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ARTIFICIAL INTELLIGENCE AND DEEP LEARNING ALGORITHMS: A POST-SMART PATH FOR CITIES

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Abstract

The Artificial intelligence (AI) and deep learning algorithms have had a significant impact in overcoming the concept of a smart city, as evidenced by the latest scientific research. That trajectory is shifting from smart ontology to deep learning algorithms. The work integrates theoretical and practical knowledge of AI cohabitation with the city and how it changes it, but also a reversible process. AI recomposition is also considered, drawing on a number of urban disciplines and case studies. Through a comparative analysis of a series of case studies in cities where different methods of mutual constitutive relations have been applied, a synthesis of conclusions and a series of criteria and recommendations is reached. The chosen methodology is based on the thesis that every local context is unique, and AI system must be developed in a way that is adapted and corresponds to the specific local context. The research reveals the various impacts of AI on society, education, infrastructure, urban planning and sustainable development. The so-called new postsmart path for cities is confirmed through empirical examples and represents a new era and paradigm of future urban life. The urbanism of artificial intelligence was analyzed and the results may be useful in some future research due to the very interdisciplinary nature of the topic both in the fields of urban studies and architecture, as well as from the point of view of studies of scientific and technological development, education, sociology, culture and politics.

Key words*: artificial intelligence (AI), deep learning algorithms, strategies management, sustainable development, urban planning.*

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1. Introduction

The life of urban AI intersects with the life of cities, because these are AI technologies designed and programmed to interact with humans and to mediate socio-economic activities that occur primarily in urban spaces, and thus deviate from the many AI employed. Most AI need a material base to operate and all AI need spaces to act upon because their activities always take place somewhere, for example, an apartment whose market value has been calculated by an algorithm (Fields, 2022; Safransky, 2020). The city gives AI a material iteration, situating it in the physical landscape (Cugurullo et al., 2023). AI is being infused into the governance of cities, and it has the potential to create the autonomous city where human agency might be overshadowed by the agency of urban AI (Cugurullo, 2021). The relationship between society and space, which is realized within the framework of the contemporary environment, is determined by a specific constellation of factors in the aspects of politics, economy and culture.

This cooperation creates a form, which is called an organization. Them organization is considered to be an open, dynamic and complex system, which requires a comprehensive approach from every point of view. As a complex system, the organization consists of a large number of integral subsystems that must be coordinated. On the other hand, the organization is a subsystem of a higher-order system, and accordingly, the complexity of the approach gains importance, as well as the process of managing such a system. The openness of the system is conditioned by the interaction between consumers, employees of the organization, as well as all others interested in the operation of the system (Vojnović, 2011).

In this sense, urban AI is not merely a passive tool to inform human decision-makers, but rather an active stakeholder which makes decisions and shapes urban governance. This situation is not accidental. Political decisions made by humans place urban AIs in the position to make decisions about the governance of cities (Cugurullo et al., 2023). Accordingly, it is not possible to isolate urban development from the context of comprehensive development. This paper proves it. The first part deals with the systemic and strategic approach in the classic view, while the second part formulates recommendations for choosing strategies, as well as strategies themselves in the context of urban development. AI urbanism is an emerging urbanism that is transcending smart urbanism, thus posing new challenges that require new questions and debates in urban studies.

1.1 Systemic and strategic approach to development

A systemic approach should take into account points of view and aspects of an economic, ecological, legal, cultural, urban and other nature. The system of city organization is limited by a border, which demarcates it from the environment. Considering that it is an open and flexible system, the influences that come from the outside or from the organization itself are followed, thus increasing flexibility and creating the permeability of the system (propulsion) towards the environment. In

this way, the system is integrated into a higher-level system, that is, it becomes a subsystem of another system. Synergy as a feature of the system is particularly evident in the service organization system. In principle, synergy encourages better connections between subsystems, which function much more effectively if they are linked, than when they act independently, each on its own.

Since it is not possible to view the system as a simple sum of individual parts, it should be holistically defined. Therefore, another feature that occupies an important place in the functioning of the system is holism. This is exactly how AI and machine learning permeate the functioning of cities. Traditional analytical methods of studying the urban land use dynamics associated with urbanization are static and tend to rely on top-down approaches, such as linear and mathematical modeling. These traditional approaches do not capture the nonlinear properties of land use change. New technologies, such as artificial intelligence (AI) and machine learning (ML) have made it possible to model and predict the nonlinear aspects of urban land dynamics (Chaturvedi & de Vries, 2021).

2. A review of AI managment in urban contexts

We offers an overview of the major considerations facing local authorities as they are make important decisions on how and when to use AI. The report provides a review of AI managment in urban contexts, an analysis of existing AI applications. Through a comparative analysis of a series of case studies in cities where different methods were applied, we have found in which direction and with what intensity the organization will develop and which objectives are formulated as strategic depends on the business policy, which is formulated as basic in the development process. A strategic approach to the problem requires a correct strategic decision. Each local context is unique, and AI systems must be developed starting from, and adapting to, the local context. The successful deployment of AI systems is often determined by how the systems interact with their environment (UN-Habitat, 2022).

2.1 Examples of urban planning management with the help of AI and deep learning algorithms

The spatial distribution and infuencing factors of E-A-U space in Yulin City were analyzed utilizing a multi source data representation and a deep learning method with GIS technology. Te results reveal distinct regional characteristics in the distribution of urban-agricultural-ecological space (Li et al., 2024). This study employs deep learning as an approach for suitability assessment, and the constructed deep learning model achieves an accuracy of 89.86% and a Kappa coefcient of 80.77% on the validation set. The outcomes of this research offer a fresh perspective on coordinating urban development, ensuring food security, safeguarding ecological integrity, and achieving sustainability (Li et al., 2024).

Second study develops siting distribution scenarios for astronomical observatory locations in Indonesia using a suitability analysis by integrating the physical and atmospheric observatory suitability indexes, machine learning models, and long-term climate models (Sakti et al., 2023). The correlation value between population and night lights had the highest correlation value of 0.9, indicating that the population in an area can be identified through the brightness of the night lights. This is because the brightness of the night lights can identify socioeconomic activity (Sakti et al., 2023).

As a third case study, the ANN-based model was applied to simulate the urban growth of Saharanpur city in India. In the proposed model, remote sensing and GIS were used to generate site attributes, while ANN was used to reveal the relationships between urban growth potential and the site attributes. Once ANN learnt the relationship, it was then used to simulate the urban growth. Different feed forward ANN architectures were evaluated in this study and finally the most optimum ANN architecture was selected for future growth simulation (Maithani, 2009).

The City of London has engaged in a cross-sectoral collaborative city planning strategy, formalising the relationship between administration, industry and academia. In the effort to manage data and AI research, both Connected Places Catapult and the Alan Turing Institute have partnered with the City of London (UN-Habitat, 2022). Their collaborations help start-ups and scale-ups based in London or operating there to develop their unique ideas. This partnership provides qualifying start-ups and scale-ups with new chances to collaborate with academics on data-driven urban challenges (Alan Turing Institute, 2018).

3. Formulation of post-smart urban development recommendations and strategies

In a similar way, as with standard strategies, and with urban development management, it is necessary to define strategies. In the new context of urban development, the Government's role is not only to achieve a good geopolitical positioning and maintain political stability and social cohesion, but also, dominantly, to encourage the development of a new model of economic growth and an appropriate platform for conducting economic policies.

The priority would be: **finding a market, favorable means, modernization of equipment, higher product quality and training of personnel**. Taking into account the topic of this work, and in the context of multidisciplinarity, the following text suggests strategies of urban development, which can, in cooperation with classical factors, form the basis of overall development. A proposal of strategies in the context of urban development is presented.

1. It is essential for citizens and communities to be involved in the development of an AI strategy. This step is **to engage the public**.

2. The next step is **to identify the affected communities targeted by AI systems**, and then actually reach out to them and engage them through established community networks and processes (UN-Habitat, 2022).
3. **Local knowledge can be included**, because misleading conclusions can stem from failing to link both the input and the output of an AI system with local knowledge. Tacit knowledge comes from the things we know from experience and practice, while contextual knowledge includes social and cultural norms and the way things are done locally (Buuren, 2009; Kitchin, 2016).
4. Existing resources can provide opportunities to draw on, as well as set limitations on what is possible, so we have **to build on existing infrastructure and datasets**.
5. **Capacity-building, for an urban AI strategy**, is defined as the process of developing and strengthening the skills, instincts, abilities, processes and resources that organisations and communities need in order to plan, design and deploy AI applications.
6. **Increased awareness and knowledge of AI and AI application in the city** will ultimately facilitate communication with the general public and with the private sector.
7. An entire **ecosystem of interdisciplinary skills** is required for a thriving AI implementation. AI regulation and law, AI ethics and AI business development are all key skills alongside computer programming. As AI finds more and more useful applications in the city, the urban sector will increasingly use cross-functional teams.
8. The balance between **the construction strategy and heritage preservation**, through the development of a sustainable structure in the present, and the tendency of sustainable development in the future, is one of the main goals.
9. The most attractive idea within the consideration of the global future is **the planning of sustainable development as a new paradigm of urban and territorial development**.
10. In addition, **social, ecological and cultural development** stand out as important pillars of further planning. There are various experiences and methodologies from global to local contexts that are increasingly used in urban planning, and which include the opinions of residents.
11. Financialization does not have a final outcome, instead it constantly reshapes the urban landscape (Stojanović & Lošonc, 2017). This adaptive **quality of financial strategy** means that global financial capital seeks new strategies of accumulation, processes of unequal development and undergoes changes and thus tries to respond to the negative externalities of financialization at the local level which it can simply solve by choosing a new location.
12. **Innovation leadership** with is a very interesting way for local authorities to be proactive on digital innovation is to nurture similar

leadership positions as those found in the tech industry (UN-Habitat, 2022).

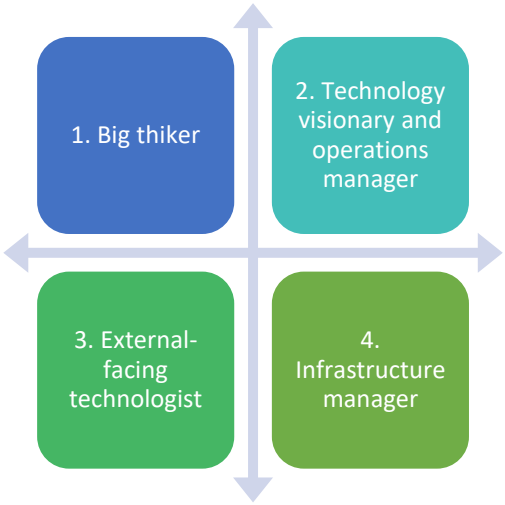

Figure 1: Innovation leadership as those found in the tech industry

4. Conclusions

The global strategy should retain important local characteristics, to the extent and in a way that will contribute to coherence with European city systems, implying the urban-cultural context of sustainable development (Pušić, 2012). By transcending the smart city, the rise of AI urbanism might lead in the future to the formation of the autonomous city defined as a space where diverse urban AIs perform social and managerial functions that have traditionally been human activities, in an unsupervised manner. This is an urgent question for urban scholars to consider because, 'a city run not by human but by artificial intelligences' would challenge the autonomy of human stakeholders and struggle to be environmentally sustainable due to energy intensive supply chains (Cugurullo et al., 2023).

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