Politics of Space and its Shadows

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This paper examines what the public, architects, urban designers, and city officials can learn about significant public spaces from emergent technologies and data generated from growing social media. Interrogating this analytical method aids us to recognize social media's potentials, such as gaining a deeper understanding of the relationship between how public spaces are "represented" and how they are "physically experienced" through the means of technology. This investigation combines emerging image recognizing algorithms—Semantic Segmentation—with location-tagged images from Instagram to investigate the newly opened Seoullo 7017 walkway in Seoul. It argues that we should recognize these newly generated "big data" as a form of "collective intelligence" that can stimulate proactive engagement with our everyday interactions with public space. Equally, the findings of this investigation reveal to our society how to cautiously engage these "collective intelligence" with counterbalancing values.

SMART CITY: TECHNOLOGY AND THEIR VALUES

Discussions about "smart cities" and their implementations are increasing along with the rise of digital technologies. However, many smart city discussions are led by large corporates who have a direct interest in the implementation of their technological solutions. Consequently, discussions prioritize tend to technology over other essential values. Rem Koolhaas has also voiced his concerns on this by stating "if we simply let cyberspace run its course to a future determined by Silicon Valley, those libertarian-minded engineers will paradoxically lead us to cities shackled by algorithmic conformity."[1] As a starting point for a more extensive investigation into how technologies related to smart cities can be a tool for promoting public values over mere commercial interests, the paper investigates the wider public implications of emerging digital tools and data.

SEOULLO 7017 AS A PROVING GROUND

This paper examines a newly built public space in Seoul, Korea—Seoullo 7017—to explore the potentials of better understanding public spaces through emerging technologies and social media (figure 1).[2] Dutch architects MVRDV won an international competition to transform a decommissioned elevated expressway from the 1970s into a pedestrian walkway. The original *Seoul-go-ga* (Seoul-highway) was built as an elevated expressway to facilitate the increasing number of motor vehicles in rapidly growing Seoul in the 70s (figure 2). City officials later decommissioned this modernist transportation infrastructure as it became structurally unsound. However, instead of demolishing the structure, it was converted into an elevated walkway in 2017. In this sense, Seoullo 7017 is much similar to New York City's High Line, converting a mobility infrastructure into an urban space that prioritizes pedestrians.

COLLECTING DATA FROM INSTAGRAM

We extracted *Instagram* images tagged under "Seoullo 7017" location to examine Seoullo 7017—a well-known public space—through social media. We used *Instagram*, as it is one of the most popular and widely used photo-based social media. We collected 8,841 *Instagram* images from just prior to its opening in May 2017 for a period of a month (May 17th to June 19th, 2017).[3]

CHALLENGES: DATA BIAS & PROPRIETARY DATA

We were aware that the moment we decided to use social media—*Instagram* in particular—that our data would be biased. This selective bias would privilege a particular demographic that has an active engagement with the social media. This awareness was an important point for us to remember in making any conclusions about the analysis we conducted. However, as nascent as it might be, we wanted to explore emerging technologies and data collection methods to learn about their potentials and their imitations, imaginably expanding the number of tools that help us understand public spaces better.

Although there were many publicly available photos and images tagged under "Seoullo 7017" the data had to be accessed through a private company's platform—*Instagram*—with its own rules, meaning that the notion of the "public" depending on how it is defined was compromised. Furthermore, limited resources, time, and restricted access to proprietary information hindered our free and direct access to raw data we wanted to use for this research. We first downloaded raw *Instagram* images available to an *Instagram* logged-in account for the period mentioned above with their linked hashtags and comments.

ANALYSIS: SIFTING AND SEMANTIC SEGMENTATION

When we first glanced at the raw *Instagram* images, there were many photos of Seoullo 7017's physical spaces as expected. However, there were also a significant number of images that were zoomed-in images of food, people, posters, and graphic images that were taken near or from Seoullo 7017. Many of these images did not have much significant

Figure 1: Seoullo 7017 with the historical Seoul Station in the background. July 29, 2017. Photo by author.

spatial information in themselves, apart from their location. Moreover, there were also advertisements and escort spams, which seemed irrelevant that attempted to increase their exposure to *Instagram* users by taking advantage of well-trafficked popular location tags.

With the limited time and resources, we were not able to develop an automated algorithm that would sift through all of the images that would categorize them into spatially relevant and irrelevant images. Therefore, we first manually went through all of the images one by one to categorize them into those two categories.

Once this larger categorization was complete, we were able to run "semantic segmentation" for the spatially relevant images (figure 3). This process identified for us what kinds of "objects" were included in each image and their proportion within the whole image. We used semantic segmentation as one of the ways to understand what kinds of spatial qualities were captured in these *Instagram* images. This gave us some clue on how the public was interacting with the public space, but also what kind of spatial qualities were captured in these massive number of images.

Semantic segmentation parses images into semantic regions. These regions are then identified as "objects" and labeled as such. This process assigns meaning to parsed regions as objects within an image, as well as computing the percentage of each object within the overall image. We used "Cascade-DilatedNe" trained on "ADE20K dataset" to semantically segment our raw *Instagram* images.[4]

EVALUATING SEOULLO 7017'S SPATIAL QUALITIES

Once all of the spatially relevant images were segmented, we were able to identify the top dominant "objects" that appeared in these images. Semantic segmentation results of each image were averaged to generate the following results.

The semantically segmented images from Seoullo 7017 on average included 16.9% of the sky; 6.5% of tree/plants; 12.9% of buildings; 11.3% of persons; and 7.7% of floors.

We also analyzed the frequency of hashtags associated with the images from Seoullo 7017. In the Korean language, the most popular hashtags were: "walk" (365); "night view" (357); "weekend" (215); "selfie" (192); "travel" (183) and "date" (157). Other meaningful words found in the comments associated with the images from Seoullo 7017 were: "today" (698); "photo" (669); "here"(657); "Seoul Station" (615); "really" (535); "like" (455); "person" (452); "stroll" (266); "night view" (266); "I" (257); and "at night" (256).

These words combined with what was found in the images indicate the general feel and experience of Seoullo 7017 are positive, where the public appreciate it as a place of leisure. We can also hypothesize that users with a positive experience of

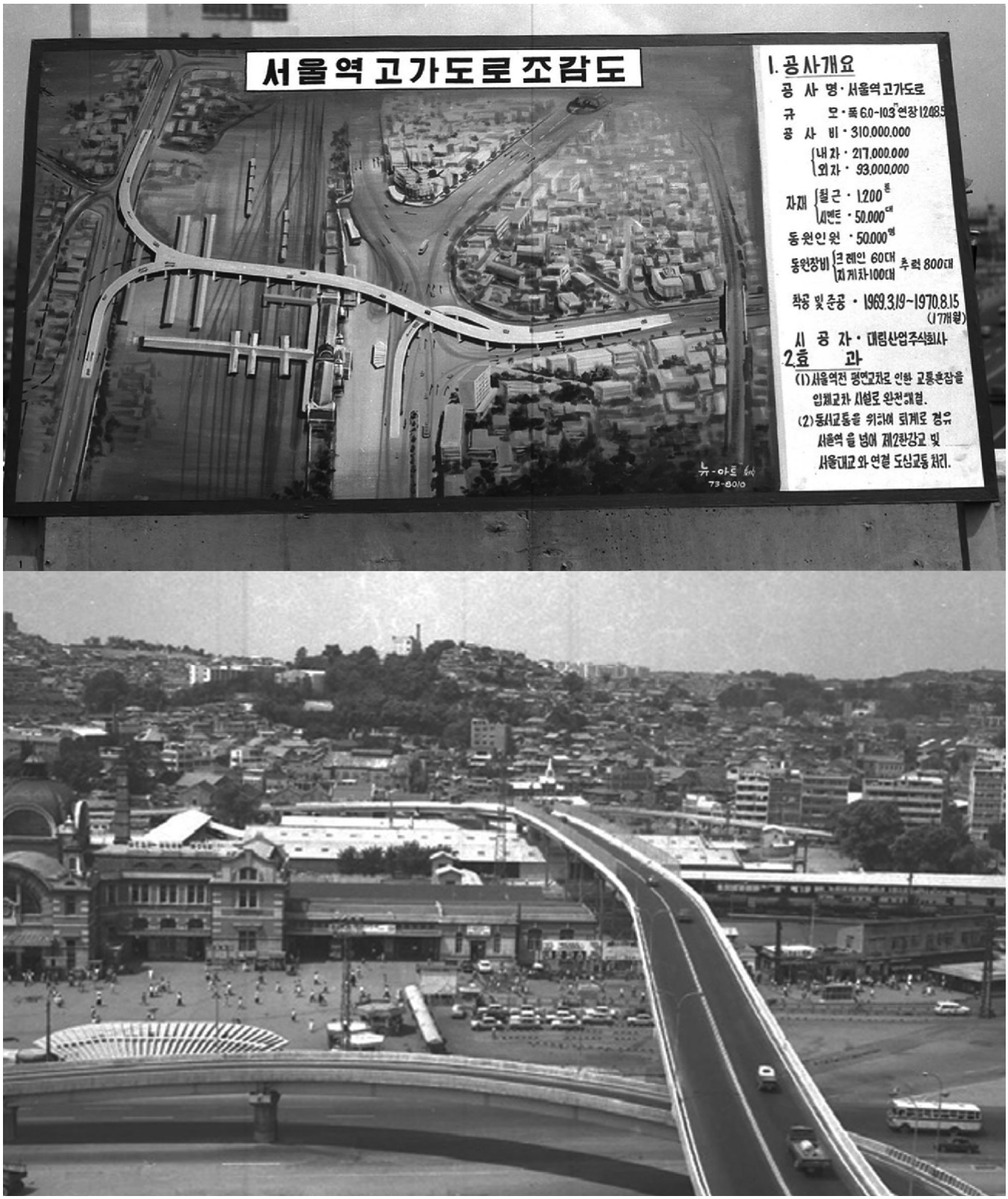

Figure 2: (Top) "Bird'e-eye-view of Seoul Station go-ga" (Seoul Station highway), c.1969. Seoullo Web Archive. (Bottom) View of Seoul Station highway under construction with Seoul Station in the background, May 29, 1970. Source: Seoullo Web Archive. (Top) http://seoullo7017.seoul.go.kr/img/front/ img_history01_rolling08.jpg; (Bottom) http://seoullo7017.seoul.go.kr/img/front/img_history01_rolling25.jpg.

Figure 3: Clock wise from top left. Original image; semanitcally segmented image; semantic segmenation result list; original and semanitcally segmented image overlaid on top of each other with object pixel ratios.

public space may be more encouraged to upload an image to social media. In this limited study, the spatial qualities generated from the semantic segmentation, hashtag words, and words from comments were analyzed independently from each other.

However, a further study of the frequency and relationships between these three sets of data could also reveal additional insight into how the public interacts with popular public spaces. Additionally, a more seamless collection of data combined with more complex algorithm stretching over an extended period could provide us with more profound insights into how various parameters change and interact at different times of the day, week, and seasons.

A COMPARATIVE STUDY: THE HIGH LINE

While we were conducting this research, we became interested in how this new Seoullo might compare to a similar, but perhaps more popular, and established High Line located in New York City.

To find out, we collected over 8,000 *Instagram* photos from the "High Line" through the same method. However, as the High Line was much more popular, we only had to collect images for a period of a week to have the equivalent number of images to that of Seoullo 7017.[5]

When Seoullo 7017 and High Line were compared, we were able to say that Seoullo 7017 had less vegetation than the High Line (6.5% vs. 16.8%). This figure can mean that Seoullo 7017 is more exposed to the elements based on the photos generated by its users. Seoullo 7017's higher percentage of the sky also illustrates this identical spatial quality (16.9% vs. 12.0%). Photos from the High Line include more buildings than those from Seoullo 7017 (21.6% vs. 12.9%). Manhattan's much higher building density near the High Line and perhaps the photogenic architecture surrounding it might be one of the explanations for these figures (figure 4). Some of the popular hashtags for the High Line were "nyc (802);" "highline (703);" "new york (703);" "manhattan (228);" "chelsea (178);" "travel (155);" "summer (129);" and "love (84)." Further, "love (1275);" "like (479);" "happy (457);" and "beautiful (416)" were among the most frequently used words in the comments associated with the High Line.

With the data from the segmentation, we also investigated correlations between semantically segmented elements through scatter plot graphs for both Seoullo 7017 and the High Line. Although we did not identify a significant correlation between elements and factors for both cases, we were able to confirm some of our assumptions. For example, an image with less proportion of "building" would have more portion of "persons" in it.

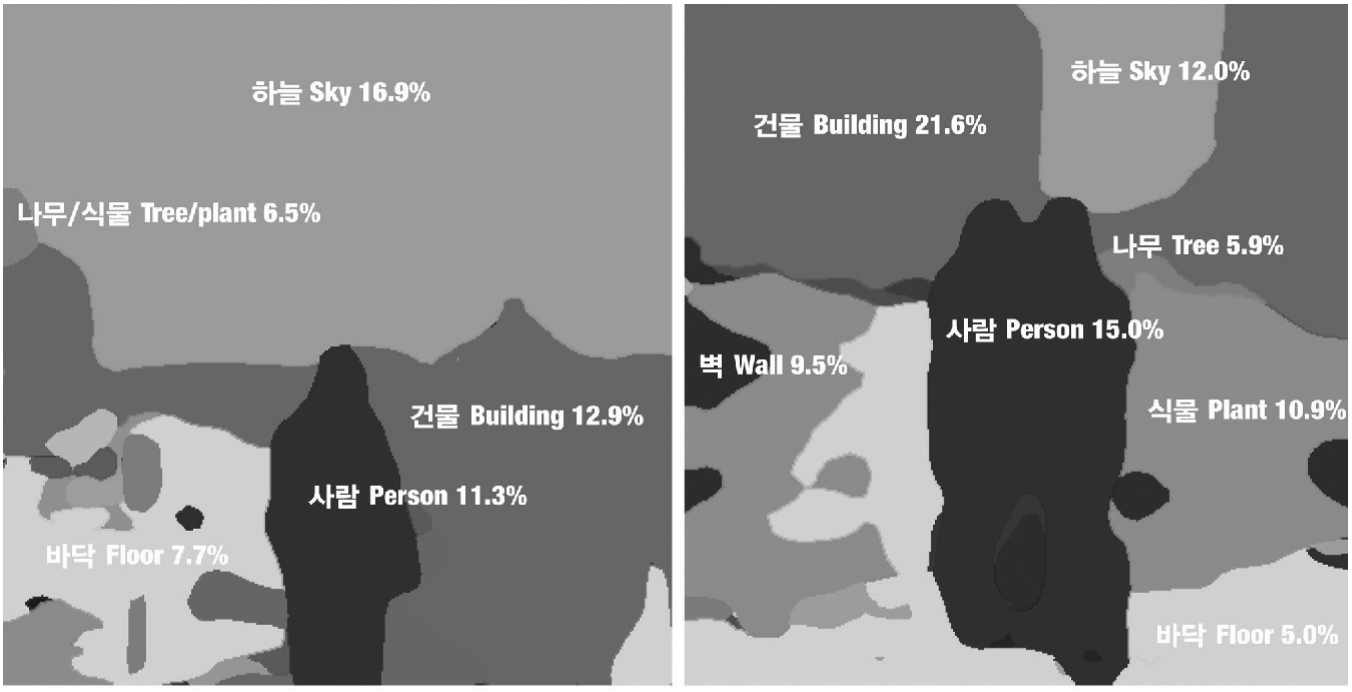

Figure 4: Seoullo 7017 and the High Line comparison. 2017. By author.

Most of these results seemed obvious, but they provided us with a robust data and visual evidence that would help us understand the public's experience in significant urban spaces through emergent technologies when they are combined with social media.

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The following finding in this research more acutely illustrated the aforementioned selective bias. Out of the 8,841 "spectacle" portrayals of Seoullo 7017, there was only one image that captured or represented what we might see as "non-participating" or an "excluded" person from this public space (figure 5). While it is essential that we engage these emerging tools, the 'big data' habitually privilege the spectacle and overlook the "excluded." This research reveals some of the potentials in using these new emerging technologies. At the same time, it underscores our important task to constantly reach out and hear the voices of the "others" and the "excluded" behind these spectacular public spaces that are often masked by glorified social media.

CONCLUSION

This research is a nascent step towards understanding how one of emerging technologies and social media can provide additional tools that enhance the understanding, thus improving the everyday experience in our public spaces.[6]

Although the research provided some results to analyze and compare, learning generated from the method developed throughout this investigation is more fruitful.

Following steps can be taken to refine this starting point into a more robust method. We will investigate how to work with proprietary data that can be considered within the public domain. The streamlining of access to raw data will significantly improve the efficiency of data collection and subsequent analysis. These issues also touch on important questions such as how we define the "public"and the "collective" when public spaces are increasingly privatized.

Focusing on more technical aspects, we will look into developing an algorithm that can automate some of the initial categorizing to accelerate the overall workflow. Speeding this process could also mean a possibility of producing a public space "heatmap" based on real-time data. Additionally, with more data, we could do additional comparative studies of different public spaces within a city or between different public spaces around the world. We will also explore ways to carefully analyze what is included in the "non-spatial" images and their proportion to all of the images from a place to further understand its nuanced characteristics. We will look at developing algorithms to connect and analyze the correlations between what was identified as the dominant object in an image and what kinds of keywords or hashtags it may be closely associated with.

We are well aware that these results have their limitations. However, this research starts to investigate different "methods" in how designers and users of public spaces can better understand their surroundings through these emerging data tools when combined with social media.

Figure 5: Screenshot of “Tale of two cities” by “stephanemot,”on Instagram, May 22, 2017. https://www.instagram.com/p/ BUYBQd0l80u/?taken-by=stephanemot.

ENDNOTES

1. Nathan Gardels, “Rem Koolhaas: The digital city will lead to ‘total conformity’,” *The Washington Post*, July 9, 2018, accessed July 22, 2018, https://www.washingtonpost.com/news/theworldpost/wp/2018/07/09/rem-koolhaas.
2. Acknowledgments: This research is part of an expanded ongoing collaboration work with Namju Lee at Environmental Systems Research Institute (Esri) and the author. Seoul Design Foundation generously funded the first iteration of this research in 2016. This initial finding was exhibited Inaugural Seoul Biennale’s International Studio exhibition curated by Prof. John Hong (Seoul National University) at the inaugural Seoul Biennale of Architecture and Urbanism directed by Hyungmin Pai and Alejandro Zaera-Polo in Seoul, Korea. Sep 2 - Nov 5, 2017. Further information on this research can be found at http://www.axustudio.com/8596372/exhibition-politics-of-space-and-its-shadows.
3. 8,841 raw *Instagram* images with “Seoullo 7017” (“서울로 7017”) location tags. May 17 – June 19, 2017, https://www.instagram.com/explore/locations/940398039397248/7017.
4. We used “Scene Segmentation Demo” at *MIT CSAIL Computer Vision Group* 2016 for our sample “semantic segmentation” (http://scenesegmentation.csail.mit.edu). We used “Cascade-DilatedNe” trained on “ADE20K dataset” to “semantically segment” our raw images downloaded from *Instagram*. “ADE20K Dataset” was developed by B. Zhou, H. Zhao, X. Puig, S. Fidler, A. Barriuso, and A. Torralba. *Computer Vision and Pattern Recognition* (CVPR), 2017.
5. 8,779 raw *Instagram* images with “The High Line” location tags. June 16 – June 25, 2017, https://www.instagram.com/explore/locations/3001573/the-high-line.
6. As of July 22, 2018, 11,307,98 people visited Seoullo since its opening on May 20, 2017. Source: http://seoullo7017.seoul.go.kr/SSF/H/ARC/010/01010.do.