

Insta-Turin. Revising The Notion Of Proximity And Mapping Communities Of 280 Venues In Cities Through Instagram Social Urban Data

Original

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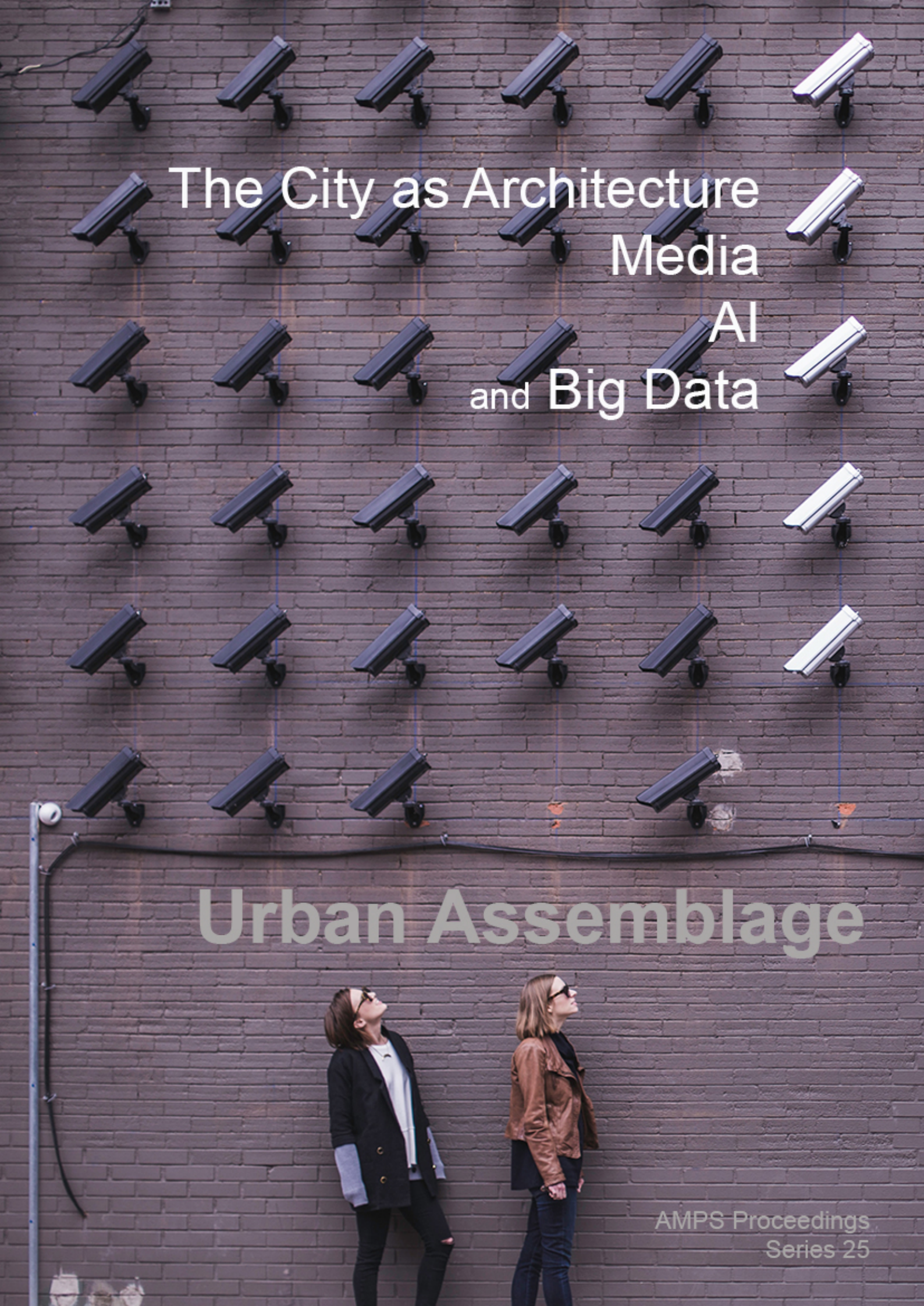
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A brick wall is covered with a grid of surveillance cameras. There are 30 cameras in total, arranged in 5 rows and 6 columns. Most are black, but the ones in the rightmost column are silver. Faint blue lines form a grid across the wall, passing through the cameras. At the bottom, two women are standing and looking up at the cameras. The woman on the left is wearing a black jacket and the woman on the right is wearing a brown leather jacket.

The City as Architecture Media AI and Big Data

Urban Assemblage

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INTRODUCTION

Urban Assemblage: The City as Architecture, Media, AI and Big Data

The central idea underpinning this volume is that cities are today characterised by assemblages: unstructured collections of elements that include people, machines, and physical and digital manifestations of architecture and design. Such elements are characterised by an evolving relationship, where roles and internal hierarchies change over time. All elements of the public life are interconnected with technology and artificial intelligence (AI).

The built environment has become a site for the production, processing and sharing of information daily through the software interlaced with it. It is also a place designed, envisaged and increasingly built through data-based digital architecture, planning and construction. Advanced parametric modelling envisages data in both building design and city management. Augmented reality mediates our experience of the city with layers of information. Digital infrastructure interconnects our city and building services. The result is a series of complex interactions of people, place and data and the establishment of the 'digital city', 'smart buildings' and 'intelligent' urbanism.

Today, the potential for technology and data to alter how we design, live and experience our cities is obvious and everywhere. However, there are concerns. GIS, Google Maps and Facebook all offer interconnected information on urban life. They are also conduits for the collation of personal data and its misuse. The assumption of digital access for all leads some to worry about issues of social exclusion. Sociologists highlight the dangers of the digital dependency of future generations. 3D printed buildings threaten job losses in the construction industry. The idea of parametric urbanism is an anathema to many for whom city is a place of interpersonal interaction.

This volume collects 30 chapters that explore the notion of urban assemblages in critical ways and through different lenses. Taking an interdisciplinary approach, case studies, theoretical analyses and thought-provoking articles are combined into themes that include socio-political aspects of cities, digital and physical in heritage, art and history, planning and human-centred technological approaches to the city and the public realm.

In taking on these themes, the papers presented here from the Urban Assemblage conference at the University of Hertfordshire offer a fascinating engagement with some of the most significant issues informing how we understand the contemporary 'hybrid' city.

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INSTA-TURIN. REVISING THE NOTION OF PROXIMITY AND MAPPING COMMUNITIES OF VENUES IN CITIES THROUGH INSTAGRAM SOCIAL URBAN DATA

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INTRODUCTION

The aim of this essay is to explore how the contemporary forms of social interactions occur in the urban space and how they affect the relationship between venues in the city.

Electronic communications have been described as new forms of sociality¹ overcoming the relevance of the face-to face culture and welcoming a new form of communities based on fluid personal networks.² The success of this phenomenon can be traced back to the loss of meaning in the previous forms of social interaction, with the new one ushering a more pivotal role for the subject.³ These contemporary forms of “communitying” when taking place in the urban space subject it to a complex layering of different evolving and overlapping hierarchies.⁴

Under this perspective, Lefebvre’s conception of the everyday as the “space” where the actual life occurs⁵ and the Certeau’s idea of “*Wandersmänner*”, the general practitioners of the city writing the urban text⁶, find further relevance. Indeed, the plural nature of life in the city finds its agency in the “banality of the everyday life” and in the so-called “recurring practices”, characterized by transitivity, manifoldness, and the fact of leaving footprints and imprints.⁷

Research on these “recurring practices” have been recently made possible by the availability of an enormous amount of data⁸ allowing urban scholars to rely on vast and heterogeneous datasets coming from different sources including social media. As any process of data gathering and analysis, however, any research founded on social urban data must be aware of the potential biases of the datasets.⁹

RELEVANCE OF INSTAGRAM SOCIAL URBAN DATA

Despite the growing interest on the application of social urban data, most scholars in the field of urban studies have only focused on Foursquare or Twitter, and little research have been deploying Instagram¹⁰. At the time when this work was developed, the situation was similar despite Instagram counting 894.9 million of accounts reached in the world and being the fourth most popular social media in Italy.¹¹

As Boy and Uitermark drew, the reasons for such a scarceness seems to be related to the reliability of information depicted on the platform, which might not reflect reality. Users tend to select, filter,

edulcorate the reality of their lives before posting content on Instagram and therefore the information potentially obtained is biased and cannot be used as proxies of people's behaviour in the city.¹²

In the present paper, we claim that what is perceived as a bias is on the contrary what gives relevance to the data derivable from Instagram geotagged posts. As we will argue, the composing elements of each post make Instagram a reliable source of data, thanks to its three main components: the user, the image, and the geotag.

The user

Amin and Thrift underline the intrinsic unattainability of the "everyday" in the contemporary urban framework, partially uncovered by Walter Benjamin's "flâneur", whose idle walk through the streets and his receptive recording of the phenomena happening around him overcome the normal distract use of architecture. These findings, however insightful, are always to a certain extent obviously biased by being the personal accounts of single individuals.¹³

The users of Instagram experience the city during their everyday life till their attention is attracted by a specific aspect of the urban life, they record it and share it with the community of users. Thus, Instagram users may be regarded as "flâneurs".

The biases deriving from the one-sided perspective of traditional flâneurs' accounts are now absorbed by the pervasiveness of the practice among the whole audience of the social platform. The intrinsic subjectivity of flânerie becomes objectivity because this "can be pursued only by multiplying the point of observations. The more numerous and partial are the perspectives from which a phenomenon is considered, the more objective and impartial will be its observation"¹⁴

According to Venturini, objectivity is, then, directly proportional to the number of points of observation – and Instagram users are indeed a lot – and to the partiality of these perspectives. This process of pervasive flânerie described above is in line with the concept of the individual as an actor and a producer in contemporary society. In the postsocial environment the imagination is no longer an imposed category, but it has been replaced by an imagination centered on individual, self-constructing significations, and processes.¹⁵ Hence, the sum of the contents produced by subjective self-centred users is per se relevant and objectively evaluable.

The image

The accounts of these masses of "flâneurs" are therefore images whose relevance in the network society is widely accepted and known. However, Instagram images have been described as partial – as they described only a part of the individual's experiences – and depicting a distorted reality.

The disapproval of the critics is founded on two main claims: the first regards the construction of the image of the city itself and the second is the overcoming of the alleged virtual-real dichotomy from a philosophical perspective.

Considering the construction of the image of the city, Lynch describes "environmental images" as "the result of a two-way process between the observer and his environment"¹⁶. The selection of certain elements is at the root of the composition of these images as they are made by three main components. The first is identity, stressing the individuality behind the construction of that image, the second is the structure, as images should put in relation according to some logic the producer and the object, and the third is meaning, practically or emotionally related to the observer.¹⁷ It emerges clearly that selection is the foundation of the construction of the image of a city for an observer. Therefore, the blamed selectiveness of Instagram contents is indeed what makes them extremely even more relevant for analysis, rather than if users shared every single space they encounter during their daily lives.

As far as regard the transfiguration of the “real” object into a “virtual” fake representation, a philosophical approach should be involved to discuss the nature of virtuality itself in the digital society and locative media.

The work of De Souza e Silva and Sutko¹⁸ stresses how the Platonic-Baudrillardian approach, disregarding the virtual in any form to either simulation or representation, is not suited to describe the complex relationships occurring between the real and the virtual in locative media. The Aristotelean-Deleuzean approach, however, conceives the real moving across the states of “act” and “potential” and, under this perspective “while the virtual corresponds to the potential state, which is actualized through the act of becoming, the actual is realized potential”¹⁹

Therefore, the contemporary subject-centred imagination²⁰ does not simply embellish reality by depicting it with an Instagram post in a “nicer” manner. Instead and more profoundly, it unveils – during the process of “flânerie” previously explained – the potential state of places and venues.

The geotag

Instagram is a non-Location Based Social Network – it is not necessary to tag a venue to share contents – therefore the act of geotagging is a conscious choice of the user, whose motivations are under discussion. Two main theories have emerged: one claims that users are keen to “showing off” to other people where they have been,²¹ the other that the act is built on the will to store memories connected to places to recall them in the future.²²

These two motivations are not necessarily conflicting and, when related to previous social studies, they allow us to consider the act of geotagging a meaningful social act performed by the user.

According to Bourdieu, distinguishing oneself from others is a part of the humans’ attitude. The aesthetic choices made by individuals have a classist dimension, as they are made in opposition with the choices made by individuals belonging to other social classes.²³ Distinguishing oneself by marking one’s passage in a place should be then interpreted as a social act, through which the individual testifies his/her belonging to a certain social milieu.

Even the aspect of memory, generally referred to as a more intimate and personal sphere of the self, when it takes place through the sharing of that information may be regarded as a social act. Memory, in fact, has been theorized as a “collective construct” related to the dimension of the group identity.²⁴

In conclusion, the conscious and deliberate choice of geotagging oneself in a venue with an Instagram post is a social act in the construction and definition of one’s identity in relation to other individuals, through the category of distinction and memory.

DEPLOYED METHODOLOGY

The practical application of the theoretical framework presented above has been conducted in the city of Turin (Italy) on a dataset gathered during the research work, insisting on a period of one solar year from December 2018 to December 2019.

Data and methods²⁵

Despite at the time of the research Instagram’s application programming interface (API) were no longer allowing the direct collection of data, it was still possible the research of posts according to “places” on the desktop version of the social media, sorted by date from the newest to the oldest.

Data was mined by deploying several algorithms and with a methodology articulated in three phases. First, the individuation of venues on the platform Yelp, followed by the association to the univocal numerical Instagram code and, last, the data scraping of the posts geotagged in those venues up to a year before.

Fifteen out the twenty-two categories of Yelp were selected due to their urban and social nature and the pertinence to the research,²⁶ identifying approximately 6,300 venues in the city of Turin.

The association to corresponding venues on Instagram reduced the number of them to 2,178, furtherly reduced to 1,071 after the data scraping of posts, since not every venue present on Instagram had posts geotagged in them.

The final dataset consists of 354,503 posts geotagged by 140,363 users in 1,071 different locations, which have been later sorted by the authors in nine new categories based on Yelp's fifteen.²⁷

Identification of communities of venues

The dataset was analyzed in order to detect communities of venues according to the affinity among them based on the number of users in common. This approach derives from the work developed by Cranshaw et al. in "The Livehoods Project ", without introducing, however, any spatial variable and by analyzing the venues without any reference to the physical space.²⁸

To avoid redundancy and noise, the dataset was filtered keeping only the venues that had more than 52 posts – approximately one for each week of the year – and the users who had geotagged at least 3 posts in three different locations. The resulting filtered dataset consisted in 117,042 posts geotagged in 228 venues.

The Cranshaw's approach, here considers the set U of the n_U Instagram users, the set V of n_V venues and the set P of geotagged posts.

Each venue v is represented with the number of posts geotagged in v , computing "an n_U dimensional vector c_v . The u^{th} component of c_v represents the number of times a user u " geotagged a post in " v . Under this representation, we can compute a social similarity $s(i; j)$ between each pair of venues $i; j \in V$ by comparing the vectors c_i and c_j ".²⁹

The social similarity $s(i; j)$ is calculated with cosine similarity as:

$$s(i; j) = (c_i \cdot c_j) / \|c_i\| \|c_j\| \quad (1)$$

Resulting in an $n_V \times n_V$ "affinity matrix"³⁰

$$A = (a_{i,j})_{i,j=1;\dots;n_V} \quad (2)$$

where:

$$a_{i,j} = s(i; j) \quad (3)$$

The subtraction from the 228 x 228 affinity matrix calculated as explained above of the corresponding identity matrix, allowed the creation of a graph with 228 nodes – representing the venues – and 15,495 edges weighted according to social affinity, with an average degree of 135.92°

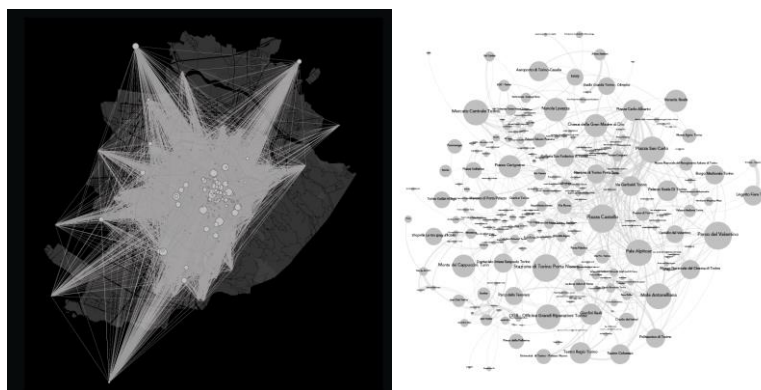


Figure 1. The graph of 228 venues (right) and its spatialization on the map of Turin³¹

Despite Cranshaw's approach would then continue analyzing the graph with spectral clustering, we deployed the technique called "community detection", also known as Louvain method of modularity optimization. This method allows the progressively grouping together of nodes in networks until it reaches an optimal level of clustering.³²

The modularity was set on the software Gephi to 0.8, which detected 12 communities empirically evaluated as consistent and with a sufficient grain of accuracy.

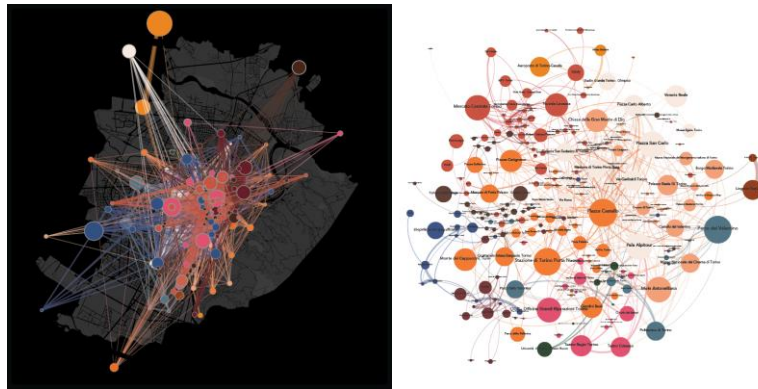


Figure 2. The twelve communities in the graph and on the map³³

VENUES COMMUNITIES' ANALYSIS

Macro classification

The twelve clusters have been classified by the authors in three macro-groups according to the typology of venues within them.

The first one was defined as "Landmarks" and it is composed of three clusters containing mainly venues belonging to the categories of "Public", "Leisure" and "Religion", with the presence of the most important landmarks of the city of Turin.³⁴

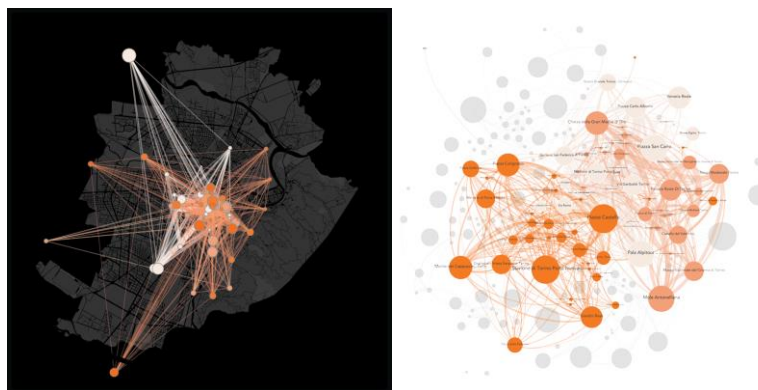


Figure 3. The three clusters of the "Landmarks" group in the graph and on the map³⁵

The "Social life" macro-group is composed of five clusters with venues mainly belonging to the category of "Food", "Leisure" and "Night", as well as some to "Shopping". Although the claim should be scientifically sustained with interviews and questionnaires, it is not difficult for an average Turinese to see a social and elective affinity among the venues belonging to each of five clusters in terms of frequenters.³⁶

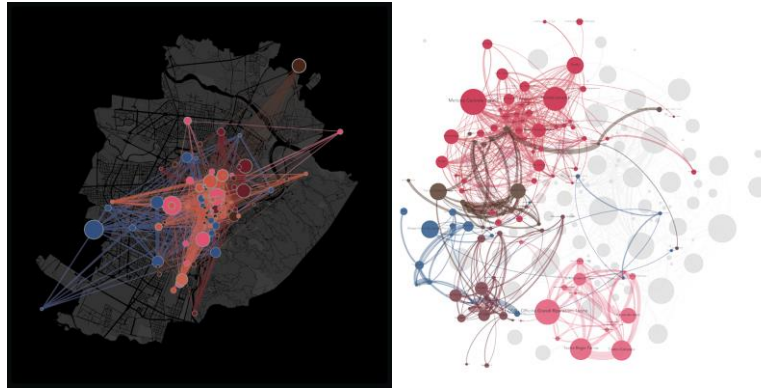


Figure 4. The five clusters of the “Social Life” group in the graph and on the map³⁷

The remaining four clusters grouped in the “Isolated networks” macro-group do not share common characteristics, but they have their internal coherence. A cluster groups the main buildings of the University of Turin, another the Polytechnic of Turin with the main parks of the city, while in the remaining two it can be seen the Juventus Stadium together with its medical center and the airport, on one side, and two neighboring shopping centres, on the other.³⁸

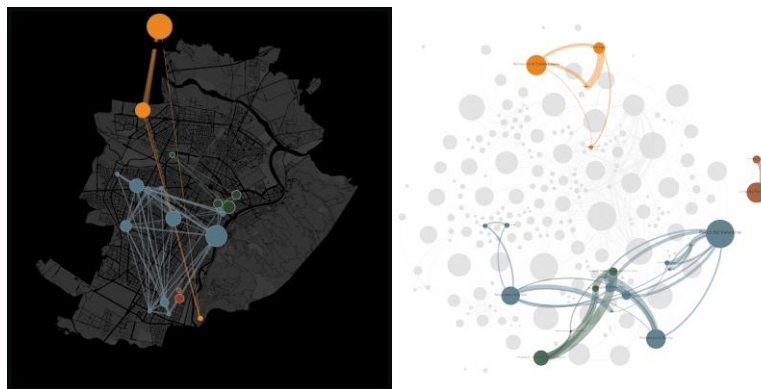


Figure 5. The four clusters of the “Isolated networks” group in the graph and on the map³⁹

It is striking to notice how the methodology developed allowed to build a connection among places distant in space, but with an affinity in the typology of uses performed and of users. The “recurring practices” of Amin and Thrift or the “urban text” written by Certeau’s *Wandermänner* can be here read and decoded in the form of manifold communities of venues phenomenologically derived.

Proximity and centrality in the contemporary city

The operation performed on the data does not simply “group together” places in the terms of affinity, but it also unveils the structure of how these urban practices organize the urban space.

Confronting the spatialization of each cluster in the form of a network and in the physical space shows how the traditional notion of proximity and centrality might be redefined in the contemporary city.

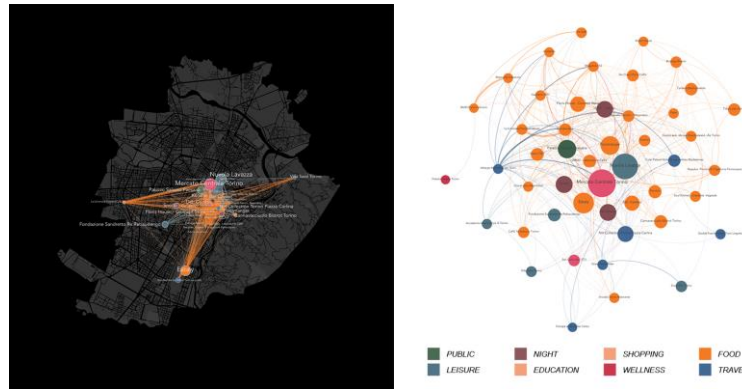


Figure 6. The cluster SL_1 spatialised according to nodes and arches weight and on the map⁴⁰

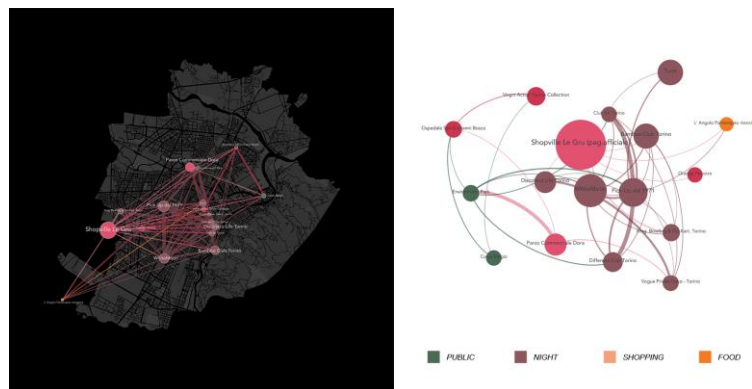


Figure 7. The cluster SL_4 spatialised according to nodes and arches weight and on the map⁴¹

We may draw connections from places even distant in space, by overturning a traditional concept of hierarchy and considering what is central and pivotal within the network does not necessarily find a physical correspondence in the urban framework.

This claim usher the urge to acknowledge the presence of these social structures of the urban space which respond to non-spatial logics, although taking shape in the physical dimension.

Social communities in the contemporary city

The community of venues identified should not be considered as “neighborhoods”, meaning that each of them pertains to a discrete set of users. Instead, the association of users to each cluster, according to whether they geotagged a post in one of the venues or not, shows how this relationship in not unique

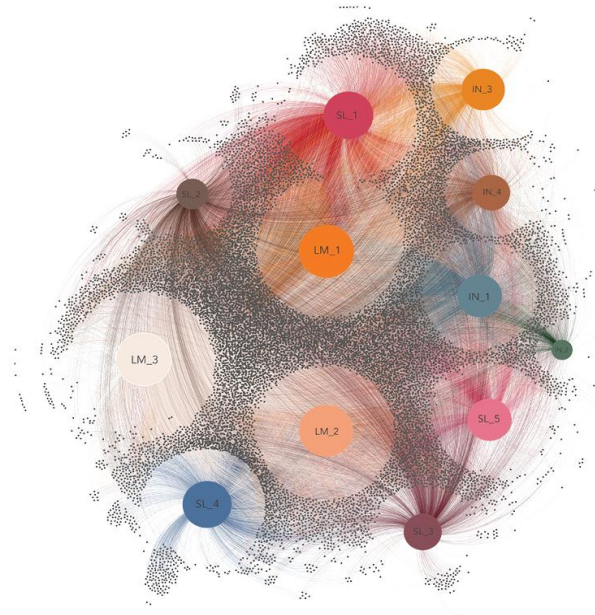


Figure 8. The users (smaller grey nodes) connected through arches to the venues of each cluster grouped together (larger nodes) if at least a post was geotagged in one of them⁴²

This finding supports the previous thesis: how the contemporary subject-centered imagination does not limit to a priori categories the process of social identification through the act of geotagging one's life. Instead, the contemporaneity offers the individual lighter and more dynamic forms of "communitying".

To understand this perspective, Bauman's theorization of the liquid modernity may clarify the claim. In his anti-utilitarian philosophy, the subjects develop an understanding of themselves, escaping the alienation of a world where the power, in its multiple manifestations, offers a unique dimension of the real. The subjects become the actors of their own destiny, freed from aprioristic ethical codes and based on the principle of ethical responsibility.⁴³

The Baumanian metaphor of the swarm, as an evolving and dynamic organism whose shape and movement are dictated by the sum of the individuals' ones, helps figurate a clear image of this process.

CONCLUSION

Overall, this study strengthens the idea that the network is a crucial and defining element of contemporary society thanks to and in its virtual multiform dimensions which needs to be deployed in the deciphering of the urban text and in the construction of narratives around the city.

The theoretical introduction established a bridge between pre-digital urban theories and modern practices, deductively validating the potential of Instagram social urban data as a source of knowledge to study the contemporary city. On the other hand, the analysis of the data and the critical discussion of them allowed to inductively prove those same theories by offering the same image of the urban scene.

From a methodological perspective, the integration of Cranshaw's approach and the Louvain method of modularity optimization offers an insight to analyze the current subject according to a critical interpretation of Lynch, Certeau, Bourdieu and Baumann. The bidirectional validation gained from this study may not only support the claim of this paper as far as regard Instagram, but at the same time invite urban scholars to deploy a more critical approach in the use and selection of the data available

nowadays. Research so far have privileged social media providing real-time data like Twitter, limiting the analysis to short temporality or limited urban phenomena, while n-LBSN might be even more representative of the complexity embedded in contemporary city

The dataset involved provides a valuable test of a practical application of a theoretical speculation on the shape of communities in the contemporary city. However, being limited to the city of Turin, this study still lacks a comparative perspective with other urban environments, and further studies are then suggested.

This work does not aspire to provide a finite tool for a locked analysis able to guide the urban planner in the design of the city, but at the same it ushers a conception of the urban space challenging the traditional approach still burdened by the cartesian plane.

ACKNOWLEDGEMENTS

This paper presents the work developed in 2020 by Adriano Aimar for his Master Thesis at Politecnico di Torino and cited in the bibliography.

NOTES

- ¹ See Manuel Castells, *La città delle reti [The city of networks]*, trans. Chiara Rizzo, 2nd ed., I libri di Reset (Marsilio Editori, 2004).
- ² See Harrison Rainie and Barry Wellman, *Networked: The New Social Operating System*, vol. 10 (Paris: Union générale d'éditions, 1980; Mit Press Cambridge, MA, 2012).
- ³ Karin Knorr Cetina, "Postsocial Relations: Theorizing Sociality in a Postsocial Environment," in *Handbook of Social Theory* (London: SAGE Publications Ltd, 2001), 5, <https://doi.org/10.4135/9781848608351>.
The conclusion» to be drawn "from the contemporary re-imagining of the individual contradicts postmodern social theories which tend to postulate the eclipse and death of the subject. As a first approximation, we can associate a postsocial environment with an expanding sphere of the subject, where 'subject' stands not only for mental or existential conceptions of individuals but for an open-ended series of individual-centered significations and processes. The remarkable rise of subjectivity thinking and the concomitant emptying out of a social imagination and of social principles and structures act in concert, so to speak, to create and unfold the space for this expansion"
- ⁴ Nigel Thrift and Ash Amin, *Cities: Reimagining the Urban* (Cambridge: Polity Press, 2002), 81.
This explains the idea of the modern forms of communities – or better of "communitying" – which when they take shape in the urban space turn it into a space of "flow and mixture, promiscuous 'meshworks' and hierarchies of different relations, rather than patchworks of different communities, hybrids involving almost continuous improvisation in which the in-between' of interaction is crucial"
- ⁵ See Henri Lefebvre, *Critique of Everyday Life. Volume I: Introduction*, trans. John Moore (Paris: L'Arche, 1947; London: Verso, 1991).
- ⁶ Michel de Certeau, *The Practice of Everyday Life*, trans. Steven Rendall (Paris: L'Arche, 1947; Berkeley: University of California Press, 1984), 93.
- ⁷ Thrift and Amin, *Cities*, 9.
- ⁸ See Phil Simon, *Too Big to Ignore: The Business Case for Big Data* (John Wiley & Sons, 2013).
- ⁹ See Paolo Ciuccarelli, Giorgia Lupi, and Luca Simeone, *Visualizing the Data City: Social Media as a Source of Knowledge for Urban Planning and Management* (Springer Science & Business Media, 2014); Alexandra Olteanu et al., "Social Data: Biases, Methodological Pitfalls, and Ethical Boundaries," *Frontiers in Big Data* 2 (2019): 13, <https://doi.org/10.3389/fdata.2019.00013>.
- ¹⁰ See Yuheng Hu, Lydia Manikonda, and Subbarao Kambhampati, "What We Instagram: A First Analysis of Instagram Photo Content and User Types," in *Eighth International AAAI Conference on Weblogs and Social Media*, 2014, <https://www.aaai.org/ocs/index.php/ICWSM/ICWSM14/paper/view/8118>.
- ¹¹ See "Global Digital Report 2019," We Are Social, accessed August 19, 2021, <https://wearesocial.com/global-digital-report-2019>; "Digital 2019 in Italia," We Are Social Italia, accessed August 16, 2021, <https://wearesocial.com/it/digital-2019-italia>.
- ¹² See John D. Boy and Justus Uitermark, "How to Study the City on Instagram," *PLOS ONE* 11, no. 6 (June 23, 2016): e0158161, <https://doi.org/10.1371/journal.pone.0158161>; John D. Boy and Justus Uitermark, "Reassembling the City through Instagram," *Transactions of the Institute of British Geographers* 42, no. 4 (2017): 612–24, <https://doi.org/10.1111/tran.12185>.
- ¹³ See Walter Benjamin, *The Arcades Project* (Harvard University Press, 1999); Thrift and Amin, *Cities*.
- ¹⁴ Tommaso Venturini, "Diving in Magma: How to Explore Controversies with Actor-Network Theory," *Public Understanding of Science* 19, no. 3 (May 1, 2010): 258–73, <https://doi.org/10.1177/0963662509102694>; as cited in Ciuccarelli, Lupi, and Simeone, *Visualizing the Data City*, 2.
- ¹⁵ See Cetina, "Postsocial Relations."
- ¹⁶ Kevin Lynch, *The Image of the City* (MIT Press, 1960), 6.
- ¹⁷ See Lynch, *The Image of the City*.
- ¹⁸ See Adriana de Souza e Silva and Daniel M. Sutko, "Theorizing Locative Technologies Through Philosophies of the Virtual," *Communication Theory* 21, no. 1 (February 1, 2011): 23–42, <https://doi.org/10.1111/j.1468-2885.2010.01374.x>.
- ¹⁹ de Souza e Silva and Sutko, 32.
- ²⁰ See Cetina, "Postsocial Relations."
- ²¹ See Dan Tasse et al., "State of the Geotags: Motivations and Recent Changes," *Proceedings of the International AAAI Conference on Web and Social Media* 11, no. 1 (May 3, 2017): 250–59.
- ²² See Didem Özkul and Lee Humphreys, "Record and Remember: Memory and Meaning-Making Practices through Mobile Media," *Mobile Media & Communication* 3, no. 3 (September 1, 2015): 351–65, <https://doi.org/10.1177/2050157914565846>.
- ²³ See Pierre Bourdieu, *Distinction: A Social Critique of the Judgement of Taste*, trans. Richard Nice (Paris: Éditions de Minuit, 1979; Harvard University Press, 1984).
- ²⁴ See Maurice Halbwachs, *La mémoire collective [The collective memory]* (France: Presses universitaires de France, 1950).

- ²⁵ For further details please refer to Adriano Aimar, "INSTA-TURIN: Revising the notion of space, community and proximity in the contemporary city through Instagram social urban data" (laurea, Politecnico di Torino, 2020), 101–9, <https://webthesis.biblio.polito.it/14124/>.
- ²⁶ The chosen categories have been Active Life, Arts & Entertainment, Beauty & Spas, Education, Food, Health & Medical, Hotels & Travel, Local Flavor, Local Services, Mass Media, Nightlife, Public Services & Government, Religious Organizations, Restaurants, Shopping, excluding The categories of Automotive, Event Planning & Services, Financial Services, Home Services, Pets, Professional Services, Real Estate.
- ²⁷ The new categories were Public (public outdoors spaces likes streets, squares and monuments), Leisure (venues for the recreation from cultural activities to sports and social events), Food (restaurants of different typologies, but also street food and take away), Night (all the venues connected to recreational night activities), Shopping (shops, markets, outlets and other locations related to purchase), Travel (hotel and other typologies of accommodation, but also venues related to commuting and travelling), Education (institutions related to education at all levels and degrees), Wellness (locations where to take care of one's body, from hospital and medical centers to hairdressers and gyms), Religion (religious organizations and related buildings).
- ²⁸ See Justin Cranshaw et al., "The Livelihoods Project: Utilizing Social Media to Understand the Dynamics of a City," *Proceedings of the International AAAI Conference on Web and Social Media* 6, no. 1 (2012): 58–65.
- ²⁹ Cranshaw et al., 59.
- ³⁰ Cranshaw et al., 59.
- ³¹ The dimension of a node is directly proportional to the "betweenness centrality" of it within the graph. "Betweenness centrality" measures how often a node appears on shortest paths between nodes in the network and it accounts for the centrality of it within the whole graph.
See Andrew Disney, "Social Network Analysis: Understanding Centrality Measures," Cambridge Intelligence, January 2, 2020, <https://cambridge-intelligence.com/keylines-faqs-social-network-analysis/>.
The thickness of arches is directly proportional to their weight in terms of social similarity between venues.
- ³² See Vincent D. Blondel et al., "Fast Unfolding of Communities in Large Networks," *Journal of Statistical Mechanics: Theory and Experiment* 2008, no. 10 (October 2008): P10008, <https://doi.org/10.1088/1742-5468/2008/10/P10008>.
- ³³ See note 31
- ³⁴ The three clusters of the group "Landmarks" are later referred to as "LM_1", "LM_2", and "LM_3".
- ³⁵ See note 31
- ³⁶ The five clusters of the group "Social Life" are later referred to as "SL_1", "SL_2", "SL_3", "SL_4", and "SL_5".
- ³⁷ See note 31
- ³⁸ The four clusters of the group "Isolated Networks" are later referred to as "IN_1", "IN_2", "IN_3", and "IN_4".
- ³⁹ See note 31
- ⁴⁰ See notes 31, 36
- ⁴¹ See note 31, 36
- ⁴² See notes 34, 36, and 38
- ⁴³ See Zygmunt Bauman, *Futuro liquido. Società, uomo, politica e filosofia* [*Liquid future: Society, man, politics and philosophy*] (Milan, Italy: AlboVersorio, 2014).

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