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On urban trajectology: algorithmic mobilities and atmocultural navigation

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ABSTRACT

In this piece, we introduce the notion of 'atmoculture' as a conceptual tool to analyse the new forms of mobility supported and enacted by digital algorithms. In historical perspective, we analyse how modernity has created a movement-space where the problem of finding one's way through an increasingly 'displaced' urban space first emerged, with noticeable psycho-social consequences. Reconstructing the new digital media as a continuation of this spatial imagination, we seek to zoom in on the forms of mobility facilitated by digital algorithms. Urban digital navigation, we suggest, proceeds in parallel with a reorientation of the urban experience towards atmospheric considerations, maximizing safety and pleasure in the user's encounters with the environment. In this context, atmoculture appears a spatial-aesthetic, psycho-cultural, and bio-technological milieu that prepares space for convenient navigation. We discuss a number of consequences: first the disburdening effect, whereby subjects delegate to a number of perceptions and decisions to algorithms, expropriating the natural problem-solving aspect of subjectivity; second, the invisible transformations of urban space due to the biases that are built in algorithms themselves; third, the tensional, even contradictory outcomes of atmocultural expectations, whereby the goal of a secure and pleasant environmental interaction is undone by the very quantity of information provided and the level of alertness required from the user.

Introduction

Since its inception, modern urban life has posed the question of orientation and disorientation.[1] Modernity has created a movement-space where the problem of finding one's way through an increasingly 'displaced' space popped up. In this new space, the existential and phenomenological experience of the urbanite increasingly overlapped with, and prolonged towards, the spaces and structures of an enlarged urban condition. From nineteenth century *agoraphobia* to twenty-first century *nomophobia* (namely, 'no-mobile-phone phobia', the fear of being disconnected from the network; see below), the urban has made increasingly explicit the *problématique* of moving in a space ridden with

anxiety, uncertainty and fear. The uncertain connection between space and movement in modernity has, in turn, guided the question of urban governance: How to organize, control, and coordinate urban trajectories? From the diagrammatic urbanism of Ildefons Cerdà [1815–1876] to the legible city of Kevin Lynch [1918–1984], up to the digital platforms of the contemporary smart city, urban governance seeks to enhance feelings of environmental safety and pleasurableness by providing orientation to dwellers and users.

Building on Kurt Lewin's topological psychology, Paul Virilio's dromology and Gilbert Simondon's ontology of individuation, in this paper we outline the scope of 'hodology' (from the Greek ὁδός [hodós]: way, path, trail), or 'trajectology', as a general science of urban trajectories. After a brief genealogy, we situate the question in the present, exploring the advent of the new media and ubiquitous computing. The new media are transforming the way we move through urban space, affecting not only the existing regimes of mobility but also, more generally, the way we experience environments and atmospheres. The triangulation of GPS-enabled smartphones, location-based social networks, big data archives and machine learning algorithms increasingly allows digital technologies to 'weave themselves into the fabric of everyday life until they are indistinguishable from it', as per Mark Weiser's definition of ubiquitous computing (1991, 66).

In this context, we advance the hypothesis that new media usage embodies – and makes explicit – an immersive navigational paradigm of urban space. Indeed, the new media are designed to make the experience of urban mobility as secure and as pleasurable – 'user-friendly', as commonly stated – as is possible. They put, so to speak, the entire world from the perspective of the user, and accompany him/her into the least insecure and the most pleasurable encounter with the qualities of the surrounding environments. For instance, playfulness comes to be inscribed into urban textures as a series of interactional possibilities to enhance the subjective 'engagement' with places.[2] Similarly, algorithms seek to preserve the user from all sources of urban danger, ranging from attacks to contagion. To achieve this aim, the user is digitally decomposed into bits of information about shopping habits and patterns, and the numberless occasions where private economic activity can be generated, with previously unnoticed or undetected economic value extracted from all the details of everyday life. At the same time, the user is also scrutinized as the carrier of biological and psychological features to be attended: patterns of movement and logs of social-environmental interaction can be used to extract information about the state of health, lifestyle, belonging, social contacts, and deviant or non-compliant behaviour. In this respect, increased reliance on these tools seems to concern not only individual users, but governmental agencies and private service providers as well. A reconstruction of the notions of subjectivity, sociability, mobility and normativity that underpin the algorithm-driven digital navigation of urban environments, reveals the scope of a science of trajectories, suggesting that the new media mobilities and the crafting of urban atmospheres are increasingly co-constitutive.[3]

In order to explore the consequences of this at the intersection of a phenomenological and an ecological gaze – that is, where the *experience of infrastructure* and the *infrastructure of experience* meet (Dourish and Bell 2007) – we thus introduce the notion of 'atmoculture'. We address, in other words, the rise of a new configuration in contemporary urban society, where atmosphere and culture converge in aesthetic, political and ontological terms. Atmoculture is simultaneously *culture as atmosphere* and *the culture of*

atmospheres. The first formula refers to the relational, affective and atmospheric under-standing of culture which has been emerging in the fields of social theory, critical geography, and contemporary philosophy, on the escort of the centrality gained by issues of affect, materiality, and aesthetics. The second formula refers to the prominence that the spatial-affective dimension of being-togetherness – such as the existence of shared atmospheres – has assumed in contemporary everyday life, in practices ranging from place-branding to security and health concerns. In this sense, atmoculture may be referred to as the spatial-aesthetic, psycho-cultural, and bio-technological configuration that in various ways prepares space for convenient navigation, by simultaneously seeking to organize it around atmospheres engineered to be simultaneously comfortable *and* vibrant, pleasurable *and* immunized, entertaining *and* secure.

From preventive policing to marketing suggestions, the algorithmic logics of atmoculture tends to foster an experience of space that is expressly designed to increase efficiency and enhance the feeling of a subjective mastery of space. Such a feeling, we suggest, hides a state of substantive reliance, with a twofold consequence: on the one hand, urban navigation is tilted asymmetrically, with old and new forms of discrimination being inscribed in the opacity and the invisibility of the algorithms the new media work by; on the other, an increasingly smart navigability comes at the expense of the incapacitation to navigate without digital support – a consequence of what has been called 'functional stupidity' (Alvesson and Spicer 2012). In this context, we highlight the paradoxical constitution of atmoculture: by attempting to craft atmospheres that disburden the urbanite from the need to 'figure out' the complexity of urban life (Simone 2016), and by inducing a state of enhanced systemic visibility and hyper-awareness – propelled by inflows of data, thresholds, codes, signals, maps etc. – atmoculture systematically undermines the very goals it promotes. Some of the disorienting effects of urban spatiality were evident to qualified late-nineteenth and early-twentieth-century observers we discuss below, such as in particular Westphal, Sitte, Simmel, and Lewin. The extent to which digital navigation continues a similar trend is the question at the centre of the present article, whereas the moral outcomes of reliance have been tackled more in details elsewhere (see Pavoni and Brighenti 2018).

Within this broad framework, the paper proceeds as follows. The first section seeks to locate trajectories in classic psychological research, with reference in particular to the works of Westphal, Lewin, Sitte and Simmel on the psychological troubles affecting urbanites' spatial life. Section two outlines some of the main features of the movement-space that affirms itself with modernity, reconstructing the navigational paradigm of the new media and their digital infrastructures. The third section digs into the meaning of subjectivity, drawing specifically from the works of Simondon and Deleuze, where the subject – and the individual more generally – is theorized on the basis of an on-going 'problem-solving' activity. Section four applies these insights to the algorithmic hodology made possible by digital portable media and machine learning techniques, highlighting the normative dimension that underpins algorithmic culture. Section five then outlines the contours of contemporary atmoculture, and surveys how algorithms have both disburdening *and* re-burdening effects that impact upon individual mobility and subjective spatial navigation. In the conclusions, we add a number of closing reflections concerning the possible ethical and political consequences and challenges of the outlined phenomena, and how we could hope to attend them.

Trajectories and psycho-social space

Everyday urban space appears as constitutively hodological: rather than homogeneous and continuous, it is crossed by a number of significant 'trajectories', or *ways*, that are coessential to spatial perception and orientation. Lived space is always oriented: as we act in it, we are always somehow turned towards certain aims that lie scattered in space. In a sense, we are always busy running somewhere: in fact, we are running after our 'tasks', which overlap and intersect in space and time, rhythmically resonating in a number of 'taskscapes' (Ingold 1993). In other words, our intuitive hodological way of existence more or less inevitably presents us with 'scenes' imbued with intrinsic orientation features, as cognitive studies of visual perception attest (e.g. Land 2009).

The French theorist and urban planner Paul Virilio [1932–2018] introduced the word 'trajective' to address the overlap of psychic, social and technological dimensions in the production of phenomena of spatial movement.[4] Long before Virilio, however, classic research in the psychology of spatial perception had already developed a number of important insights, paving the way to laying out many of the problems associated with contemporary media use. In the 1930s, influenced by Gestalt psychology and field theory, the German-American psychologist Kurt Lewin [1890–1947] defined the principles of a 'topological psychology', whose task was to investigate the subjective life space. According to Lewin (1936), not only do people live in space, but their psychic content is likewise articulated spatially. The individual's psychic content unfolds in a space that can be characterized as a dynamic, topological field. For Lewin, the properties of connectivity, boundary, transformation and regionality are more fundamental than distances and directions, which in pure topological analysis are not considered. Stretching beyond pure topology, Lewin introduced the notion of 'valence' (*Aufforderungscharakter*) to explain how certain locations in space acquire a peculiar status, a certain affective 'colouration' – for instance, in terms of attractiveness or repulsiveness. It is the presence of valences in psychic space that makes specific vectors arise, argued Lewin.[5]

Lewin saw psychic vectors as ways in which the subject, so to speak, moves through its own psychic contents. In mathematics, vectors are characterized by direction and magnitude, and these can be transcribed into psychological facts of investments and object relations (although Lewin himself eschews the psychoanalytical language). Lewin's main thesis lies in the idea that actual spatial movement ('locomotion') mirrors precisely the organization of the psychic field. He suggested that, in the absence of obstacles or other intervening factors, psychic vectorization initiates an oriented locomotion. For instance, in an experiment know as 'the strange room', when placed in a room where a central object conveys a negative valence, subjects will seek to discharge their tension and ambivalence towards the object by first moving along the wall. If, on the contrary, an object conveying a positive valence cannot be attained because of some interposed barriers, the ensuing frustration will colour the rest of the space and the tension between the positive and the negative valences will tend to generate 'restless movement' along the lines of equilibrium between the contrasting valences. A movement that is neither directed away from the goal, nor towards it, is the best expression of an unresolved state of psychic tension.

Before Lewin, in 1871, the German psychiatrist Karl Friedrich Otto Westphal [1833–1890] had, for his part, tackled the issue of restless movement introducing the diagnosis

of agoraphobia. Restless movement appeared to Westphal as a kind of trajectory-less movement, which could be likened to hodological paralysis. This had to be the result of a riddling problem, a tension in psycho-physical space that could not be discharged spatially. Westphal's patients were incapacitated to move in the public space of a large modern city such as Berlin. For instance, one could not cross a square, which appeared as *monstrous*: to this patient, the city appeared as saturated with an impassable 'atmos-fear'. Agoraphobic patients could only overcome their anxiety by navigating *a vista*, that is, by relying on ad-hoc signposts: a friendly face, a certain stick, a recognized way out. In a well-known instance, the sight of an open door in a building would allow a 32-year-old male to *embark* on the heroic effort to actually cross the square. Within the pathological, 'unresolved tension' of agoraphobia, the non-domesticated public space appeared as fearful, while the door glanced on the other side of the square embodied the promise of an interior perceived as a protective safe haven.

Interestingly, agoraphobia emerged as a named disease at the same time when a new type of spatial experience was coalescing in the modern metropolis, whose traits would be finely dissected by Georg Simmel [1858–1918]. The Austrian architect and urban theorist Camillo Sitte [1843–1903], too, argued that agoraphobia was a symptom of the alienation produced by the 'inhuman' quality of modern planning, whose scale, geometry and open voids were unfamiliar, disquieting and fearful to many (Sitte 1986[1889]). The anonymous landscape of the large city, its labyrinthine illegibility and lurking dangers conferred a constitutively uncanny quality to the city as a whole. In this undomesticated, un-homely wide space, the establishment of trajectories became problematic, if not literally 'impossible' (Vidler 1992). In his historical reconstruction, Paul Carter (2002, 20) qualifies agoraphobia as a movement inhibition which is 'not so much a fear of wide-open spaces as a fear of their slipperiness, their tendency to incubate uncontrolled, uncoordinated movement'.[6] Rather than simply connected to the dwarfing impression provoked by large and alienating modern architectures, agoraphobia would thus be the symptom of an earlier erasure – namely, of that pre-emptive 'flattening' that subtends the making of modern space itself (Farinelli 2003).

The experience of public space, in other words, put modern urbanites before an untameable space, whose wilderness persisted despite the aspirations of civilized modernity. The unresolved, nauseous state of psychic tension that seized the agoraphobe represented the counterpart of that homogeneous *tabula rasa* presupposed by modern city planning: 'One of the patients compared it to the feeling of a swimmer crossing a lake, uncertain whether he will be able to reach the other side' (Westphal quoted in Carter 2002, 17). The new movement-space of modernity thus led to the unprecedented quest of finding one's way in a space that was itself increasingly 'displaced', one where the existential and phenomenological experience of the urbanite increasingly overlaps with, and is prolonged towards, the spaces and the structures of an enlarged urban condition.

Navigating the movement-space of modernity

The modern modes of urban orientation can perhaps be gradually seen appearing in the course of the European Middle Age. In a historical research on medieval Marseille, for instance, Daniel Lord Smail (2000) highlights how, for most people, orientation in the

city was based on the local reality of the neighbourhood. No street names and no addresses were needed, because actual movement was largely confined to one's own local area. The city space appeared to be organized into small 'islands' – the carpenters' district, the fishmongers' district, etc. – where local taskscapes unfolded. Since 'going around the city' was a relatively rare occurrence, orientation remained extremely place-based. This fact also required people on the move to negotiate the dense reality of the neighbourhood and its rich public life. It was with the notaries, who had to travel widely around the city to stipulate contracts and identify plots and parcels, that street names and street addresses were introduced. The notaries, Dourish and Bell comment (2007, 423), were 'the first people who, on a consistent basis, start[ed] to think about the city in terms of navigation'. What is peculiar of navigation, is the need to triangulate concrete locations and abstract geographic space, via some measurable devices of orientation. Once established, correlations can be encoded as data. Successful seafaring, for instance, relies on the capacity to transform a smooth spaces like the sea into a space of hodological calculation. The compass, the map, the clock, and so on, have historically functioned as essential technological tools to achieve this goal. Street names and numbers also played a similar role, producing a meta-urban grid that enabled the authorities to chart the main flows in urban space, thus paving the way towards an abstract, disembodied, and 'diagrammatic' type of spatial understanding.[7]

The beginnings of the logistical planning of urban mobility, which is so central to con-temporary capitalism (Mezzadra and Neilson 2019), can be traced back to this point. The rise of a diagrammatic movement-space becomes noteworthy in connection to capitalist economy and its 'circulatory' and 'distributional' requirements. Such a view was already entailed in the early science of urbanism. In the mid nineteenth century, Cerdà (1867) defined urban mobility as correlate to the fixity of domestic spots – the residential block, the street corner, and so on. For Cerdà, *viabilidad* (namely, circulation or traffic) was conceived of as the technical calculation of the most efficient connections. Political and ethical considerations were not part of that process: urbanism, in Cerdà's view, was to be an independent, technical science, essentially concerned with efficiency in hodology (Aureli 2013). Perhaps paradoxically, such a vision ended up marginalizing the public domain: naturally heterogeneous, unpredictable, conflict-ridden, and messy, the open urban space of the city was bound to slow down circulation and, consequently, was regarded as an impairment to circumvent.[8]

Modern urban hodology is, in this sense, premised upon clarity, speed and the linear-ity of trajectories, achieved through technological design, measure and calculation. Virilio (1989) first remarked that post-WW2 military technologies have not only a defence significance, but entail a deep transformation of perception: what becomes crucial in the movement of a body is its *potential* mobility. The latter becomes more important than actual movement, insofar as it can be calculated, visualized, projected and controlled at a distance: 'space is no longer separated from the trajectory; the relation to that space is precisely defined by this "navigation", and this relationship creates a kind of behavioural ballistics' (Virilio 2001, 60). Multiple disjunctions and interspersions are introduced by the movement-space of modernity, between local and global, between experience and abstraction, between an existential 'here-and-now' and an abstract total-ity 'elsewhere-at-other-times'. Nowhere are these entanglements more visible and effective than in the contemporary city, where urban spaces are visibly and invisibly

stretched, prolonged and hollowed out by an array of geopolitical, economical, socio-cultural and affective vectors.

Already in the mid-twentieth century, the navigational paradigm featured powerfully in the work of the iconic American urban planner Kevin Lynch. Indeed, a key hodological question informs Lynch's seminal oeuvre *The Image of the City* (1960): How to prevent the rise of potentially unresolved states of psychic tension caused by the disorienting forms – or even the formlessness – of the modern city? In order to counter urban alienation and reconstruct a sense of place, Lynch set out to harmonize the relation between the collective and individual dimensions of environmental perception, imagination and movement. To this aim, Lynch's key notion of *legibility* was devised to measure 'the ease with which [city] parts can be recognized and can be organized into a coherent pattern' (1960, 2–3). The quest for healthier and happier urban rhythmic patterns brought him to a series of planning efforts aimed to equip urban space with signposts (paths, landmarks, edges, nodes, districts) that could increase the 'value for orientation in the living space'. In turn, legibility would have resulted in a space more conducive to sensations and cognition, further reinforcing urban *imageability*.[9] The deep connection between legibility and imageability in Lynch's theory has been highlighted by cultural historian Orit Halpern (2015), who emphasized the similarity with the cybernetic model of perception. In cybernetics, ordered patterns are assumed to emerge through distributed interaction and feedback mechanisms that can be subsequently coded into algorithmic protocols.[10] In analogy, Lynch's effort to find a cure for urban alienation did not resort to the ideal urban forms of the classic architectural tradition and their normative templates; instead, the mental images of urban dwellers themselves were to be appraised and utilized. Lynch surveyed them empirically, working under the assumption that 'the city must be plastic to the perceptual habits of thousands of citizens, open-ended to change of function and meaning, receptive to the formation of new imagery. It must invite its viewers to explore the world' (Lynch 1960, 119). This way, Lynch came close to what later Virilio (1989) would call a 'logistics of perception'. By developing an approach in which data-gathering and pattern-finding precede policy decisions (contrary to what happens with normative approaches), Lynch aimed at unfolding a recipe, or algorithm, for successful urban-psychic orientation.

Like Cerdà, Lynch sought ways to curb a perceived excessive wildness of public space; unlike him, however, he did not evacuate the public domain in all its dimensions, nor did he try to subdue it to the domestic model – rather, he proposed to *modulate* it, through means that were largely inspired by system theory, cybernetics and psychology. Planning through imageability brought matters of perception, aesthetics and psychology to centre stage, inherently displacing matters of class, social structure and inequality (Halpern 2015). In this sense, Lynch's model also contains hidden normative presuppositions, which become palpable at times – for instance in the negative connotation he attributed to all occurrences of disorientation.[11] More generally, Lynch's depoliticized urban aesthetics anticipates what below we propose to call 'atmoculture', that is, the pivoting of urban hodology around engineered and optimized atmospheres. It is possible to notice, at this point, that the tenets of the navigational paradigm were clearly in place well before the rise of the new digital media. Before proceeding further, however, in order to clarify the nature of the 'problems' the urban subject is supposed to cope with, it is necessary to unpack the very notion of subjectivity more thoroughly.

Subjectivity as problem and resolution

As we have seen above, navigation proceeds through a problem-solving strategy. Its central 'problems' follow from the heterogeneity of bodies, spaces and information in the urban sphere. To understand what type of subjectivity this implies, it may be useful to turn to the work of the French philosopher Gilbert Simondon [1924–1989]. Challenging the presuppositions of an ontology populated by already-individuated forms (which he attributes to Plato's Archetype and Aristotle's Hylomorphic scheme), Simondon foregrounds the process of individuation as a formative, morphogenetic one. Rather than as a pre-given, pre-formed being, the individual can be regarded as a specific *phase* of the process of being. The focus shifts, from the realm of completed forms, to the pre-individual field of intensities and the sets of heterogeneous singularities out of which individuals eventually emerge. The coming about of a new individual thus corresponds to 'the discovery of a new dimension' (Simondon 1995[1964], 207–209), enacted to overcome the incompatibilities that riddle a pre-individuated system. Yet individuation, continues Simondon, is never completed: a non-individual preserve continues to exist within the individuated systems as a sort of in-built excess available for further individuations. From this perspective, a pre-individual system or field is simultaneously *more* and *less* than an individual: it functions as a wild 'soup of intensive differences' (Laerke 1999, 91–2) and a reservoir of potential energy, always in excess vis-à-vis actual forms and formed individuals. An ontology of becoming follows, which Gilles Deleuze [1925–1995] will study attentively.

Simondonian ontogenesis, we believe, can help illuminate both topological psychology and the psycho-social nature of public space. As reconstructed above, Lewin treated individual and milieu as essentially pre-existing entities that had to be adjusted to one another through the dialectics of individual perspective and subjective spatial valences. For Simondon, on the contrary, we must begin with a pre-individual field contradistinguished by the heterogeneity of multiple, virtually unlimited, points of view. The problem of the emergence of *a* point of view thus appears to be – we may say with a nod to Lynch – a problem of perception. For Simondon (1995[1964], 209), acting and perceiving are indistinguishable from the process of individuation: action, in other words, emerges as 'the solution of problems of mutual coherence between perceptual universes'.[12] In this sense, each individuation is a resolution that unfolds as the production of a trajectory 'thrown across' (*transjectum*) a pre-individual multiverse: 'the trajectory is at the same time the world and the subject'.[13] Retrospectively, Virilio's 'trajective' can be said to take up this Simondonian point (although we are not sure Virilio was aware of Simondon's work). In this light, what Lewin's theory missed is the specifically *ontogenetic* dimension, whereby individual and milieu feature as simultaneous, correlative productions. A new conception of action follows, whereby action 'is not only a topological modification of the milieu; it modifies the very constitution of subject and object' (1995 [1964], 209, *our translation*).[14]

The process of individuation not only emphasizes *formation* over accomplished form, but also points to the centrality of *information* in the creation of new individual realities. In cybernetics, information featured as a probabilistic measure of the ordering potential of a given situation, a *signal* whose organizing tendency *resists* entropy (Shannon 1948).[15] For Simondon, information constitutes the very 'formula of individuation', in that it

embodies a *mise-en-forme* which – as Deleuze (2002[1966], 49) writes in his review of Simondon – 'establishes an interactive communication between orders of disparate magnitude or reality' capable of 'solv[ing] the problem'. In its capacity to advance a 'disparative' solution of individuation, information is so creative that, for Simondon, it cannot, in the strictest sense, be measured (Simondon 1960, 549). This point makes his approach similar to cybernetics, and yet distinctive. Modulation and moulding are considered by Simondon as two technical strategies to carry about the individuation of new physical objects. While moulding usually evokes a hylomorphic separation between form and matter – although Simondon shows that, if we look closely, this is not really the case – modulation more visibly entails the *tuning* of an intensive spatiality in becoming, as when multiple voices suddenly fall in tune, or as the *mutual tuning-in* of tasks which rhythmically compose a taskscape (Ingold 1993). In his 1981 course on painting, Deleuze explains the notion of modulation referring to the TV signal, which he describes as an on-going adjustment of the amplitude and frequency of waves. In analogy, he employs the concept to define painting as the modulation of colour and light in function of a signal which, in the context of painting, is space itself. Space is, in other word, the signal that the painter seeks to *tune in* and *attune to* via the modulation of light-waves and colours on the canvas. Likewise, Simondon describes individuation as a process of modulation whereby a differential tension – an information – is tuned-in to a novel dimension (an individual, a society), so that a new coherence (a new 'consistence', as Deleuze would say) appears.

A novel social monadology is envisaged, in a kind of Tardeian legacy (Tarde 2012 [1893]). Its constituting units, however, are no longer individuals, but rather *dividuals*, pre-individual singularities flowing through individuals and capable of precipitating social formations.[16] Elaborating on this insight, coupled with Foucault's extensive analysis of disciplinary power, in 1990 Deleuze diagnosed the rise of a new, post-disciplinary diagram of power, which he famously called 'society of control'. With implicit reference to Simondon, Deleuze (1992) argued that contemporary control is not based on the *moulding* of individuals (as it were the case in the disciplinary diagram described by Foucault), but on the *modulation* of the social field. Contemporary control entails neither the dressage of an individual body, nor a simple act of subjugation, rather, it exploits the environmental potentials of pre-individual social fields. To exert control, the ontogenetic emergence of trajectories is traced back to spatio-temporal patterns to be detected in the dense complexity of the social. As we suggest below, the subsequent advent of extensive urban computation and machine learning algorithms seems to confirm Deleuze's earlier insight into the nature of contemporary 'dividuality' and its peculiar relation to individual existence.

Learning the trajectory

As reconstructed above, Simondon and Deleuze have in a way pioneered a 'machinic' model of individuality and subjectivity, one which could even be called 'algorithmic' – at least if by algorithm we mean an immanent problem-solving dynamic. In one of the foundational texts on cybernetics, Norbert Wiener [1894–1964] observed that 'the process of receiving and of using information is the process of our adjusting to the contingencies of the outer environment, and of our living effectively within that

environment' (1950, 17–18). In this sense, algorithms appear as veritable *recipes of* and *for living*: they emerge out of a repetitive trial-and-error process sustained by negative feedback – i.e. the incorporation of previous errors into an overall adaptive effort – that gradually crystallises into a coherent adaptive sequence expressing the most convenient way to achieve a result. As remarked by Pasquinelli (2019), here we are not dealing with 'a rule that is invented from above but [with one that] emerges from below'. It seems that, until recently, this emergent, learning capability of algorithms was marginalized in mainstream computer science, despite being implied by early cybernetics.

Until well into the 1990s, the dominant view conceived of computing machines as central processors of linear computational sequences, going from input data to output results: machines were *programmed* in advance to reproduce given results. In the original cybernetic project, however, a different imagination was at play. During World War II, while working on enhancing the precision of anti-aircraft missiles, Wiener devised a system 'based on constantly updating their trajectory, comparing the real trajectory of the target with prior estimates' (Cardon et al. 2018, 9). The philosophy of machine learning similarly encompasses the extraction, recognition and prediction of hodological patterns via recursive, comparative, and statistical computation performed within a field of contingent events.[17] Wiener's machine was designed to stay 'open to the world', capable of performing computation out 'in the wild', that is, on unknown and always new terrains.[18] Contrary to the type of artificial intelligence dominant throughout the 1970s and 1980s, with machine learning techniques the algorithm is not taught *what to do* in a deterministic way, but is rather *left free* to roam over large bodies of data, applying multivariate linear regression computations to get progressively closer to an optimal result.[19] *Recursivity* is the key property that makes algorithms fully 'capable of integrating contingency into their operations' (Hui, in Lovink 2019b). In this context, the notion of 'architecture' becomes central, no less than the comparison between algorithms and living systems.[20] Probably, among the first to reason in this way was Simondon (1958, 134 ff.) himself, who noticed that the evolution of machines does not proceed through 'automation' – in fact, a form of 'idiocy' of the machine – but through the progressive opening and interfacing of the machine to the world.[21]

Today, the limits of the localized technical object tend to vanish, and technical reality fully becomes 'environmental'. The triangulation of big data, GPS-enabled smartphones, and location-based networked information imparts an 'algorithmic sieving' (Lury, Parisi, and Terranova 2012) to urban space as a whole, reshaping the grammar of the urban experience through trajectories that are constantly generated, multiplied and prompted, as well as traced, tracked and stored. With an ever-increasing power to sense, register and recognize, 'machine learning unveils hidden patterns, correlations, tendencies, and structures that would be otherwise unconceivable for human cognition' (Pasquinelli 2017, 289). At its most striking, this may be observed in the 'machinic vision' (Johnston 1999) of war drones, which 'see' the ground through the recursive de-/re-composition of a constellation of bits of information, out of which a series of *patterns-of-life* (known precisely as 'POLs') can be extrapolated (Bousquet 2018). More prosaically, this politics of trajectory is at play in the everyday logic of marketing and security through which contemporary urban navigation unfolds. As Malcolm McCullough (2013, 200, 204) explains, 'with urban computing relations between embodied cognition,

spatial mental maps, and explicit way showing systems now slip apart and recombine … [urban computing] interleaves media objects among themselves and with unmediated objects, and in effect becomes ambient'. The new media navigational model urbanizes all territories that can be coded and signposted, while invisibilising those that cannot.

To paraphrase Bergson, pattern-recognition *naturally prolongs into* pattern-generation, as digital assemblages are fed with information about the subjective and collective spatial valences of various urban spots, designing the ensuing trajectories of fear and desire. In this new movement-space, the occurrence of diagrammatic 'instructed movement' – movement guided by a set of parametric reference points translated into detailed, recipe-like in-vivo instructions – acquires its full navigational significance. Some have evoked a subject-less mode of governance that 'operates with infra-individual data and supra-individual patterns without, at any moment, calling the subject to account for himself' (Rouvroy 2013, 145). But, as we have been showing, this logic more precisely entails a specific reconfiguration of individual subjectivity with hodological-atmospheric inflection. Likewise, this does not entail the end of the normative dimension, but rather its transformation. Pasquinelli for instance observes the surfacing of a *computational norm* which 'is no longer validated from above, but statistically computed from below' (2017, 289). With slightly different terms, Grégoire Chamayou (2014) speaks of 'normativities without norm', which emerge out of the dense materiality of the social as the machine learns what is normal and what is anomalous (rather than abnormal) 'on the basis of an analysis of frequencies and repetitions in given sets of activities'. This seems to imply a new power of normalization, a *trajectivity* based on the composition of masses of dividuals assembled into clusters of POLs.

The contemporary trajective is constituted real time, via recursive feedback loops of information that cross-cut growing, interrelated datasets. These computational overflows coalesce in an atmospherics which may be regarded as foundational of the new urban hodology: it is the noisy, pre-individual wilderness where the processes of individuation remain open to a variety of modulations – emancipatory, oppressive, capitalizing, extractive, and so on. In the contemporary city, this results in what we define as the rise of atmoculture. Not dissimilarly from architectural structures (Borch 2014), atmocultural mediation between the phenomenological aesthetics of everyday life and the underlying abstract structures of capitalism occurs via the algorithmic architecture of ambient computing and logistic hodology. In this sense, and following Dourish and Bell's distinction, the concept of atmoculture encompasses both the *experience of infrastructure* and the *infrastructure of experience* of urban life:[22] it exists at the intersection of its aesthetic phenomenology and its structural underpinnings, where social life appears as a hodology of fear and desire within more or less controlled conditions.

Atmocultural experimentation

If urban algorithms really develop as 'recipes of and for living', their curious mix of factuality and normativity can perhaps be explored using Peter Sloterdijk's (2006) concept of *nomotop*. Adapting Buckminster Fuller's architectural work, Sloterdijk uses the engineering notion of 'tensegrity' to address social-cultural situations of reciprocal co-tensions, capable of holding together social formations in foam-like structures: 'culture – he contends – is primarily and normally the nonrelaxation of tensions generated by a pull

through which the members of a group are bound to the regularities proper to that group' (*ibid*. 6). The nomotop corresponds to the 'field of efficacy' that stabilizes social relations 'through internal normative tensions'. The concept seeks to capture the way interacting bodies are imbricated in a shared, co-produced spatiality. A key point of Sloterdijk's argument is that a world-wide nomotopic or tensional-integral atmosphere has historically become more *explicit* in its aesthetic, affective and biological sense during the twentieth century: from WWI's chemical warfare to the birth of the environmental sciences, from the creation of air-conditioned shopping malls in the 1950s to new sectors such as global political economy and interior design.[23] The modern quest, in this sense, concerns the organization of social coexistence under conditions of 'co-fragility', where physical, psychic and affective immunity has to be counterbalanced with movement, speed and circulation which, as we have seen above, are designed as primary requirements of modernity.

As hinted above, atmoculture is intertwined with the problem of ordering – materially, symbolically, and emotionally – urban trajectories in the light of their atmospheric qualities and requirements. This way, atmoculture refers to *culture as an atmosphere*, in the sense of a material and affective understanding of culture which is regarded as emerging out of the coming together of ideas, practices, bodies and technologies, at the intersection of infra-structures, representations, and experience. But, at the same time, it also designates *a culture of atmosphere* in the sense of the increasing visibilisation of the spatio-affective dimension of being together. Recent writings on atmospheres tend to focus on phenomenological experience, immanent co-production, or strategic staging (Brighenti and Kärrholm 2018 for a critical review). Here, we add the point that atmoculture is today fundamentally imbued with digital computation of algorithmic type – 'the fog of data, the algorithmic atmosphere, the hazy geography of digital intelligence' (Mattern 2016). Developing an ethnographic approach to algorithms in the context of a culturalist approach, Nick Seaver (2017) has recently proposed to frame them as cultural productions: rather than simply an additional 'transformative force' that shapes culture, or a represented and debated 'cultural object', algorithms enfold a set of more or less coordinated 'collective human practices' (*ibid*. 5). In other words, they are not exogenous to the socio-material reality that shapes atmoculture. Although not considered in Sloterdijk's genealogy, digital computation and machinic problem-solving therefore adds another, significant layer to his genealogy of atmospheres, providing a key to contemporary atmoculture, in the form of a structuring force of the social which, differently from the background architecture of the nomotop, is not simply socially latent or quasi-unconscious, but has a markedly machinic, extra-conscious, and yet vital, dimension to it.

From preventive policing to marketing suggestions, the algorithmic logic of atmoculture tends to neutralize metastable tensions, catastrophic discontinuities and the non-teleological orientations that characterize the problematic ontology of the urban, making its socio-spatial materiality adapt to the trajectives that populate it.[24] As a result, digital urbanites experience the environment from within bubbles: location, movement, trajectory, interaction and experience are coded into a complex logistics of perception, mediated by digital platforms, whereby what is mobile and what is static seem to swap their roles. An example in this sense is the explosion of food delivery services, in which the role of the algorithm proves fundamental in articulating the triangulation home-restaurant-rider, but also the relation between desire and consumption on

the side of the home, and between movement and exploitation on the side of the driver. With food delivery platforms, the restaurant does not move physically, but is drawn within the circulation of an algorithmically-filtered reputation economy, constantly shifting its topological position in the city. Digital platforms express most clearly what Yuk Hui refers to as the inscription of given teleological ends (with their inherent forms of discrimination) to 'promote a kind of frictionless and personal individuation – in which there is no tension experienced between different modes, sites and scale of individuation' (2015, 87). Algorithms, in other words, have an in-built teleological yearning towards a seamless hodology of the urban, where physical and psycho-social trajectories are smoothly integrated within a series of valences: attraction, safety, reputation, recommendation, consumption, co-optation and collaboration – like a videogame. In fact, in a certain way, urban navigation may be said to assume a videogame-like quality: as we move around the city, increasingly, it is the city itself that appears to be moving around us, constantly adjusting to the movements and desires of its users (Tripodi 2020, 435).[25]

The discourse of 'user activity', upon which much of new media and contemporary smart governance are grounded,[26] implies a model of subjectivity dominated by delegation and reliance. As in videogames the user's problems have already been encoded before s/he enters the game, so does the user of urban platforms find his/her own urban problem already configured, and is therefore deprived of the possibility of engaging in the actual creation and co-construction of those problems. The algorithmic architecture of the platform pre-selects the available situations, acting through modulation at the level of 'the problematic', ultimately decreasing the subject's capacity to engage with it. If, as media theorist Lev Manovich (2000, 179) has suggested, the experience of videogames represents a close encounter with the algorithm, at the same time it also pushes the user towards the progressive incorporation of its logic and its in-built biases. This is also why the parallel between urban platforms and videogames should not be too far-stretched, since it risks reproducing the rhetoric which allows algorithms to ideologically shape atmoculture as a seamless user-friendly experience of urban navigation – at best epitomized in the smart city rhetoric.

To the extent that urban politics is turned into a matter of crafting user-friendly atmospheres wherein navigation may smoothly, efficiently and leisurely occur, questions of class, race, gender and social inequality are made invisible, bypassed and discarded. Of course, these questions do not really disappear; but, by being pushed onto the background of computation, they end up reasserting power asymmetries, reinforcing existent biases, and thus surreptitiously striating a hodology of bordering and exclusion. That is why the 'open wild' of the urban is never immediately encountered by the machine. While the jargon of data scientists have often evoked the 'raw data', in fact, the world offered to machine vision is first 'granularised and atomised' to be amenable to computation: 'the world must be coded in advance in the form of a purely digital vectorial representation' (Cardon et al. 2018, 23) in order to be processed.[27] This means that data are never really raw, and data labelling procedures are prone to confirm and reinforce already existent skews of visibility.[28]

We do not wish to imply that atmoculture is homogeneous, totalizing, and all-encompassing. The reality of its algorithmic digital platforms is not only tilted by asymmetries, biases and inequalities; it is also marred by discontinuities, gaps and blunders.

Atmoculture may as well spectacularly fail. At the same time, ethnographic enquiry should be able to uncover the extent to which the channelling of smooth, comfortable and convenient trajectories is coupled with the violent blocking of other ways, such as the dangerous and uncomfortable trajectories of the illegal migrant, and the entrapment of many in utter deprivation and subjection. We certainly do not live in tender times. Paraphrasing Sloterdijk, we may say that atmoculture functions as a phenomenological and ecological supplement to the process of urbanization: it provides a safe and enticing refuge from dislocation – one which, however, is available only to those who are able to afford it, as well as willing to enter the 'comfort-animated artificial continent' floating 'in the ocean of poverty' (Sloterdijk 2013, 195). Likewise, while atmoculture facilitates urban mobility, purportedly making movement secure, smooth, efficient and enjoyable, it does not challenge the default characterization of urban space as a space of anxiety. In the interstices of ease, comfort and playfulness, urban agoraphobia, the fear of urban space, fatefully re-emerges: as evoked at the outset, agoraphobia has been replaced by – or, rebranded as – *no-mo-phobia*, for 'no-mobile-phone phobia'.[29] Such condition, defined as a 'pathological fear of remaining out of touch with technology', refers to the fear of losing one's phone – or equivalently, being out of signal, battery or credit (Bragazzi and Del Puente 2014). These examples highlight how, through its tendency to pre-emptively smoothing out frictions and channelling trajectories, atmoculture tends to atrophy the cognitive tools to articulate boundaries and normativities, 'undermin[ing] the mechanisms by which members of society can demonstrate, to each other, their sensitivity to these nuances' (Dourish and Bell 2007, 426).

At first sight, atmocultural navigation makes the urbanite feel 'disburdened;' in reality, however, constantly accessing live information streaming, together with the awareness of contributing to the creation of such streams, can in the end have more burdensome consequences. These are not only legal and political, but also existential and even ontological consequences.[30] In his interpretation of Spinoza's *conatus*, Deleuze (1990, 222) shows that the vital oscillation of the body and the mind between the states of *joy* and *sorrow* – that is, between a maximal increase and a maximal decrease in the capacity to affect and be affected – functions as a force or power to act (*agendi potentia*) open to variation, which may be empowered or inhibited. Side by side with the oscillation of the intensity of affection lies another variation, concerning its breadth, or 'elasticity', which may change at the individual level, for instance with age or illness. This allows us to see another risk of the atmocultural ethos, namely, the reduction of the breadth and depth of *conatus*. For his part, the media theorist Geert Lovink (2019a, 47) has described the 'sadness [which] arises at the point we're exhausted by the online world', an exhaustion that is prompted by the constant demand for attention, the frequency and engagement of digital existence in 'the perpetual now that defines the "smart" condition'.

In contemporary atmoculture, the demand for engagement morphs into a demand for hyper-attention doubled by the hyper-engagement of our smart tools as they invisibly interact with the environment. In this context, sadness as the atrophy of the breadth and depth of our *agendi potentia* becomes 'a [new] general atmosphere, a chronic background condition' (*ibid*. 48). These considerations apply to what Alvesson and Spicer (2012) term *functional stupidity*, which is the quantum of stupidity required by organizational life. Functional stupidity consists in acting without much critical engagement or search for meaning, in order to let the system flow smoothly; it is an instance of acting

automatically, rather than with critical reflection. In parallel, Goriunova (2013) has remarked the tendency of the new media to produce 'idiocy', not so much as a way of thinking, but as a mode of living by staging 'encounters with the real through its force of insignificant, false and preposterous doings' (*ibid.* 225). A degree of stupidity and idiocy is, in fact, the coessential corollary of the increasing smartification of society: in a capillary attention economy, urbanites are stunned, stupefied, while complex decision-making, delicate conflict management, and even the expression of moral disagreement, are delegated to algorithms.[31] Abdoumaliq Simone (2016, 149) notes that 'part of the importance of everyday urban practices is that they constitute a repository for this urban learning, enabling knowledge about how to forge and conduct new relationships among people, places, and things'. Informal urban literacy concerns crafting relations, having to *figure out,* develop temporary alliances, improvise and act in the face of the unexpected. Seemingly tasked with disburdening the urbanite, algorithmic atmoculture outsources this literacy to other agencies and to non-human interaction between sentient devices, in this way threatening to atrophy a fully developed politics of the urban body (Protevi 2009), and pushing towards a generalized *urban deskilling.*[32]

Certainly, a historically-conscious understanding of algorithms warns against technophobic lamentations. As we have shown, the pre-structuring of the problematic field enacted by algorithms is at bottom not dissimilar from how subjectivity is constituted, as well as how social 'nomotopic' normativity operates. However, algorithmic recursive capacity, technical opacity, and aesthetic invisibility, makes them quantitatively challenging. While algorithms are concrete ways of mobilizing social relations, they also enact a selective visibilisation, whereby relations of power are encoded, made opaque, and misleadingly reduced to concerns of efficiency (Scannell 2015). Urban algorithms encourage what Morozov (2014) has called 'solutionism', i.e. the preventative neutralization of the problematic in social life. This is why rescuing a *right to the problem,* namely, a right to participate in the *creation of new problems*, may be amongst the most important challenges to be faced before atmocultural solutionism (see Deleuze 2006[1986], 87).

Conclusions

In the Covid-19 pandemic era, the reflections of Westphal, Lewin, Sitte and Simmel on the psychosocial anxiety of urban space have been given a novel twist. We have learnt that atmoculture also includes *atmophobia*, or 'atmos-fear', the fear of an invisible airborne disease populating the vapour (*atmòs*) that encircles us. Especially in urban environments, the ontological density of our coexistence and its co-fragile vulnerability have become painfully visible. At a planetary scale, the pandemic situation has triggered a sudden re-organization of the urban being-together, in the attempt to find a complex balance between slowing down biological contagion (risk of illness), preserving psychic well-being (risk of isolation), and keeping the economies running (risk of unemployment). As the immunitarian ethos imposed itself in normative, aesthetic and biological senses, the techno-social and legal regulation of urban navigation has become paramount: from the analogical requirement of social distancing, to the digital solution promised by contact tracing apps. Perhaps never have we assisted to such an explicitly hodological turn in governance, aimed at the channelling, regulating and tracing of

urban *trajectives* in the context of ethical exhortations to be responsible and caring for the common atmosphere.

Culture has been fully revealed *as* the atmosphere in which the aesthetics, the biological and the normative precariously merge. 'Distanced' social life has also plastically rendered the cult of the atmosphere that characterises our experience-economy societies. If Andy Warhol once famously declared that restaurants in New York no longer sold food, but rather atmosphere, we have experienced what it means to remove such an asset in the form of a spectral life conducted entirely *at distance*. In the hardship of the first viral wave, the immediate biological aspect of security has been reclaimed as paramount, whereby the preindividual heterogeneous multiplicity of the social has been shifted to *cultivation* in a suitable medium to be kept under controlled conditions (as opposed to the 'spill-over' of zoonotic contagion). More profoundly, as an immersive *culture medium*, atmoculture has been tasked with mediating between the existential and the structural, between experience and abstraction, shaping a novel understanding of responsibility and valorization. The question of what is important, what is essential, *what makes life worth living* (Stiegler 2013) has returned to centre stage. This way, atmoculture has been functioning as a culture of information in all its dimensions – and, more specifically, as a culture of measures (two-metre or one-metre interpersonal distance, 37.5°C body temperature, quarantines …). The outcomes of these events remain quite uncertain at present. *In theory*, that is, in a controlled experiment, social multiplicities can be modulated according to a topology of spatial valences in Lewin's sense. The fact that, *in practice*, the 'experiment' is far from being 'under control' has, however, not detracted from the powerful atmocultural orientation that has set in. This remarkable situation has made explicit the intersection between the affective, the aesthetic, the biological and the computational dimensions that compound contemporary atmoculture.

While we do not intend to draw premature consequences from the remarkable events we have been through, we suggest that they may be not unrelated to the interplay between atmoculture and an emerging new understanding of subjectivity, such as the one we have outlined above. The convergence, in atmocultural conditions, of widespread computation and urban movement transforms the movement-space of modernity into an algorithmic architecture which entails a specific problem/solution ratio. The paradoxical features of atmoculture lie, as we have seen, in the fact that it simultaneously disburdens the user (immunization, safety, etc.) and re-burdens it (hyper-stimulation, shrinking of *agendi potentia*). Increased reliance on digital algorithmic platforms substitutes subjectivity and shuts it out of the capacity to pose – rather than solve – problems, driving urban life towards atmospheric contexts that always appeared as structured in advance, with in-built asymmetries of class, gender, race, age, and ability.

Any attempt to democratize algorithmic mobility must counteract on its two threats: on the one hand, the atrophying production of functional stupidity and the ensuing 'sadness by design;' on the other, the in-built biases that invisibly structure it. Yet, we also suggest, the question concerns not simply a more equal and transparent redistribution of algorithmic *potentia*.[33] More profoundly, what needs to be challenged is the implicit nomotopic normativity sustained by the cybernetic ethos of maximal efficiency, complemented by the technocratic ideology of solutionism. In this vein, we concur with Pasquinelli's (2017, 289–90) analysis of the potential that our contemporary socio-technical context harbours, in the sense of ushering in the birth of novel

transindividual social formations, emphasizing the need to focus not only 'on the deconstruction of the individual into dividuals' but also look at 'its political reconstruction and assemblage as condividual'. The current pandemic has made tangible the ethical and techno-social materiality of possible *condividual formations*, in the form of new solidarity practices.

Moving beyond the necessary and yet per-se insufficient critique of the deleterious effects of algorithmic hodology, we believe it is necessary to scout for new possible forms of social life potentially summoned by the atmocultural condition itself, envisaging a new articulation of abstraction and experience. A way out cannot be grounded on sheer escapism, nor just on repurposing existing technology for emancipatory end. Both the inner logic of algorithms and the attitude of solutionism, both the techno-social metrics through which 'raw' data are collected and the assumption of frictionless individuation upon which that collection rests, must be attended. Moving beyond libertarian individualism, apocalyptic technophobia, and naïve technophilia, the field of *the problematic* needs to be rescued, outlining a fully-fledged *right to the problem*. Instead of stopping at the – albeit necessary – critique of utopia and dystopia, we might need, as Hui says, 'to re-appropriate the concept of modulation'. The potential for building a different hodology, where the emancipatory potential of dis-orientation is not left to the isolated individual, or to already-constituted social bodies, such as corporations and institutions, but actually becomes *condividual*, opens up here. Instead of unconditional smoothening, new ways of inserting creative constraints to rearticulate the modulation of algorithms and make them more modest vis-à-vis the large and small catastrophes and discontinuities of our social life, can be imagined.

Notes

1. We wish to acknowledge two anonymous reviewers appointed by the journal for very stimulating comments and remarks.
2. A classic illustration is Google Maps' 'areas of interest', which, it has been remarked, are 'less about *how* to get around than about *where* to go' (Grabar 2016).
3. There is a rich and growing literature on *urban atmospheres* inspired by the three main directions of 'atmospheric' thinking: the French tradition (in particular the work of Jean-François Augoyard, Jean-Paul Thibaud at the CRESSON lab in Grenoble), the German tradition (in particular the work of Hermann Schmitz, Gernot Böhme, Peter Sloterdijk), and the more recent Anglo-Saxon tradition (in particular the work of Ben Anderson, Derek McCormack, Kathleen Stewart). We have reviewed these developments elsewhere (Pavoni and Brighenti 2018). For a useful introduction, see also Bille, Bjerregaard, and Flohr Sørensen (2015). Similarly, *mobility* has been constituted into a veritable sociological paradigm by the Lancaster school associated with John Urry, Mimi Scheller, and others (e.g. Sheller and Urry 2006, 2016). Human geographers have also developed the mobility paradigm extensively, see e.g. Cresswell and Merriman (2011); Merriman et al. (2013), and Cresswell (2011, 2012, 2014).
4. 'Between object and subject, between objective and subjective there is an enormous gap: the trajective [*le trajectif*]. Object, subject and trajectory are one single being' (Virilio in Offner, Sander, and Virilio 1991, 48).
5. Incidentally, a similar idea is foreshadowed in Freudian psychology, specifically in the notion of *Besetzung* (energy investment, or 'charge'). While we cannot venture more extensively into this topic here, arguably Freud's *Besetzung* laid the foundations of a fully 'cathectic' approach to the urban psyche.

6. Specifically, Carter (2002, 9) develops this argument reflecting on the etymological co-presence, in the word agoraphobia, of the notion of *agorà* (the public square) and its dialectical opposite, the *agròs* (the countryside, the 'faraway place'), arguing that since its inception the agora is 'twinned with wilderness', whereas the repression of this constitutive wilderness is typical of the modern imaginary. Esposito (2002) develops a similar argument, focusing on the 'impossible' relation between community and immunity.

7. We refer here to the difference between map and diagram proposed by the anthropologist Peter J. Wilson (1988). According to him, whereas hunter-gatherer societies are intrinsically 'map-making' societies, insofar as their problem is fundamentally one of reaching out for resources scattered over large territories, domesticated societies should rather be considered as 'diagrammatic' or 'recipe-based': they function through instructions and templates allowing to perform certain tasks – such as for instance, 'How, what, and when to plant, and where; how, where and when to herd; who should (has to, has the right) to be where and to have what … ' (Wilson 1988, 153), and so on. A domestic life then requires a diagrammatic way to organize, connect and integrate movement across its 'wild' in-betweens: something like an infrastructure of mobility is called forth. To avoid confusion, the word diagram is used here in a different sense from Gilles Deleuze's homonymous notion. In Deleuze, the diagram has to do with the immanent surfacing of a 'consistence' among the different parts of a given formation, for instance a social group, a territory, or more generally a 'machine' or 'assemblage'. The diagram is what keeps a formation together, it is its way of working, or actual mode of functioning. While Wilson's connotation of the term is different, its algorithmic premises, as we are to see, are remarkably similar. Recently, in this vein, Matteo Pasquinelli (2019) has characterized algorithms as 'an abstract diagram that emerges from the repetition of a process, an organization of time, space, labor, and operations: it is not a rule that is invented from above but [one that] emerges from below'.

8. Cerdà's intention to domesticate the urban in its entirety is later echoed in Le Corbusier's [1887–1965] vision of fast urban mobility unhampered by the unpredictable chaos of the urban crowds and the intermingling of pedestrians and cars (Adams 2014). As Le Corbusier (1987[1924], 168) put it in *Urbanisme*, 'traffic can be classified more easily than other things. Today traffic is not classified – it is like dynamite flung at hazard into the street, killing pedestrians. Even so, traffic does not fulfil its function. This sacrifice of the pedestrian leads nowhere'.

9. Specifically, imageability is defined as 'that quality in a physical object which gives it a high probability of evoking a strong image in any given observer', that is, an object able to polarise a significant valence – not necessarily seen, but in any case 'presented sharply and intensely to the senses' (Lynch 1960, 9).

10. As known, the word 'cybernetics' derives from the Greek *kybernetes*, i.e. steersman, which in Latin translated as *gubernator:* the verb *to govern* initially developed from the field of navigation, and *cybernétique* was introduced by André-Marie Ampère in nineteenth-century French to designate 'the science of governing humans'.

11. See for instance the following passage: 'Let the mishap of disorientation once occur, and the sense of anxiety and even terror that accompanies it reveals to us how closely it is linked to our sense of balance and well-being. The very word "lost" in our language means much more than simple geographical uncertainty; it carries overtones of utter disaster' (Lynch 1960, 4). One can contrast this view with the Situationists' practice of *dérive*, or drifting, which proceeded through the deliberate production of spatial disorientation as a prelude to urban play and discovery.

12. In the original: 'L'être percevant est le même que l'être agissant : l'action commence par une résolution des problèmes de perception ; l'action est solution des problèmes de cohérence mutuelle des univers perceptifs'.

13. In the original: 'le chemin est à la fois monde et sujet' (Simondon 1995[1964], 209).

14. In this sense, we may also understand better Simondon's critique of Lamarckian evolutionism, where the process of adaptation is understood as carried out by pre-formed individuals in pre-given environments: a 'biology without ontogenesis', glosses Simondon (1995[1964], 208).

15. 'Just as entropy is a measure of disorganization, the information carried by a set of messages is a measure of organization' (Wiener 1950).

16. Literally, the individual is that which cannot be cut down into pieces – or better, that which cannot be cut down *without changing nature*. By contrast, the dividual is divisible without undergoing a change in nature. This makes it, to some extent, scale-less, and always mixable, or even always currently mixed: a new principle of social composition is envisaged.

17. As Kasy (2019) explains in different terms, machine learning for the most part is grounded on two basic concepts: *regularisation*, that is, the selection of relevant patterns and the discounting of irrelevant ones; and *tuning*, that is, the comparison of 'the predictions for the validation data to the actually observed outcomes'.

18. As Matteo Pasquinelli and Vladan Joler write, 'a statistical model is said to be trained successfully when it can elegantly fit only the important patterns of the training data and apply those patterns also to new data "in the wild"' (2020, 10).

19. The artificial intelligence paradigm devised by I.J. Good, Marvin Minski and others in the 1960s was mostly moulded upon a formalistic vision of human rationality. The neural network model changed the approach, reformulating of the relation between the machine and the world, 'basing the performance of prediction on the world itself' and in this way 'renewing the adaptive promises of the *reflection machines* of cybernetics' (Cardon et al. 2018, 30). For an interesting exploration, see also Errol Morris' 1997 feature film, *Fast, Cheap & Out of Control* covering Rodney Brooks' work in robotics.

20. As Cardon et al. (2018, 9) summarise, 'The characteristic feature of the architecture of these machines is that their coupling with the environment (the world) is so organic that it is not necessary to grant the calculator its own agentivity'. In his useful introduction to the concept, Pedro Domingos (2015, 7) offers an illuminating comparison – unwittingly, perhaps, a fully vitalistic one: 'In farming, we plant the seeds, make sure they have enough water and nutrients, and reap the grown crops. Why can't technology be more like this? It can, and that's the promise of machine learning. Learning algorithms are the seeds, data is the soil, and the learned programs are the grown plants. The machine-learning expert is like a farmer, sowing the seeds, irrigating and fertilizing the soil, and keeping an eye on the health of the crop but otherwise staying out of the way'.

21. This, he remarked, is the opposite of an 'hypertelic' adaptation to the task that deprives the machine of flexibility. Increasingly pushing forward the constraints of the technical evolutionary phyla they belong to, open machines are able to assume within themselves a number of 'critical points', dealing with margins of indetermination to be temporarily and strategically 'localised'. However, Simondon warned that, contrary to cybernetics, the analogy between living things and technical objects cannot be stretched too far: while the living thing is an actually concrete reality, the technical object contains an 'abstract' part, the partial concretisation of which corresponds precisely to the given degree of technical evolution. Reasoning with Simondon, until machines will not be in measure of posing the coordinates of their own vital problem, they will always contain a degree of abstractness.

22. 'By "the experience of infrastructure," we point to the ways in which infrastructure, rather than being hidden from view, becomes visible through our increasing dependence upon it for the practice of everyday life. By "the infrastructure of experience," we want to draw attention to the ways in which, in turn, the embedding of a range of infrastructures into everyday space shapes our experience of that space and provides a framework through which our encounters with space take on meaning' (Dourish and Bell 2007, 417).

23. Sloterdijk has traced this spatial genealogy in his remarkable three-volume *spherology* (2011, 2014, 2016). We engaged more directly with Sloterdijk's work elsewhere (Brighenti and Pavoni 2018, 2019).

24. For a similar take on control as 'environmental modulation', see the growing literature on so-called *environmentalities*, inspired by Foucault's lectures on biopolitics and Deleuze's postscript (e.g. Anderson 2012).

25. In this sense, Holert and Mende (2019) write: 'Navigation, instead of framing or representing the world, continuously updates and adjusts multiple frames from viewpoints within the

world. Navigation in the digital realm is the modelling and mapping of an elusive environment – in the service of orientation, play, immersion, control, and survival'. See also Galloway (2006).

26. For remarkable examples of urban governance tailored to citizens as *users* and explicitly using gamification strategies, see for instance the cases of Gainesville, Florida, and San Francisco (Budds 2016a and 2016b).

27. The world is rendered as a vector space supporting a topological system of pattern recognition based on statistical proximities (Topological Data Analysis). 'According to Yann LeCun, the goal of the designers of connectionist machines is to put the world in a vector' (Cardon et al. 2018, 24).

28. While few would doubt that behind the interface, multiple informatic protocols intersect, it is rather harder to convey the idea that such protocols are not innocent, and that behind their technocratic functionality there are always asymmetries. Authors such as Noble (2018), Benjamin (2019) and Espeland and Yung (2019), for instance, have drawn attention to the racism that may be encapsulated in algorithmic language, and made accordingly 'infrastructural' and invisible.

29. Curiously, the proponents of the word 'nomophobia' for this psychic condition seem to have been unaware about the earlier meaning of the word, referring to a fear of the law (*nómos*).

30. We have dealt more extensively with some of the legal and political consequences of atmoculture elsewhere (Brighenti and Pavoni, 2020).

31. 'The discernment that Kant called understanding (*Verstand*) has been automatized as *the analytical* power delegated to algorithms executed through sensors and actuators operating according to formalized instructions that lie outside any intuition in the Kantian sense – that is, outside any experience' (Stiegler 2018, 28).

32. 'This figuring-out of connections was one of the key skills and preoccupations of residents inhabiting popular districts'. Simone is referring to African and Southeast Asian cities, such as Khartoum, Kinshasa, or Jakarta. Admittedly, our discourse is grounded in an eminently Western genealogical trajectory; nonetheless, the planetary dimension of both contemporary urbanization and global computation means that it can be applied to a variety of non-Western contexts. Although it takes place in very different ways, atmoculture is a general reality of the contemporary urban.

33. An example in this vein is for instance *fairbnb*, https://fairbnb.coop/.

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