

AI system found to outperform humans in creating urban planning designs

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Demonstration of community renovation and a 15-minute city. a, Community renovation. We replicate the roads, residential blocks and parks from a real-world community and leave other areas as vacant lands for renovation. The agent places different types of facilities to maximize the accessibility of service for residents in the community. b, A 15-minute city, which means that five basic residential needs can be satisfied within 15 min by walking or cycling. c, Facility needs. We vary the needs for five different facilities (school, hospital, business, office and recreation) that correspond to the five basic services (education, medical care, shopping, working and entertainment). We investigate low needs (2 counts per facility), medium needs (4 counts per facility), high needs (8 counts per facility) and mixed needs (10, 5, 4, 8 and 3 counts for the five facilities, respectively). d, Service accessibility performance under different needs. We show the 15-min-circle index for the five basic services of the generated community plan under different facility needs. The radical value

means the proportion of residential blocks that can access the corresponding service within 15 min. Credit: *Nature Computational Science* (2023). DOI: 10.1038/s43588-023-00503-5

A team of urban planners and information scientists at Tsinghua University in China has found that an AI-based urban planning system was able to outperform human experts in creating urban planning designs. In their study, reported in the journal *Nature Computational Science*, the group describes the factors that were used in describing the ideal urban plan and how well their AI did when tested. Paolo Santi, with the MIT Senseable City Lab, has published a News & Views piece in the same journal issue outlining the work done by the team on this new effort.

For much of history, cities have been left to grow organically—immediate needs were determined and urban planners and engineers attempted to fulfill those needs. In many cases, such a haphazard approach to [urban growth](#) has led to less-than-optimal results. In more recent times, [city officials](#) and other planners have attempted to take a more logical approach to the problem by creating designs for areas to be developed that account for things like livability and pollution controls.

This has led to the development of urban planning as a science and the advent of professional urban development experts. This science can be extremely complicated due to the increasing number of variables that must be accounted for as the size of a new development increases. In this new effort, the research team found a way to apply AI to the problem to ease the burden.

In developing their AI system, the team chose to use the 15-minute

concept, in which residents of the planned community should be able to travel from their homes to essential services within 15 minutes. Under such a system, quality of life is improved due to reduced [travel time](#) and far less generated air pollution. The researchers trained the system with prior plans crafted by humans along with factors that are believed to be good design features such as the inclusion of parks, general greenery, bike paths and places for entertainment.

Once the system was built, the research group used it to first design a small community in a 3x3 grid city block. That allowed them to tweak the system, which led to improvements. They then gradually increased the size of the development desired and studied its results.

The researchers found the plans the system developed were as good or better than those created by humans. They also found a huge reduction in time—from hours to seconds. The team concludes that their system is not meant to replace human [urban planners](#), but to free them from the mundane parts of urban planning, allowing them to focus on overall concepts.

More information: Yu Zheng et al, Spatial planning of urban communities via deep reinforcement learning, *Nature Computational Science* (2023). [DOI: 10.1038/s43588-023-00503-5](https://doi.org/10.1038/s43588-023-00503-5)

Paolo Santi, AI improves the design of urban communities, *Nature Computational Science* (2023). [DOI: 10.1038/s43588-023-00515-1](https://doi.org/10.1038/s43588-023-00515-1)

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