns over relatively long periods of time (cf. Noulas et al. 2012; Liu et al. 2014; L. Wu et al. 2014; Huang and Wong 2016; Luo et al. 2016; W. Wu, Wang, and Dai 2016; Zhang et al. 2016). Although these data represent one of the most comprehensive and detailed ways of tracking such mobility patterns, they are not without shortcomings. The nature of social media data, as compared with data from mobile phone tracking or even an analog travel diary, is that they fail to record all movements by any given individual. Nonetheless, over longer periods of time, social media data can provide a reasonably accurate view of those key points of interest for individuals, even if it cannot provide detailed information of the means by which they moved between them. The second major shortcoming of social media data is that they represent a limited, nonrepresentative, and self-selected sample of the whole population of a given city. That said, the biases of the data do not invalidate their usefulness. Indeed, the most significant observed biases in Twitter data are in age and geography, with both younger people and more urban areas being overrepresented (Mislove et al. 2011; Pew Research Center 2018), although socioeconomic status and skill level have also been shown to be significant influences on the use of such sites (Hargittai 2018). Perhaps contrary to received wisdom, though, social media data from Twitter actually overrepresent the voices of black users relative to the general population in the United States (Hargittai and Litt 2011; Pew Research Center 2018). Indeed, as Murthy, Gross, and Pensavalle (2016) found, historically black cities in the United States are some of the most active centers of tweeting activity across the country. Elsewhere, Shelton, Poorthuis, and Zook (2015) demonstrated that even when social media data are spatially uneven, this does not necessarily denote that places with fewer data points are not adopting the technology but rather that offline social inequalities have shaped the everyday routines of residents in those areas such that they are producing data, just in other parts of the city. In this way, leveraging these data to understand the aggregate mobilities and activity spaces of urban residents might actually provide a greater voice to some underrepresented groups in



understanding urban processes than has historically been the case with top-down, government-driven planning initiatives.

In this case, we use a data set consisting of all geotagged tweets sent worldwide since 2012, as collected by the DOLLY Project at the University of Kentucky (Poorthuis and Zook 2017). We extract all messages sent from the greater Atlanta area<sup>1</sup> within a three-year period from July 2012 to June 2015, yielding a total of 28.5 million tweets. We then further filter based on the boundaries of the City of Atlanta (see Figure 1) and only keep tweets where the location is derived from the more precise cell phone or Global Positioning System triangulation. Because we are primarily interested in spatial interaction, we further select only those users who have sent more than two messages during the study period. Our final data set consists of 124,792 users who have tweeted a total of 8.2 million times from the greater Atlanta area.

We use this initial data set as a proxy for each user's activity space. This particular use has become quite common with both mobile phone data (Ahas et al. 2010) as well as social media data (Hristova et al. 2016; Poorthuis 2018), because such data sets hold information on the links between a person and the various locations that person frequents. These locations are then connected through that person: If a person visits location A and subsequently also visits location B, a link can be drawn between those two locations. The more often a person makes this trip, the stronger that link might be.

To construct this network of links between locations, we follow the approach outlined in more detail elsewhere by Poorthuis (2018) and thus only highlight a few relevant methodological points here. When dealing with social media data, we need to address that users tend to have different levels of activity and, if not taken into account, power users might dominate the resulting data sets. To do this, we weigh each user's activity space in the following way:

$$W_{ij} = \sum_{u=1}^U \frac{T_{iu} + T_{ju}}{(L+1) \sum_{l=1}^L T_{lu}}.$$

The weight ( $W$ ) of the link between two locations  $i$  and  $j$  is the sum of all users' ( $u$ ) connections between those locations ( $L$ ). An individual user's contribution to that connection is then determined by the sum of tweets ( $T$ ) in the two locations by

that user, relative to the total weight of all tweets between all locations for the user.<sup>2</sup> This results in each user having exactly the same "vote" in the resulting interaction network. To ease subsequent computations, we define a "location" here as a grid cell of 0.0075 degrees (roughly 800 m), yielding a total of 998 grid cells within the Atlanta area. Among those 998 locations, there are a total of 407,002 links.<sup>3</sup>

To turn this spatial interaction data into functional neighborhoods, we draw on both the longer histories of regionalization discussed earlier and more recent advances in network analysis and community detection algorithms (cf. De Montis et al. 2007; Gao et al. 2013; Liu et al. 2014). Many approaches in both regionalization and community detection share a drive to find an objective or "best" fit for the neighborhoods that are yielded by such algorithms. For example, community detection algorithms often use the concept of modularity, a goodness-of-fit metric that relates to how well a network is partitioned (cf. Lancichinetti and Fortunato 2009). This approach yields a single metric that can then be algorithmically optimized. Its adoption within geography and regionalization also brings with it an ontological view on communities and neighborhoods as somehow "natural" and "objective," a view that is not necessarily compatible with our theoretical understanding of space as fuzzy and relational.

For this reason, although we build on the significant achievements of network analysis and community detection, we also diverge from it. Instead of overgeneralizing and finding the set of optimal neighborhoods, we show here how different algorithmic parameters could yield different outcomes that can help us understand the variegated and fuzzy nature of urban space. Specifically, we use the Infomap algorithm (Rosvall, Axelsson, and Bergstrom 2010) to find or detect neighborhoods in the network of spatial interactions described previously. Particularly relevant in this regard is that the Infomap algorithm gives the researcher control over the outcome of the algorithm by exposing a scale or size parameter, which is referred to as Markov time (see Schaub, Lambiotte, and Barahona [2012], for a more in-depth discussion). We use this parameter in our analysis to generate neighborhood boundaries at different scales, allowing us to then analyze the relative stability of different neighborhoods in the city as the scale parameter or Markov time changes.

Together, millions of geotagged tweets forming a record of many individuals' mobility patterns (including those of groups who might have traditionally been left out of such data sets), an understanding of space as fluid and relational and neighborhoods as defined not only formally but also functionally, and an approach to regionalization that does not seek to privilege a single best output, work together to produce the speculative reimagining of Atlanta's neighborhoods provided next. Although our analysis points to the problems with the way in which the NPU system's geography was developed and implemented, our own mappings of the city's neighborhoods are not without their own shortcomings or meant to supplant all other ways of thinking about and defining the city's neighborhoods. Our purpose here, though, is to use this approach to privilege an alternative perspective on what constitutes a neighborhood and how we can (and should) draw its boundaries.

### Mapping Stability and Change in Neighborhood Boundaries

Before we examine the relational neighborhood geographies based on our analysis of geotagged Twitter data, it is worth stressing that the fluidity and fuzziness of neighborhood boundaries is inherent to the concept of a neighborhood, regardless of the particular data being used. Although the boundaries of Atlanta's NPUs have seen scarcely any change since their original creation, the boundaries of Atlanta's neighborhoods are anything but natural and unchanging. By using a series of archival maps available through Georgia State University's Planning Atlanta digital collection, we can understand how the City of Atlanta partitioned its neighborhoods in different ways in the lead-up to their more-or-less permanent enshrinement as part of the NPU system.

Figure 2 draws specifically on a series of four archival maps from the Planning Atlanta collection that were digitized and then traced for further analysis, as seen in Figure 2A–D.<sup>4</sup> Figure 2 shows a significant evolution in the number, size, and shape (not to mention names, which are not depicted) over a relatively short period of time from 1963 to 1975, with plenty of change occurring in just the three maps created between 1973 and 1975. Perhaps most evident from these four maps is the significant

fragmentation of the city's neighborhood spaces, with Figures 2A and 2C in particular demonstrating that not every place within the city was assigned as being part of a given neighborhood. Figure 2E visualizes these four different maps overlaid on top of one another, with darker line weights highlighting those borders that are shared across different definitions. Ultimately, this map highlights that despite attempts to use these sub-urban neighborhood definitions as means of making the city more legible, when taken in the aggregate, they highlight the fundamental complexity and subjectivity of urban space that defies the belief that such partitions of space lead to a more precise understanding of urban processes.

To compare the similarities and differences across these four maps beyond the simple visual analysis enabled by overlaying each set of polygons (as we do in Figure 2E), we employ the Jaccard index, or Jaccard similarity coefficient (Jaccard 1912). The Jaccard index can be used to compare the similarity of two sets (in this case two sets of neighborhoods) and yields a range from 0 (*similar*) to 1 (*not similar*). In practical terms, we first divide Atlanta into a set of grid cells. For each grid cell, we determine its relation to all other grid cells: If both cells are located in the same neighborhood we assign a 1; if not, we assign a 0. This creates a binary shared neighborhood vector for each location that we can subsequently compare across the five different neighborhood sets. Because the Jaccard index is designed to compare only two vectors at the same time, this results in ten possible comparisons and thus Jaccard coefficients for each location. We take the mean across coefficients to visually represent the degree of overlap, as seen in Figure 2F. In addition to the Jaccard index, Figure 2F shows the present-day definition of the city's 244 neighborhoods for comparisons of how coherent they are over time.

Figure 2F demonstrates that only a handful of neighborhoods are consistently defined across each of the different historic maps analyzed here. They include everything from historically black and middle-class, but since declining, neighborhoods like Hunter Hills on the city's west side, to working-class neighborhoods like Pittsburgh and Adair Park just to the south of downtown, as well as from more white and affluent neighborhoods on the city's east side like Virginia–Highland and Morningside–Lenox Park, to neighborhoods that have undergone



multiple shifts in their demographic and socioeconomic composition like Ormewood Park, East Atlanta, and Edgewood.

In some cases, these consistently defined neighborhoods are the result of tangible, material boundaries that clearly separate one area from another. For instance, both Pittsburgh and Adair Park are bounded by highways and railroad tracks that provide clear, relatively unchanging borders. In other places, though, these boundaries are more a function of history and social division. Edgewood presents an interesting case because it has both material and immaterial borders. Three sides of the Edgewood neighborhood accord with major thoroughfares, but this is not the case for the neighborhood's eastern boundary with the Kirkwood neighborhood. This hardened, consistent boundary can be attributed in part to the social divisions between these two areas: Edgewood has long been home to more black residents than many of the surrounding neighborhoods. Indeed, part of the border between Edgewood and Kirkwood is defined by the edge of the increasingly infamous Edgewood Court apartment complex (Raviv 2016). This border is highlighted in an episode of the Vice TV program *Noisey Atlanta*,<sup>5</sup> which juxtaposes the poverty of Edgewood Court with the luxury condos being built just yards away on the other side of the boundary with Kirkwood. It is through these kinds of juxtapositions that one can understand how the seemingly stable borders visualized in our mapping are made material not just in (relatively) unpassable barriers like a freeway but also in the ways in which racial and class biases are instantiated in urban landscapes and neighborhood definitions.

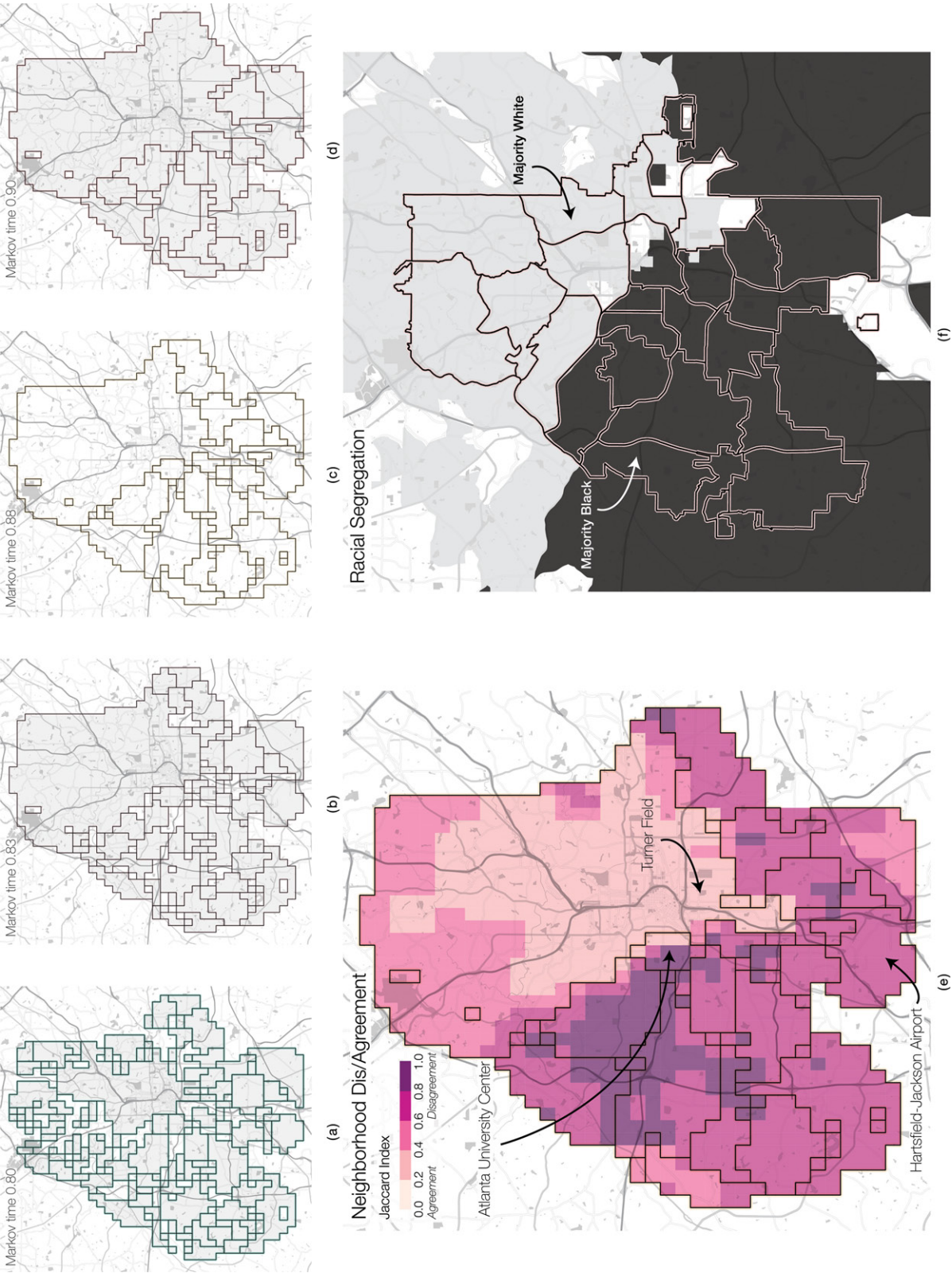
### Mapping Relational Neighborhood Geographies with Geotagged Tweets

Using geotagged social media data as a proxy for people's urban mobilities provides an important window into how these invisible barriers are made manifest in people's everyday routines. Figure 3 shows a variety of outputs from the Infomap algorithm at different spatial scales, as discussed earlier. Figures 3A through 3D highlight how the output of the Infomap algorithm changes considerably depending on the scale or Markov time parameter, showing outputs at Markov times 0.80, 0.83, 0.88, and 0.90.<sup>6</sup> For instance, going through each of the Markov

times represented in Figure 3, one goes from a total of just 20 Twitter neighborhoods in Figure 3D to 26, 54, and 108 neighborhoods, respectively. Of particular interest is Figure 3C, which is the output at Markov time 0.88, producing a total of 26 neighborhoods. This output most closely approximates the city's twenty-five NPU's and is thus most directly suggestive of what an alternative set of boundaries for the city's NPU's would be based on functional connections, were one to hold other aspects of the system constant.

These maps are also interesting because of the particularities of how the geographies of these functional, relational neighborhoods can change drastically with only small adjustments to the scale parameter. For instance, the area at the intersection of NPU's A, C, and D in northwest Atlanta is fairly stable from Markov time 0.83 to 0.90 (Figures 3B–3D) but becomes significantly fragmented when the scale parameter is lowered to 0.80 (Figure 3A). Conversely, the Atlanta University Center (AUC) just west of downtown, home to the city's historic black colleges of Morehouse, Spelman, and Clark Atlanta, is lumped in with the larger northeast cluster at Markov time 0.90. Adjusting the scale parameter downward, however, the AUC quickly breaks off and forms its own neighborhood, highlighting at once the coherence of the area and its connections with the rest of the city through the movements of its student population.

The stability of these relational Twitter neighborhoods across spatial scales is summarized in Figure 3E, which again uses the Jaccard index to demonstrate agreement and disagreement between scales. Arguably the most important aspect of these maps is the size and stability of the one large neighborhood that covers the majority of Atlanta's northeast area. This area is notable primarily because it approximates the racial geography of the city, where predominantly white and more affluent residents live to the north and east, with predominantly black and poorer residents to the south and west, as can be seen in Figure 3F. In other words, our more functional and relational understanding of Atlanta's neighborhoods highlights that despite the bevy of different official neighborhoods throughout the city's northern and eastern reaches, the city's white residents tend to have one fairly coherent activity space that reaches across the entirety of these areas. This one large neighborhood deviates so much from the



**Figure 3.** Changing neighborhood geographies according to Twitter. (A)–(D) highlight different outputs of the Infomap clustering algorithm with different scale (Markov time) parameters, showing outputs at Markov times 0.80, 0.83, 0.88, and 0.90, respectively. Areas with no color fill indicate isolates with not enough connections to other cells to form a larger neighborhood (i.e., isolates). (E) (Dis)agreement between those scales by using the Jaccard index. (F) shows the census tracts that have a majority of either white or black residents.

conventional definition of the city's neighborhood boundaries that it includes all of six NPUs, the majority of another five, and at least part of six more. Of the city's 244 officially recognized neighborhoods, our northeast neighborhood includes all of 85 and parts of an additional 40. Therefore, we can say that from a functional perspective, many of these distinctions are fairly meaningless, because residents are much more expansive in their everyday mobilities through the city, albeit still largely confined to majority white spaces.

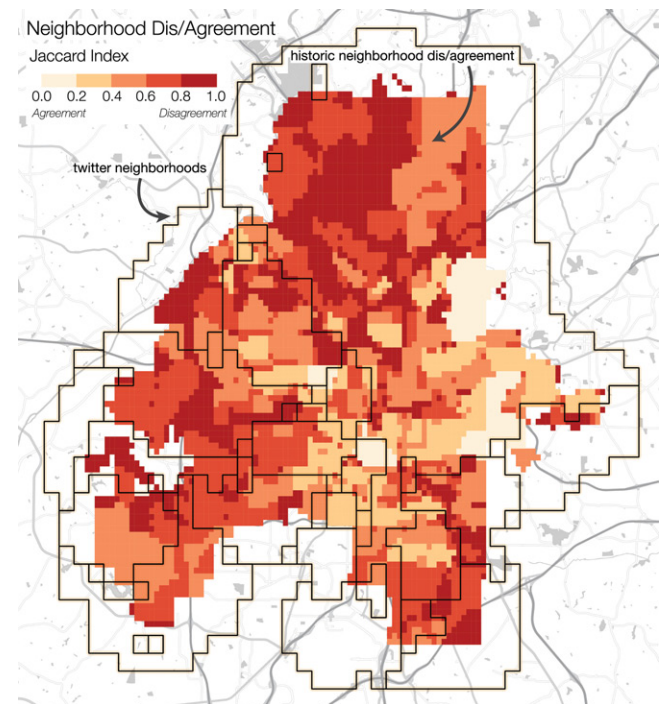
The highly racialized nature of these resulting neighborhood maps should come as no surprise for anyone familiar with Atlanta, one of the country's most segregated and unequal cities. A number of eccentricities in the resulting map complicate this picture in small ways, however. For instance, although the northeast neighborhood largely mirrors the city's racial divide, it also reaches beyond these stereotypically white spaces. Consistent across different Markov times, this neighborhood stretches all the way south toward the city's Hartsfield-Jackson Airport, also including parts of Atlanta's "tourist bubble" (Newman 2002) like downtown and the Auburn Avenue historic district, home to the Martin Luther King, Jr. historic site, an area that the city has actively tried to shape into a heritage tourist destination that caters to such white residents and visitors (Inwood 2010). It is also worth highlighting the area around Turner Field, just south of downtown and to the east of the downtown connector, which similarly remains a part of this northeast cluster even as the Markov time is lowered to 0.80, despite being surrounded by a historically black neighborhood. Even this particularity is part of a bygone era, however, because the Braves relocated to the largely white and affluent Cobb County suburbs in 2017 in an effort to ostensibly better serve the social and spatial preferences of their fans (Walter 2015).

The stability of the northeast neighborhood is all the more interesting when cast against the relative instability of the neighborhoods in the western portion of the city, as demonstrated by the darker purple hues in Figure 3E. The contradictions between the coherence of the predominantly white northeast neighborhood and the divergence of the largely black cluster on the west side calls attention to the racial compromise of the city's governing regime in the mid-twentieth century under Mayor William

Hartsfield, where in an effort to move black residents further from the city center to open it up for redevelopment, land on the city's west side was offered to black residents for development, under the condition that blacks not attempt to move to Atlanta's wealthier and whiter north side (Stone 1989). Ultimately, this shows the incongruity between the ways in which these spaces are imagined as more-or-less coherent by white residents of the local state and the reality of their significant variegation in the everyday lived realities of residents. That is, these maps help to highlight the diversity, differences, and segmentation across the city's predominantly black neighborhoods, with multiple alternative understandings of neighborhood spaces emerging from the movements of residents as captured in geotagged Twitter data.

### Comparing Historical and Twitter Neighborhood Geographies

In Figure 4 we compare the two neighborhood geographies more directly by overlaying the Jaccard index map for historical neighborhood boundaries with the Twitter neighborhood boundaries. As with the findings from Figure 3, arguably the most



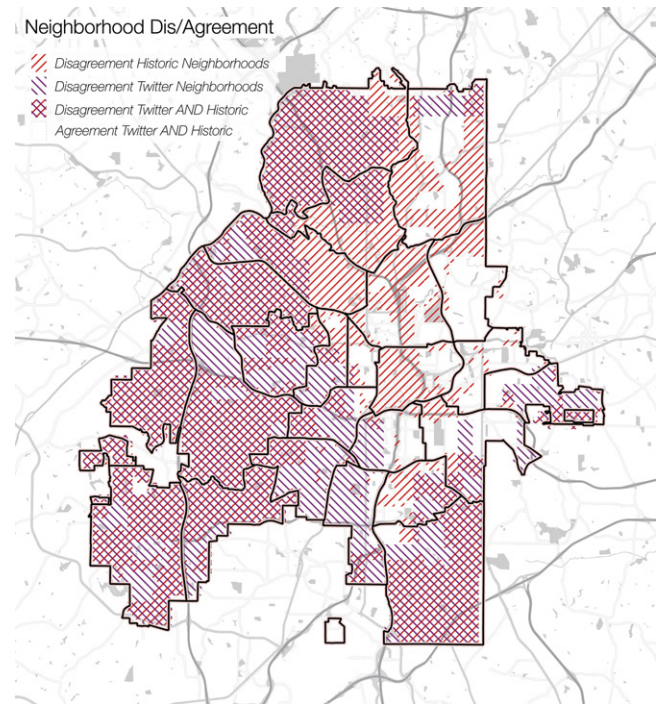
**Figure 4.** Comparison of the (dis)agreement index between different sets of historical neighborhoods with the boundaries of Twitter neighborhoods.



interesting result of this map regards the northeast neighborhood identified previously. Whereas Figure 3E showed this neighborhood to be extremely stable across multiple Markov times in our analysis of Twitter data, comparing it with the administrative definitions tells a more complex story. Although this northeast neighborhood cluster is something of a proxy for the activity space of Atlanta's white population, a considerable portion of the space within this neighborhood cluster has some of the lowest rates of cohesion among our different historical neighborhood boundaries. So even though the official names and boundaries of these areas have changed consistently over time, our analysis of functional neighborhoods shows that these places are actually quite well integrated with one another despite such change.

At the same time, some of those areas where our historic neighborhood definitions are most cohesive and consistent over time do not match up neatly with the outputs from the regionalization algorithm. In some cases, they sit at the intersection of multiple functional neighborhoods, whereas in others they exist as just one small part of much larger functional neighborhoods that they are seen as separate and apart from in more conventional definitions. This is especially true for the area around NPU K on Atlanta's west side. Within this one NPU sit side by side some of the city's most and least coherently defined neighborhoods based on our historical analysis. When looking at our Twitter neighborhoods, though, what was previously lumped together as part of one NPU is now divided into part of five different Twitter neighborhoods. Even the Hunter Hills neighborhood (discussed previously in Figure 2), which is defined consistently and coherently across the historical maps, ends up being split into three different functional neighborhoods.

We take a more abstract approach in Figure 5 by comparing the Jaccard index for Twitter neighborhoods with the Jaccard index for historical neighborhoods, specifically focusing on those places with Jaccard index scores greater than 0.50 for either set of neighborhoods. Although most of the city is characterized by some degree of instability in either historic or Twitter neighborhoods (or both), a number of places demonstrate a significant degree of coherence and stability across both neighborhood types (as denoted by those areas without the hatched pattern). This includes areas ranging from a variety of



**Figure 5.** Comparison of the (dis)agreement index between historical and Twitter neighborhoods. Areas with Jaccard index scores greater than 0.50 (indicating significant disagreement) are filled with a hatched pattern.

neighborhoods on the city's east side to some central Atlanta neighborhoods south of I-20.

One of the more striking insights from this analysis is that within this significant area of the city characterized by substantial change in neighborhood identification across both our historic and Twitter neighborhoods (as symbolized by the cross-hatched areas) is the neighborhood surrounding the intersection of Peyton Road and Harlan Road on the city's west side, just inside the Perimeter and south of I-20. This area was the site of "Atlanta's Berlin Wall," a pair of physical barriers set up by Mayor Ivan Allen, Jr. in 1962 as a means of physically limiting the spatial mobility of black Atlantans into a predominantly white neighborhood, also symbolically attempting to limit their social mobility through a material statement in support of the maintenance of racial residential segregation (Crater 2011; see also Kruse 2005). Although this area quickly became a prototypical example of blockbusting and white flight upon the removal of the barriers, the surrounding area of Cascade Heights would continue on to be one of the most prominent neighborhoods for Atlanta's black elite well into the present day. In our analysis, though, this area is visualized as a place of significant change, both in historic



maps as the racial contours of the city were being remade as well as in the present day, where the variegated spatial mobilities of Atlanta residents work to construct and reconstruct neighborhoods at multiple scales on an everyday basis.

## Conclusion

Far from the Westphalian neighborhood imaginary of “the city as fully divided among different neighborhoods pictured as non-overlapping and of clear outline” (Madden 2014, 473), this article has highlighted that the nature of neighborhoods is, and has long been, one of relationality and multiplicity. Through an analysis of both historical neighborhood definitions and contemporary urban dynamics, this article has documented the evolution of neighborhoods as they are imagined and lived by both powerful and average Atlantans. Rather than the Westphalian and fundamentally static vision of neighborhoods promoted by the city’s NPU system, our analysis has shown that neighborhoods have long been contested and re-created within Atlanta. On the one hand, the redefinition of neighborhood names and boundaries in official city plans and documents leading up to the NPU system shows that neighborhoods are not unchanging, external forces on social life but rather a reflection of larger social and spatial reconfigurations. On the other hand, our analysis of contemporary neighborhoods through the lens of everyday mobilities shows that the unchanging geography of the NPU system does not reflect the actual activity spaces and routines of the city’s residents. This fundamental relationality of urban neighborhoods ultimately contradicts the logics of the NPU system, with our redrawing of the city’s neighborhoods based on geotagged social media presenting an alternative vision of where these boundaries might lie, albeit in a fundamentally fuzzy and nondeterminate way.

As such, this article calls into question the reification of neighborhood boundaries, whether in the form of planning units or in the statistical geographies of the census tract, which often comes to stand in for a more qualitative and subjective understanding of neighborhood produced by those who actually inhabit such spaces. This problem is, again, fundamental to the nature of neighborhoods. Any given definition of neighborhood boundaries is sure to be contradictory in some fashion or another. If, through political or practical necessity, neighborhoods need

to be redrawn—as is the case in Atlanta—it is thus important to also create mechanisms to reevaluate and interrogate the neighborhood boundaries on a regular basis. So although it is extremely difficult, if not impossible, to solve this hurdle, our analysis has sought to demonstrate how a more critical analysis of how neighborhoods have come to be and changed over time can provide a useful antidote to the more rigid, instrumentalist understanding of neighborhoods often used elsewhere in geography and urban planning.

At the same time, however, this work provides new insight into how these neighborhood geographies and the geographies of segregation in the city overlap and diverge. For instance, our analysis of relational Twitter neighborhoods demonstrated that the nature and evolution of the city’s segregated landscape has meant the formation of a relatively coherent, but extremely large, space of white sociality covering the vast majority of the city’s north and east, although predominantly black social spaces elsewhere are much more internally differentiated and variegated in how different people occupy, use, and move through them. Although it would be difficult, if not impossible, to infer causality for the spatial patterns demonstrated by our mappings, the fact that these maps highlight spaces of conflict and change, which quite often overlap considerably with historic flashpoints in broader urban political struggles, demonstrates the potentials for this kind of analysis to be connected to further work that investigates such conflicts, whether in places like the intersection of Peyton and Harlan Roads or Turner Field as discussed earlier in the article or in places like Buckhead’s East Village and the Old Fourth Ward that have been the site of more recent tensions over racialized and classed codings of urban space (cf. Hankins, Cochran, and Derickson 2012; Powers 2017). Although we have not explicitly explored such issues in this article, these speculative redefinitions of the city’s neighborhoods raise further questions for how the NPU system structures citizen participation into the planning process. In short, the question of who should have a say in decisions made in and about a certain area of the city is troubled by our analysis, which shows that neither proximity nor property ownership—the two means by which one is provided with a vote in NPU decision-making processes—defines the totality of one’s relationships and affinities with a given neighborhood.

Finally, beyond the specifics of investigating the definition and construction of neighborhoods, this article has sought to contribute to broader methodological and theoretical debates within geography by demonstrating the utility of big data, mapping, and quantitative analysis for understanding and uncovering these underlying relational geographies. Although GIScience has long been associated with a Cartesian understanding of space, there remains a significant undercurrent of relational spatial theory within quantitative geography that has often been overlooked within conventional stories about the discipline's history and evolution. The seeming opposition of quantitative geography and relational space is, however, a contingent phenomenon and one that this work has sought to chip away at, providing further possibilities for mobilizing these methods to develop alternative conceptualizations of social and spatial processes.

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## Notes

1. Defined as a bounding box with the following coordinates as left, bottom, right, and top coordinates, respectively: 84.814968, 33.560851, 34.258351, and -84.181023.
2. For a longer description of the weighting approach, we refer to Poorthuis (2018).
3. Mean weight of all links = 0.30; standard deviation weight = 8.81; maximum weight = 2,795.58. It is worth noting here that a different grid size or shape could potentially produce different neighborhood outputs due to the persistent relevance of the modifiable areal unit problem.
4. These maps are as follows:  
Staging Areas (1963): <http://digitalcollections.library.gsu.edu/cdm/singleitem/collection/atlmaps/id/1828/rec/1>  
Neighborhood Data Collection Areas (1973): <http://digitalcollections.library.gsu.edu/cdm/singleitem/collection/atlmaps/id/1766/rec/2>  
Neighborhoods (1973): <http://digitalcollections.library.gsu.edu/cdm/singleitem/collection/atlmaps/id/2448/rec/15>  
Planning Units (1975): <http://digitalcollections.library.gsu.edu/cdm/singleitem/collection/atlmaps/id/1720/rec/68>
5. Available from <https://youtu.be/psMrUGRSQbI>.
6. Although the output at Markov time 0.88 is shown because it most closely approximates the number of NPUs in Atlanta, the other Markov times shown are

selected more or less randomly simply to show the wide variation in outputs even with only small changes in the scale parameter.

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