The Social Media Life of Public Spaces:

Reading Places Through the Lens of Geo-Tagged Data

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Abstract

Users of locative social media platforms are generating constant streams of highly granulated geo-located information. How does this data change the ways we study a geographic location? What types of insights are revealed in this data about the particular structure of a place? And finally, what biases are embedded within it? In this chapter we examine these questions by exploring the social media "life" of public spaces. Studying geo-tagged data from three public parks in New York City, we take a data-driven approach to survey possible spatial, temporal, and social insights. In addition, we point to the limitations of this data and conclude with a call for a mixed approach of both quantitative and qualitative methods to the study of places.

Introduction

How to "know" a place? What are the modalities by which we can study the character of a social place today, examine social interactions within it, and trace its unique rhythm? The vast growth in geo-located and time-stamped social media data such as tweets, check-ins, and images promises new challenges and opportunities to investigate these questions. This research is about city spaces and locative social media, what we can learn, what we can't learn about these spaces, and what the practical lessons and applications may be. It is a research that is a by-product of data-driven observation.

Public spaces offer us a way to escape the fast pace of urban life, they are places where people from various backgrounds can gather and participate in community meetings, events and festivals. They serve as a landmark, a point of reference and as an asset for local communities. But what do we know about these places and how can we study them? Until recently, researchers that wanted to study social interactions and usage of specific places had a very limited set of tools (such as surveys, documentation via photos or videos and crowd counting) that served their goals. In contrast to these earlier forms of observation, the high granularity of social media data provides researchers with the ability to visualize, analyze, and conceptualize the structure and character of particular geographical areas according to the multitude of social media activities produced within them.

As mobile devices are becoming increasingly ubiquitous and people are constantly encouraged to document their everyday activities, researchers, planners, and local community organizations are faced with new opportunities to better understand their locality through access to publicly shared social data. In this way, data generated by users of locative media tools might provide new ways to study activities in specific places and uncover local insights.

These insights, which are usually only available to a limited group of people such as community leaders and local advocates, were always highly coveted. Over the years, social scientists and urban planners used methods like interviews, surveys, people counting or photo and video documentation to study particular places and the social participation that takes place there.[1] The famous American urbanist William Whyte, for example, published in the 1970s one of the first works that tried to study and compare various public places in New York City.[2] Whyte set out to examine what makes a certain public plaza more sociable than another and for that he used video

recording, crowd mapping and interviews to synthesize several recommendations. Georges Perec conducted similar work on a much smaller scale. During a three days period, Perec documented the non-events, the mundane life of Place Saint-Sulpice, a public plaza in Paris as he observed it through the window of a nearby coffee shop.[3] More recently, Joachim Höflich followed the movement of people using mobile phones while walking through an Italian public plaza and drew maps that uncovered their behavioral patterns.[4]

Although these studies do provide meaningful insights about the ways people interact with other people as well as with the place itself, they are limited in scope and can only provide a glimpse into a specific time period in confined geographical area. In this way, comparing the use and activity of specific places turns out to be a challenging task that requires vast resources and considerable time. Computer scientists who attended this problem developed various techniques that utilized social data on a large scale from many places, people and times. However, these studies rarely examined the particularity of specific places within the city. Favoring an aggregated image of the entire city or of confined regions within the city, these representations override the unique socio-cultural aspects of a place and its dynamic structure in space and time.

Following Whyte, and 30 years later, this study traces three public parks in New York City, this time utilizing geo-tagged social media data from locative media platforms such as Instagram and Yelp. In the following sections, we will survey existing literature and showcase our data-driven exploration of these public spaces. We first illustrate several techniques that can help researchers approach the study of social media data from public places. More specifically, we use computational methods to look at various factors that can help us understand people use and navigation through three public parks in New York City. The results of this analysis show

differences in parks usage based on time of day, the prominence of public art as it appears in this data, as well as the unique activities and interests (based on textual analysis of references and caption from Yelp and Instagram data) that are offered in each of these public venues.

To summarize, we offer a preliminary conceptual and analytical work for a more nuanced understanding of physical places based on the social media data generated within them. By applying computational tools to data sets from various location-based social networks we are able to identify special characteristics and produce a comparative analysis of these places as well as examine the opportunities of using geo-tagged data for the study of urban public spaces. This research sets to depict what is "the social media image" of a public place and how can we use social media data to compare these places and trace their differences? And finally, who is left out? What are the demographics, activities and social interactions that are not captured by this data and should be taken in consideration when using this kind of data in decision-making processes?

The Study of Urban Spaces

The social scientific study of spaces via social media data can be tracked back to first explorations and usage of aerial photography in the aftermath of World War II by social scientists, who attempted to mash together for the first time aerial and ground/street level perspectives for the study of social, economic, political and cultural aspects of geographic areas. The researchers combined emerging forms of militaristic aerial representations with ethnographic fieldwork to "reveal" the structure of a particular geographic area, or what they called a "social space": "the division of a space according to the particular norms of a group". As explained by Jeanne Haffner, this new representational space was abstracted "from the chaos of

the ground but not divorced from it", it was "a model of the relationship between these analytical categories–a spatialization of complex social and economic relationships within a particular urban environment."[5]

With the growth in geo-located social media data, these urban representations take new forms and shapes, created by aggregating hundreds of millions of peoples' tweets, check-ins, images and videos into condensed representations of neighborhoods, cities, and of the entire earth. One trend in social media research has focused on identifying landmarks and points of interests that have high visibility (most shared or tagged) on social media data.[6] Other studies utilized users' profile data such as home city and past activity to denote a place most frequented by tourists or locals.[7] The resultant representations, however, completely neglect the temporal element of the data, create aggregated, cumulative and constant activity profile of an area, and do not capture real-life social dynamics.

Another strand in social media research aims to uncover collective geographic patterns in confined areas. For example, many studies have examined mobility patterns and urban dynamics. More closely related to our interest here are, Noulas et al. have examined geographical clustering based on the aggregated activities in an area, while Cranshaw et al. and Zhang et al. offers a glance into the areas of the city that like-minded people visit.[8] The Livehoods project for example shows how a series of bars, restaurants, parks, or shops may carry a strong connection for a certain group of people who include them in their social media profiles.[9]

While these studies overall continue to ignore temporal dynamics in the data and geographic area is considered in aggregate, the also apply clustering or homogeneity models in order to extract social *similarity* between different geographical locations in the city. In this way, these models

offer to restructure the city by means of tracing its social boundaries (where and when particular social groups go to) based on users' social media activities as apposed to pre-determined values or traditional hierarchies (i.e. municipal borders). The result, however, are homogeneous clusters of fixed entities that erase the *particularity* of a singular place and its dynamic nature in favor of its aggregation and categorization with other similar "types" of places with different levels of abstraction (i.e. areas frequented by locals vs. tourists). In other words, they override the particularity of a place in favor of its representation as a connected, networked whole with other similar places.

As information technology evolved, the ways in which we understand and engage with places is transformed by mobile media.[10] Existing computational research of the particularity of a place over social media networks are still rare in kind. A related and exceptional study in our regard examined the profile pictures of bar patrons in Austin, Texas illustrated how users' Foursquare profile photos conveyed information about the character and connotations of specific venue based on impressions about the types of people who frequent these venues.[11] In addition, Hochman and Manovich examined the dynamic representation of political, social and cultural event in particular location in the city.[12] Moreover, researched started studying the use of mobile phones and social interactions in publics spaces. Hampton et al. studied the impact of wireless Internet use on public spaces and showed that online activities in public spaces contribute to broader participation in the public sphere.[13] While recent studies that examined the use of location-based communication technology in public spaces showed how the use of Foursquare changes and impacts people's sense of place and promotes parochialization and personal attachment to the public space.[14]

Users of these locative media platforms generate ongoing flows of information that provide a glimpse into the daily activity of city dwellers. For this work, we have selected to focus on two main platforms: Instagram and Yelp. Although the affordances of each of these platforms differ, the locative aspect of the data is at their core. Using the platforms' API access (Application Programming Interface) as well web crawler that was developed especially for this work, we were able to access vast amounts of data that were tagged to various public spaces in the city of New York.

The first of these, Instagram, is a photo and video sharing social network for the mobile phone that was first introduced in October of 2010. Instagram users can take pictures and videos, apply various filters, and share them with their friends on the application or in many other social networks. The popular service has over 150 million active users as of September 2013.[15]

When sharing a photo or video users can choose to add it to their "Photo Map" a personal visualization that showcases the users' activity based on geographic data. In this way, a photo that is added to this personal map includes the specific latitude and longitude of the place where the photo was uploaded. The location can then be displayed to other users in a timeline or news feed where participants can view photos taken by the users they follow.

In contrary to the visual-centric Instagram, Yelp is an online reviews community which started in 2004 as a website that meant to provide its users an online urban guide. From a modest start as an email service for local business recommendations, the platform has grown considerably and was later transformed into a social networking service that receives almost half of its traffic from mobile devices. In September 2013 Yelp had a monthly average of 117 million unique visitors

and its mobile application was used on 11.2 million unique mobile devices on a monthly average.[16]

On the mobile phone versions, users are encouraged to check-in to a location and leave a review. Reviews on Yelp tend to be long and also include data such as the user hometown and score given which are not available in other check-in services. Due to relatively long life span of this service it has a vast dataset of reviews by its users. By the end of Q3 2013, Yelp users (referred to as Yelpers) had submitted more than 47 million local reviews. Reviewers can also upload photos and mark other reviews as "Useful", "Funny" or "Cool."

Locative social media data can provide new perspectives to better understand the spatial aspects of a public space. As users publicly share check-ins, reviews, photos and videos we must ask ourselves: what happens then when we aggregate this data from several parks? What can this data tell us about the spatial conditions, points of interests and groupings of people thought these public spaces? In the following sections we will examine the type of insights as well as limitations this data holds.

Spatial Reading

Each Instagram photo contains rich meta-data. These details include the username of its creator, the exact time the photo was taken as well as the exact location from where it was uploaded. This location in annotated by a latitude and longitude information that, when cross referenced, create a unique dot on the world's map. We started our exploration by retrieving all the publicly shared Instagram photos from three parks in Manhattan: Madison Square Park, Bryant Park and Union Square Park. Each of these parks is located next to various office buildings, food venders, and

public transport hubs. Using Instagram API interface we gathered all the publicly shared geo-tagged photos from theses parks over a period of 6 months (11/20/2012-04/15/2013). We resulted with the following numbers of photos: Union Square: 14,593, Bryant Park: 18,352 and Madison Square Park: 14,989.

When plotting our data over a city map, we can see several interesting formations of patterns among the photos. For example, in the Union Square plot we can see how there are two main high-density locations: the middle south part and the top west part. In Bryant Park on the other hand, there is only one center area along the middle part of the park that shows high numbers of photos. Finally, in Madison Square Park we can see that large portion of the photos taken at the park where tagged to the south west part of it. When looking at the photos from each of these locations we examine the reasons for these dense plots.

In Bryant Park, the center area of the park (or the great lawn) is the home of the ice skating rink during the winter as well as other community events during the year such as free public yoga sessions. The park, which was re-designed in 1930s by Robert Moses, the famous "master builder" of New York City, follows traditional symmetrical European architecture including a center fountain feature and a main lawn area. This layout promotes the grouping of photos in its center and as we can see the symmetrical plots of photos follows closely the traditional architectural layout of the park (Figure 1).

The plots of Union square on the other hand display two different concentrations. One concentration is located in the north west part of the square and another one in its southern central part (Figure 1). When examining the photos from these two areas we discovered the northern grouping is attributed to the farmers market that takes place on Monday, Wednesday,

Friday, and Saturdays while the southern part serves as a public venue for demonstrations and public gatherings.

Madison Square Park has a relatively equal coverage throughout the park except for the bottom west part that is consisted of mainly pictures of the Flat Iron building from across the street. This spread of the photos can be mostly attributed to the renovation of the park that was completed in June 2001. This renovation created several different points of interests throughout the park such as a dog run, a center water feature, a kids playground and also brought in a ongoing series of outdoor sculptures exhibitions.

<Figure 1>

Caption: Geographical plotting of publicly shared geo-tagged Instagram photos from 11/20/2012-04/15/2013. Left: Union Square - 14,593 photos, Center: Bryant Park - 18,352 photos, Right: Madison Square Park - 14,989 photos.

Temporal Reading

This data can also provide a more historical perspective and help us examine temporal trends and use cases of the parks over several months or years. In this way, we can study upload times of photos as an indicator of users activity in the park and then look at a time series and find out which days are busier than others. For example, in the following graphs we can see the average rate of photos per hour in each of these locations (Figure 2a). Looking at these charts we can see that most of the parks are busier around the afternoons with Madison Square Park peaking at 4pm, Union Square at 5pm and Bryant Park at 6pm. Even though the peaks are just about similar between these places, we can see how the amount of photos during the afternoons and evenings

at Bryant Park is a rate of one and a half times bigger than during the lunch hours (1000 vs. 1500 photos per hour in the afternoons).

We can also extract daily patterns out of this data. In figure 2b we can see how photo-sharing activity is different in city parks throughout the week. Bryant Park for example shows a high number of photos during the weekend with its peak on Saturday, while Union Square peaks on Sunday and Madison Square Park on Thursdays.

<Figure 2a>

<Figure 2b>

Caption:

(a) Hourly time series of publicly shared geo-tagged Instagram photos from 11/20/2012-04/15/2013. Left: Union Square - 14,593 photos, Center: Bryant Park - 18,352 photos, Right: Madison Square Park - 14,989 photos.

(b) Daily time series plotting of publicly shared geo-tagged Instagram photos from 11/20/2012-04/15/2013. Left: Union Square - 14,593 photos, Center: Bryant Park - 18,352 photos, Right: Madison Square Park - 14,989 photos.

By looking at a particular physical location from a temporal perspective we can uncover patterns that were not visible before. For example, we can see the effect of seasons, weather conditions or catastrophic events such as hurricanes on theses places. When aggregating these temporal signals, we can start read the rhythm of a place,[17] The cycles of visits throughout week days and hours of each day.

Tracing Experiences

In his work, Whyte looked at the different factors that make a successful public plaza. Among these were the availability and type of sitting, the configuration of the place in relation to the sun and the wind as well as the importance of trees, water and art to the experiences of their visitors. Moreover, a special attention was given to the existence of food vendors and restaurants as places where patrons can enjoy while exploring and socializing in the public realm. These factors play a large role in the experiences of people in these public spaces as well as the social interactions that take place there.

Social media can provide us a way to tap the visitors' experiences through following their online social interaction and activity. In this case we looked at the reviews that were posted to these venues. By crawling the yelp reviews that were tagged to these parks and using textual analysis techniques, we were able to extract the main themes that appear in these user-generated texts. In the following word clouds (figure 3a, 3b, 3c) we can see the occurrence of various words throughout the reviews. These visualizations display the main topics that people find interesting to share and review.

<Figure 3a, 3b, 3c>

Caption: Word Cloud Plotting of Yelp Review from (a) Union Square – 226 reviews. (b) Bryant park – 462 reviews. Madison Square Park – 221 reviews.

First, we can see the high occurrence of the word "people" in each of these word clouds (Figure 3a, 3b, 3c). Although it might not be surprising that this is among the most common word in these reviews, it does show how these places are center for social gatherings of many individuals.

However, if we dig deeper and look at another form of visualization that shows relations between words we can see how the word "people" is closely related to the verb "watch" displaying the special practice of "people watching" that takes place in these public parks.

This practice is also closely related to the topic of sitting conventions in these parks. Sitting has been a much debated in the realm of urban planning and designers have tried many different methods to provide sitting options that will be both sustainable and easily maintainable as well as comfortable and usable for the general public. One of the recommendations in Whyte's work described the importance of moveable chairs and tables.

This recommendation was applied in each of these parks but the number of chairs and tables in Byrant Park exceeds by a large number the other parks. In 1988 Bryant Park was closed for a four-year project that enhanced the very traditional French garden design, improved and repair paths and lighting as well as placed movable chairs and tables throughout the park.[18] This difference among the parks can be also seen in the mentions of chairs and tables in the review. While all of the parks have mentions of these, Bryant Park's visualization shows the magnitude of these occurrences together with their close relationship with the mentions of the verb "enjoy" (Figure 3b).

Food plays another important part in the experience of public parks and plazas. When examining the textual analysis results from these reviews we can see how "Shake Shack" a popular American fast food restaurants appears prominently in the Madison Square Park visualization. This is mostly due to the 2004 addition of this permanent food stand that serves hamburgers, hot dogs and shakes.

In addition, special features in the park can also come across in this kind of data. For example, the placement of art, dog run, farmers market, or a s skating rink are all activities and facilities that have an important part in the life of the public space (Figure 3a, Figure 3c).

<Figure 4a, 4b, 4c>

Caption: Phrase Net visualization displays networks of related words of Yelp Review from (a) Union Square – 226 reviews. (b) Bryant park – 462 reviews. Madison Square Park – 221 reviews.

Who is Left Out?

Contrary to other methods such as small scale observations or the various interviews and surveys that did try and capture the varied demographics in these publics spaces, social media data is pre-filtered to a very specific group of users. While studying this data we must take in consideration people who do now own a mobile phone, as well as people that do now own a smartphone. Despite the proliferation of smartphones usage in the US, only 50% of mobile users are using one. Moreover, only 30% percent of them use the location indication of their phone over social media.[19]

We are therefore left with a population that is reasonably tech savvy, with the means to own and maintain a smartphones, document and participate in social media platforms as well as select to share their daily activity publicly. This bias is particularly important when studying public spaces. As opposed to other places such as home and work, public spaces, also referred as third places,[20] are suppose to be a place that people from various background can come together. A public sphere that welcomes people from all levels of society. When we use only geo-tagged social media data, we are inclined to ignore a large portion of the city's population.

Considering this kind of data as a detailed reflection of real life is problematic as is it is far from being a precise indication of location of social interactions. As Larissa Hjorth notes there are many playful, creative practices that emerge on these platforms,[21] And as Barkhuus et al. have shown, expressing one's location over a social network may also signal mood, lifestyle, or life events and maintain or support intimate social relationships.[22] The manner in which certain locations or activities are named, captioned, or annotated can be understood as performative. Cramer et al. provide evidence for this claim in their study of Foursquare users and the common practice of creating "imaginary" places, and fictitious or creative names for places or events.[23] Humphreys also examines how practices of cataloging and archiving personal mobility and presence within place encourage intimate bonding with friends, are used in the service of bragging or "showing off", self-promotion, making inside jokes, recording places as a memory aid, or receiving points or rewards for particular habits or actions.[24]

Moreover, in many instances, social media signals in public spaces are biased towards special events or activities that are out of the usual. Consequently, regular patterns are less well documented. For example, people that frequent the park in order to read a book, walk their dogs or eat lunch will not necessarily be inclined to share this mundane activity on social media. On the other hand, if there was a street artists or a band that would play in the park, these instances might trigger more people to share their activity with their online friends and followers.

Conclusion

There is no denying that our perspectives and understandings of human activity in urban areas are changing. As a rapidly growing number of people constantly log and publicly share their

daily activity, more and more companies, urban planners and researchers are gaining access to highly granulated social data of urban activity that was not available before.

Studying a specific geographic place was always a challenging task. Public spaces are therefore fertile ground to study geo-tagged social media data since they provide a place that is (if done right) designed to be an open, inviting public sphere that supports local social interactions. As Lofland notes, these spaces level differences between people on the base of their social circles and diverse backgrounds. It is the public sphere in its glory, a place to meet both friends and strangers.[25]

In this paper we showed a glimpse into the type of data and insights that we can extract from studying these kind of information flows as well as the data that we can not access, the demographics that are left behind and the performance aspects of the data. It is therefore highly crucial to understand the biases and caveats that are inherited in this type of data. This data in not only biased by the specific demographics that generate it but also by the social practices and norms that are enabled by these platforms. In this way, ideas regarding access to technology and online connectivity are joining ideas such as gaming and exhibition and performance of the self to tell us that many of the data points should not be considered as precise indication of location or social interactions.[26] They are inherently biased and they should be treated as such.

To conclude, geo-tagged social media offers a new lens to better understand the use of urban public places. Every day an ongoing stream of information is produced by various users who act in a constant documentation effort of the life of the park, tweeting, reviewing, checking-in and taking pictures of themselves or others (using the hashtag #peoplewatching), social events and art installations. However, as with any other skewed lens, some artifacts are receiving more

attention than others. It is an additional layer of information that can shed new light on old questions or give rise to new questions that were not available before. However, using this kind of data does not eliminate the need to perform additional, more traditional, research such as observations, surveys and interviews. Only by applying mix of both qualitative and quantitative methods, can we advance our understanding of our public spaces in our efforts to make them a better venue to socialize and enjoy as part of the experience of living in highly dense urban habitat.

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