

# How Your Data Will Power the Smart City Revolution



Among the changes ushered in by the 21st century, perhaps the most surprising—as rapid as it has been disorienting—has been the revitalization of cities.

In the last two decades, plummeting crime rates, growing populations, and real estate markets fueled by inflows of global capital have transformed expectations of urban growth that had been all but abandoned for two generations. In the 21st century cities have become the engines of economic growth; by 2050 there will be 2.5 billion more people living in cities globally than there are today,<sup>1</sup> and the world's 100 largest urban centers will account for 35% of global GDP growth between now and 2025.<sup>2</sup> And growing inequality among cities is a symbol for society's challenges overall; in the United States, wealthy coastal cities are becoming privileged havens of freedom, whereas the fates of smaller inland cities are far less certain.

As municipal governance becomes infused with technology, however gradually, “the Smart City” has become a euphemism for progress and data-driven efficiency. This phenomenon is certain to unfold in some form or other, offering cities the opportunity to be safer, more automated, more personalized, and more accessible. But the nature of “smart” urban life is often left to opportunistic startups and architectural renderings that can be both aspirational and distressing. Will our “smart” urban future be defined by more efficient transit, personalized services, and pedestrian-friendly streets? Or will it be littered with e-scooters, eight-figure condos, and pervasive surveillance? Euphemisms exist for a reason.

The “big data” phenomenon is often discussed in abstract terms—the stuff sitting in data centers far away, used by the world's biggest brands, advertisers, and technology companies. To most consumers, the value of big data is most evident in their interactions with platforms like Amazon and Netflix as a tool for generating personalized recommendations.

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1 Scher, Peter. “Cities Are The Engines Of Economic Growth.” *Forbes*, 28 May 2015, [www.forbes.com/sites/jpmorganchase/2015/05/19/cities-are-the-engines-of-economic-growth/](http://www.forbes.com/sites/jpmorganchase/2015/05/19/cities-are-the-engines-of-economic-growth/).

2 Dobbs, Richard, et al. “Urban World: Mapping the Economic Power of Cities.” McKinsey & Company, Mar. 2011, [www.mckinsey.com/global-themes/urbanization/urban-world-mapping-the-economic-power-of-cities/](http://www.mckinsey.com/global-themes/urbanization/urban-world-mapping-the-economic-power-of-cities/).

Less obvious is how patterns and intelligence derived from that data are increasingly applied in the background of our day-to-day experiences. The algorithms behind the foundations of modern life are only starting to utilize data sets in novel ways that are far more subtle and rarely obvious.

The impact of these techniques will become amplified and more rapid as they're applied across large systems in real time. Moreover, the scale of data that's being collected by those platforms is only a fraction of what's to come. The power of data-fueled AI is moving beyond movie recommendations and into all facets of urban life: mobility, security, housing, education, and municipal services.

New York's Open Data<sup>3</sup> initiative is one of several such programs around the world that have attempted to make municipal data of all kinds available to the public, and to third party developers for use in their applications; it boasts "over 1,600 New York State data resources on topics ranging from farmers' markets to solar photovoltaic projects to MTA turnstile usage." The reality of using this data is more complex; it's often a patchwork of databases and spreadsheets, some more complete than others, that can require substantial effort to parse and effectively use in any real-world application. But that this data is available at all is an important precedent, and with enough support the quality of these initiatives is sure to improve over time.

Beyond the humdrum digital artifacts of daily municipal governance, advances like 5G networks, sensors, bluetooth beacons, mobile device location data, and payment data (some of consumers' most sensitive data, it should be said) promise to open vast new categories of data-driven intelligence for meaningful decision-making at scale. Location data is particularly valuable to city and state agencies, as they allocate, deploy, and manage their resources. But one could forgive a citizen who might have some hesitation about this arrangement—data presents opportunities for a city like New York, a progressive city government in the best of times; less clear is how it could be used by a hostile one in the worst of times. Singapore, which aims to be the world's first "Smart Nation"<sup>4</sup> has been criticized by privacy and democracy advocates for collecting

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3 "Open Data NY." State of New York, [data.ny.gov](http://data.ny.gov).

4 "Transforming Singapore Through Technology." Smart Nation Singapore, Smart Nation and Digital Government Office: Singapore, [www.smartnation.sg](http://www.smartnation.sg).

massive amounts of data (everything from your car's location to your energy consumption) without the protections of privacy laws, a concern underscored by its history of suppressing dissent.<sup>5</sup>

How might cities become smarter, more efficient, less private, or possibly less secure than ever before? Here are five ways these trends might unfold:

## The Frictionless City

Possibly the biggest single impact of data-driven services will be found in mobility. Mobility-as-a-Service (“MaaS” in industry shorthand) is an oft-discussed paradigm in the world of transportation, perhaps most evident with user-initiated on-demand services like ride sharing. But the logistical burden of knowing which service to use, and the limitations of those services, still largely sits with the consumer. What's the fastest way to get to work? The easiest? The cheapest? The most enjoyable for the weather? These judgements are yet ill-suited to the cloud except within narrow use cases. But the cloud is getting better.

Recommendation algorithms can route around system disruptions without having to ask about service status. Apps like Pigeon<sup>6</sup> (developed in-house by Google) enable crowdsourcing, so that the public can know about a disruption even before the agency does. And during high-volume periods, transit agencies that feed data to those algorithms can make adjustments that help smooth out bottlenecks.

## The Personalized City

The promise of data-driven mobility isn't just about efficiency; it's also about delivering a personalized experience that makes urban living safer, more affordable, more energy-efficient, and (lest we forget) more ripe for hyper-targeted advertising.

The use case of the commuter is a perfect example of where personalization can deliver benefits. Repetitive behavior is especially useful for real-time recommendations, because it's based on usage patterns that emerge for each individual, and across transportation modes at scale. The predictive

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5 Geib, Claudia. “Smart Cities May Be the Death of Privacy as We Know It.” *Futurism*, 17 Jan. 2018, [futurism.com/privacy-smart-cities/](http://futurism.com/privacy-smart-cities/).

6 “The Crowdsourced Transit App for New Yorkers.” Pigeon, [pigeon.area120.com](http://pigeon.area120.com).

power of commuter data is at the core of how many cities will enable personalization of their urban experience, with transportation at the core.

Mobility-as-a-Service initiatives should be focused first and foremost on the customer experience. It's not enough to know that mobility services are integrated with usage data and sensors; all the integrated services in the world only begin to matter when a customer can be told—without having to ask—that they should consider grabbing a nearby CitiBike to their upcoming appointment across town if it might be faster or help them meet their exercise goal, or taking the NYC Ferry to Brooklyn if there's a subway service change. It should be said that a truly personalized experience will rely heavily on existing ecosystems like Google, Apple, and Amazon to extend their ecosystems or open their platforms to third-party developers who can find new ways to make it useful; their appetite for doing so remains to be seen.

## The Equitable City

Urban growth is inextricably linked with inequality. It's a complex and foundational issue, and it's why accessibility, affordability, and fairness are so central to the wellbeing of urban communities. To be successful, city policies must consider equitable uses of technology, data, and infrastructure.

Rethinking how street design promotes bicycle usage, walkable neighborhoods, and green space is a fundamental example of smart city governance. But others, like transit fare policy, are more subtle and can be more financially impactful to the neediest inhabitants.

Affordability is perhaps the most overlooked virtue of smart cities. Inequality has been at the root of upheaval at the global scale, but its more local manifestations—luxury development at the expense of communities, skyrocketing costs of living, startups who cater to the wealthiest residents—risks a bifurcation of urban life that would undermine its sustainability.

## The Hackable City

The tradeoff between convenience and security is a well-worn principle in data security. And owing to a combination of forced transparency, lack of internal coordination, and internal interdependencies, city governments are uniquely vulnerable. Anything that's connected to the internet can be hacked, and the connected city is no exception.

Anyone who doubts the risks of data collection and storage should take note of a data breach reported recently by the Washington Post: photos of travelers who had been recorded upon entry into the U.S. by Customs and Border Protection were taken in a massive data breach, and later made available for download on the dark web.<sup>7</sup> And the city of Atlanta was hit by a ransomware attack last year that took down its police, courts, and other city services.<sup>8</sup>

## The Surveillance City

“The worrying thing about this is that we live in an asymmetrical world, where just a few companies and public institutions know a lot about us, while we know little about them,”

—Carlo Ratti, MIT Senseable City Lab<sup>9</sup>

Even with the best of intentions, when data is collected by a city, difficult questions arise. Who owns all this data, and who controls it? With whom is it shared? And what do we give up as a society by agreeing to be monitored, tracked, and surveilled—whether by people or algorithms—in the interest of being “smarter?”

San Francisco recently became the first city to ban the use of facial recognition technology by its police and city government, and the legislation is being considered as a model for other cities around the U.S.<sup>10</sup> The rationale for this move includes the shortcomings of the technology itself (it often misidentifies women and people of color<sup>11</sup>), the financial interests of its vendors, and the opportunities for misuse by authorities (Baltimore police

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7 Harwell, Drew, and Geoffrey A. Fowler. “U.S. Customs and Border Protection Says Photos of Travelers Were Taken in a Data Breach.” *The Washington Post*, 10 June 2019, [www.washingtonpost.com/technology/2019/06/10/us-customs-border-protection-says-photos-travelers-into-out-country-were-recently-taken-data-breach/](http://www.washingtonpost.com/technology/2019/06/10/us-customs-border-protection-says-photos-travelers-into-out-country-were-recently-taken-data-breach/).

8 Newman, Lily Hay. “The Ransomware That Hobbled Atlanta Will Strike Again.” *Wired*, 30 Mar. 2018, [www.wired.com/story/atlanta-ransomware-samsam-will-strike-again/](http://www.wired.com/story/atlanta-ransomware-samsam-will-strike-again/).

9 Geib. “Smart Cities...” 2018.

10 Samuel, Sigal. “San Francisco Banned Facial Recognition Tech. Here’s Why Other Cities Should Too.” *Vox*, 16 May 2019, [www.vox.com/future-perfect/2019/5/16/18625137/ai-facial-recognition-ban-san-francisco-surveillance/](http://www.vox.com/future-perfect/2019/5/16/18625137/ai-facial-recognition-ban-san-francisco-surveillance/).

11 Samuel, Sigal. “Some AI Just Shouldn’t Exist.” *Vox*, 19 Apr. 2019, [www.vox.com/future-perfect/2019/4/19/18412674/ai-bias-facial-recognition-black-gay-transgender/](http://www.vox.com/future-perfect/2019/4/19/18412674/ai-bias-facial-recognition-black-gay-transgender/).

have already used facial recognition to target and arrest protestors<sup>12</sup>). China has taken a different approach. Its use of facial recognition technology and AI has all but created a de facto surveillance state in the western province of Xinjiang, where it's being used to monitor and control millions of Muslim ethnic minorities with its Orwellian "Integrated Joint Operations Platform (IJOP)."<sup>13</sup> According to Human Rights Watch, China is already exporting this technology to other countries such as Brazil, which creates "the potential for social control and racial profiling."<sup>14</sup>

## Utopian Thinking

Smart Cities are often discussed as a kind of idealized new model for human coexistence in the decades to come. The discourse is reminiscent of utopian thinking, and is often sponsored by those with a financial interest in having those concepts come to fruition. But if utopian literature has taught us anything, it's that the best of intentions can lead to unsettling outcomes. Like any powerful technology, urban innovation is replete with opportunities and risks. Ultimately the governance of Smart Cities, and the technologies that power them, will determine how they will serve society.

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12 Buolamwini, Joy. "When the Robot Doesn't See Dark Skin." *The New York Times*, 21 June 2018, [www.nytimes.com/2018/06/21/opinion/facial-analysis-technology-bias.html](http://www.nytimes.com/2018/06/21/opinion/facial-analysis-technology-bias.html).

13 "China: How Mass Surveillance Works in Xinjiang." Human Rights Watch, 6 June 2019, [www.hrw.org/video-photos/interactive/2019/05/02/china-how-mass-surveillance-works-xinjiang](http://www.hrw.org/video-photos/interactive/2019/05/02/china-how-mass-surveillance-works-xinjiang).

14 "High-Tech Surveillance: from China to Brazil?" Human Rights Watch, 31 May 2019, [www.hrw.org/news/2019/05/31/high-tech-surveillance-china-brazil](http://www.hrw.org/news/2019/05/31/high-tech-surveillance-china-brazil).

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