

Making Cities Smarter

How video data plays a pivotal role in **safeguarding** the welfare of citizens



Introduction

Around 56% of the global population, some 4.4 billion inhabitants, currently live in urban environments. As people flee conflict, seek opportunity, or join relatives, this trend is only set to continue. By 2050, this proportion is expected to rise to nearly seven in 10.

The speed and scale of urbanization brings myriad challenges for municipal authorities. Affordable housing. Viable infrastructure. Efficient and sustainable transport and mobility systems. Jobs and services. Unsustainable sprawl. Increased energy consumption. Pressure on resources. Poor air quality. The list is endless.

One of the most urgent priorities in the world of today is building cities that work for their citizens. Cities that provide a decent standard of living and meet the needs for all. Cities that are green, clean, efficient, safe, and inclusive. In other words, smart cities.

The smart cities of the future will be powered, managed, and maintained by technology and innovation. AI, smart analytics, and machine learning will all play a part as integral as concrete, glass, and asphalt. To work effectively, these technologies rely on video data. This report explains why video is so essential for making the smart city of the future a place where everyone can flourish.

Section 1

Digital transformation and smart cities

The concept of a smart city isn't simply limited to the use of digital technologies for a specific goal, such as managing resources or reducing emissions. It encompasses every aspect of an urban habitat: well-designed urban transportation and mobility networks, robust water and energy supplies, reliable waste disposal facilities, efficient lighting and heating, safe public spaces, effective emergency services, comprehensive educational and recreational facilities, and access to green areas. And bringing all these various strands together, a connected and responsive city administration.

The original idea of smart cities came from a largely supply-side and sector-driven context. The private sector would take the lead in defining both the challenges of the future and the ways in which digital innovation could overcome them to improve the life of citizens.

Today, the smart city is seen very much as a partnership between the private and public sectors. Even so, emerging technologies remain integral to the future of urban development. These technologies include 3D printing, the Internet of Things (IoT), artificial intelligence (AI), machine learning, advanced energy storage, unmanned aerial vehicles, big data analytics, and video technology.



A smart city is a place where traditional networks and services are made more efficient with the use of digital solutions for the benefit of its inhabitants and business.

- European Commission

Examples of smart city thinking

Smart grids to manage energy consumption.

Smart meters and pipes to track water quality and detect leaks.

Smart sensors and videos to improve traffic flow and enhance public safety.

Mobile applications to help citizens report problems in real-time and engage directly with city authorities.

Smart homes help manage the demand for energy.

Self-driving cars and car-sharing platforms to alleviate pressure on land use.

Section 2

The role of video in smart cities

Video technology plays a fundamental part in the everyday life of a smart city – and its use extends far beyond security and surveillance. 5G significantly increases the bandwidth of connected devices, while an increasing number of interlinked devices can be added to the internet of things (IoT). These kinds of technological advances have greatly expanded the opportunities for deploying video in response to the rising pressure on urban infrastructure.

The data collected from video cameras can be used to analyze and inform actions within an almost endless range of scenarios. It provides smart cities with the capability to monitor and control air quality, manage traffic flow, safely control crowds and demonstrations, and respond more quickly to emergencies, to name just a few possibilities.

Video provides the real-time insights that make it possible for authorities to manage a city more responsively, more efficiently, and more safely. We will now take a closer look at just a few of the ways in which it does this.



Video technology offers the capability to monitor a huge range of the elements essential to an efficient smart city. These can range from air quality and public safety to crime prevention and traffic management.



2.1 Video data eases traffic flow

Smart cities install video cameras and sensors at busy traffic interchanges, and along roads and bridges, to improve both mobility and safety. By collecting and communicating traffic data in real-time, authorities are able to identify and respond to issues as and when they arise. For example, changing the sequence of traffic lights in response to a build-up of traffic, or managing electronic signs to adapt the opening, closing, and merging of lanes or speed limits to current traffic conditions. In the longer-term, video technology will also enable smart cities to analyze traffic trends and use these insights to constantly improve transport infrastructure.

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2.2 Video data improves public transport

Video recordings and live streams from buses, trains, streetcars, and stations can generate valuable insights that allow providers to improve services and boost revenues.

For example, video opens the possibility for passengers to check the number of free seats available via an app. It allows transport authorities to monitor the condition of train cars to ensure they are quickly and efficiently repaired or cleaned as and when required. In the case of trains, cameras can also analyze their surroundings to deliver instant insights into the conditions of tracks, stations, bridges, etc.

Automated passenger counting also allows companies to track numbers for the purpose of revenue sharing, or to gain the insights into capacity that allow them to consistently operate fleets at optimal levels.

Video data can also support long-term infrastructure planning. For example, understanding which areas of a bus terminal or train station are the most highly frequented allows operators to optimize layouts or even adjust rates for shop rentals.



While public transport providers use video data to gain valuable insights, they must ensure individuals' privacy. By using brighter AI's anonymization solutions, Deutsche Bahn Service & Station uses videos to monitor the state of their 10.000 camera units and successfully protects their passengers' identities.

Case study #1

brighter AI + S-Bahn Sitting comfortably

Our partnership with S-Bahn Stuttgart dates back to 2019, when the organization began automatically monitoring seat occupation across their trains. Using camera data to identify available seats, the S-Bahn app and in-station displays then direct passengers to them. We anonymize the video data so that it can be processed in compliance with GDPR requirements.

2.3 Video data enhances training

Transportation companies can also incorporate video into education and development programs to significantly improve both their effectiveness and their efficiency. For example, Berlin public transport provider BVG has implemented video into its e-learning program, allowing staff to learn from real-world track footage.

Case study #2

brighter AI + BVG Ensuring driver e-training complies with the GDPR

Berliner Verkehrsbetriebe (BVG) is Germany's largest public transport company, managing Berlin's tram network among others. A recent expansion has resulted in the need to run more cars and recruit more new drivers. With training limited by ever tighter schedules and limited vehicle resources, BVG decided to incorporate video footage of tram routes into an e-learning program.

Yet these videos cannot help but capture numerous data subjects such as pedestrians, cyclists, and vehicles – all of which can potentially be identified. Since processing personal data without consent violates the GDPR, it needs to be anonymized.

brighter AI is using Precision Blur to anonymize personal data in 75 hours of footage. This highly accurate AI-based solution achieved a recognition rate of 99% for number plates and 97% for faces in benchmark tests.

Thanks to Precision Blur, BVG is saving resources and improving operational efficiency – all while remaining compliant with privacy standards.

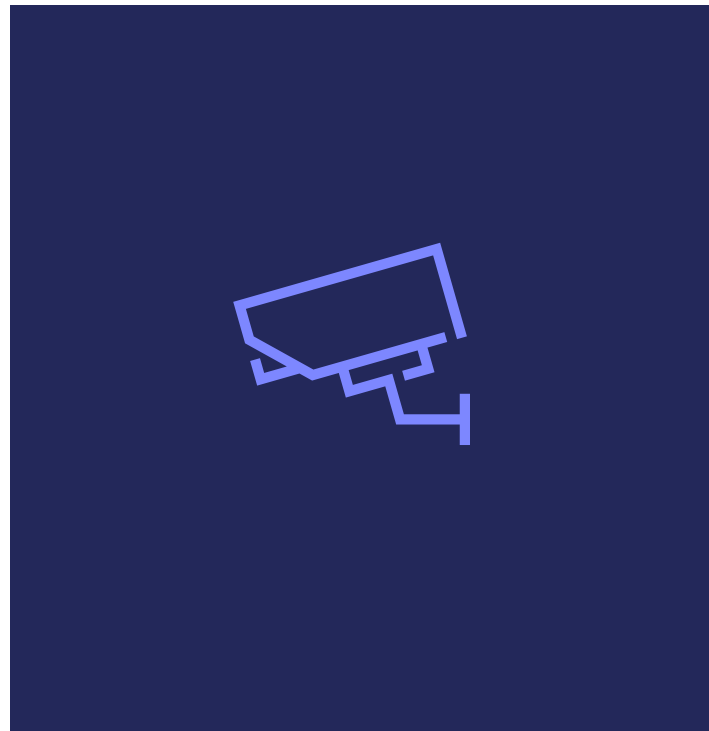


2.4 Video data detects and deters crime

Protecting citizens 24/7 in a context of finite resources is a challenge to any city. Video surveillance in combination with sound detection and alerts is perhaps one of the most important weapons in a smart city's arsenal.

Video surveillance complete with intelligent video analysis—otherwise known as smart analytics—is capable of instantly detecting sounds such as screams, breaking glass, and gunshots, not to mention unusual and aggressive behavior. For example, if loud voices are suddenly detected in a park, video data can guide operators to the source. It may simply be a group of people playing soccer or kids running around. But should the noise emanate from an attempted mugging or physical assault, for example, the operator can quickly alert the police or security guards.

Even so, there will be occasions when law enforcement is unable to reach the location in time. By connecting video surveillance to loudspeakers, cameras can deploy live or pre-recorded verbal warnings to deter criminal behavior or minimize the consequences.



Video systems allow smart cities to optimize the way they manage law enforcement. It has been proven that criminal activity is less likely to take place in spaces surveilled by security cameras.

2.5 Video data aids environmental monitoring

In the face of urban sprawl, monitoring and analyzing the quality of air, water, and even soil is of the utmost importance to safeguarding the health and wellbeing of citizens. Video management systems that provide data and alerts in real time can play a significant role in a comprehensive environmental monitoring program: tracking air particulate pollutants, observing weather conditions, measuring temperatures, and even analyzing water and soil quality are all possible – or will be.

The powerful combination of video and sound can also help to address the challenge of noise. Noise pollution is a growing problem across Europe and exerts a negative impact on the health of millions. According to the EEA, 20% of Europe's population is exposed to long-term harmful noise levels, which corresponds to over 100 million people.

Robust video and sound detection solutions not only allow smart cities to closely monitor noise levels in specific locations, but also track, analyze, and identify the sources of those noises. Authorities can then use these insights to formulate strategies to reduce the noise: for example, optimizing signage or traffic light sequencing to ease the flow of traffic at busy intersections.

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2.6 Video data helps to safeguard public spaces

Surveillance cameras can also play a key role in safeguarding public spaces such as parks, plazas, or beaches – especially when working in tandem with audio sensors. By monitoring numbers, cities can stay ahead of potential issues before they escalate, avoid dangerous overcrowding, and ensure the safety of public events and demonstrations.

Video surveillance cameras allowed cities to manage the capacity of public spaces and avoid unnecessary (or illegal) crowding and congestion, especially during times of lockdown. Authorities were able to track their citizens' adherence to safety regulations, from social distancing to mask wearing. And some even used these technologies to record anonymized temperature readings and movement data, insights which allowed them to analyze and predict the expansion and evolution of infection clusters.



One recent use case came to the fore as a result of the global COVID-19 pandemic, when capacity control became a paramount consideration in cities around the world.

Section 3

How can we drive the adoption of video?

Video technology and smart analytics are helping to shape the future of ever smarter cities. As we have already described, we are starting to see them play a pivotal role in almost every aspect of everyday life, from public transport to law enforcement to air quality.

Yet these technologies generate enormous amounts of high-quality image and video data. As they do, privacy standards are becoming ever more tightly controlled by regulations such as CCPA in the US, PIPL in China, and, above all, GDPR in the EU.

Municipal authorities are therefore facing a two-pronged challenge: developing the appropriate data collection and storage infrastructure, while remaining compliant with privacy and data laws.



3.1 Increase data storage capabilities

More cameras and more surveillance inevitably generate more data. This is especially the case with the advent of machine learning, which often means large volumes of video data—that would previously have been archived—now needs to remain available for training algorithms. The impact on storage requirements is clear.

To operate as efficiently as possible, and to make the most of smart surveillance and video analysis, smart cities require equally smart storage and management solutions.

This means investing in frictionless, tiered storage that offers the scale—and the scalability—capable of meeting current and future requirements. This frees busy IT teams from the day-to-day management and monitoring of limited-capacity data centers to focus on value-added tasks.

The mere act of collecting data may form the foundation on which smart cities are built, but it is meaningless without the capability to interpret, analyze, and act upon it.

3.2 Enhance AI analytics

The most innovative cities integrate video with smart analytics that analyze data from a wide range of sensors and sources. Cutting edge video systems are also capable of performing intelligent forensic searches that identify specific images or actions, and even combing through stored video to find and highlight related patterns or events.

Ultimately, smart cities need to integrate AI-powered video analytics customized to specific objectives. They will also deploy the power of neural networks in training systems to perform set tasks. The quality of the results, however, rests upon huge amounts of quality data. This means that safeguarding the privacy of citizens has become of paramount importance.

3.3 Support compliance

Regulations such as CCPA in the US, PIPL in China, and, above all, GDPR in the EU have imposed strict controls on the way data can be used. This poses a challenge to smart cities, who rely on technologies that consume vast amounts of high quality video data.

The General Data Protection Regulation (GDPR) is one of the toughest privacy and security laws in the world. The EU may have drafted and passed the regulation, yet it applies to any organization (or municipality) that collects the personal data of EU citizens and residents – no matter where in the world that organization is located.

The GDPR (and other regulatory bodies) has the power to hand out significant fines to any entity that violates its standards – up to 20 million euros or 4% of global revenue, whichever is higher. Subjects of any breach also have the right to seek compensation for damages.

In 2022 alone, authorities have handed out fines amounting to 832 million euros to organizations in breach of privacy standards.

(Source: [enforcementtracker.com](https://www.enforcementtracker.com))

As smart cities become increasingly reliant on video data to power the technology that allows them to operate at an optimal level, so too do the risks of failing to comply with increasingly stringent privacy regulations.

Section 4

Anonymization keeps cities smart

Video technology sits at the heart of the technologies that make smart cities ever smarter. At the same time, privacy regulations such as GDPR have become increasingly robust. So how do smart cities continue to operate at an optimal level while remaining compliant?

There are plenty of solutions out there offering the ability to anonymize data through metadata aggregation, privacy masking, data purging etc. Yet until now, conventional anonymization techniques have been unable to preserve the quality of the original data that represents the backbone of AI innovation and machine learning.

Original



This technology makes data collection in public compliant according to privacy regulations worldwide, such as GDPR in Europe, CSL in China and the upcoming CCPA in the US.

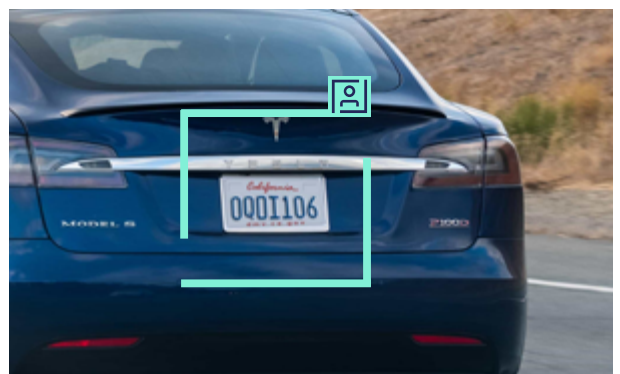
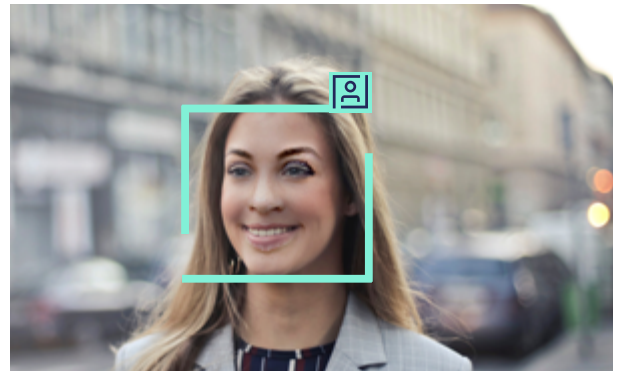
- The Washington Post, March 21st, 2019

DNAT: keeping smart cities smart

Deep Natural Anonymization, or DNAT, changes all that. Based on generative AI, this unique technology prevents the original subjects from being recognized by creating synthetic overlays.

At the same time, DNAT maintains the data quality required for machine learning. This allows municipal authorities to safely use videos and images to power AI and analytics free from the threat of breaching privacy regulations.

Anonymized with DNAT



Identities protected
Natural appearance
Applicable for analytics and machine learning

How it works

DNAT uses AI to automatically detect faces and other identifiable elements such as license plates in the original images and videos. The technology then randomly generates artificial replacements that reflect the original attributes.

For example, facial attributes such as gender, emotions, intent or age may often need to be preserved for further analytics. DNAT retains any information that does not contain sensitive personal data without modification. In doing so, it effectively removes the compromise between anonymizing data and retaining the original quality.

The technology then applies these non-reversible overlays to the original, ensuring that re-identification by facial recognition technology is impossible.

Case study #3

brighter AI + DB Regio Planning ahead

As a subsidiary of Deutsche Bahn, DB Regio is responsible for the group's regional transport activities across Germany. DB Regio is using video data from inside their trains to improve scheduling and capacity planning, both essential drivers of customer satisfaction. Our anonymization software makes this possible as part of a GDPR-compliant, privacy-first approach.

DNAT v Conventional anonymization

Conventional anonymization solutions, such as blurring or black bars, are not compatible with analytics and machine learning and compromise data quality.

In contrast, DNAT keeps data natural but compliant, yet also retains attributes such as age and gender to preserve semantic segmentation.

DNAT allows authorities to leverage video data, keep people safe, and run cities smoothly without compromising data privacy.



Case study #4

brighter AI + DB Netz On track to autonomy

DB Netz AG is a major subsidiary of Deutsche Bahn, owning and operating most of the German railway system. The company's R&D into autonomous trains is inseparable from publicly collected data, with high-definition cameras used to film routes, capture changes on the railway, and analyze their impact on operations. Since the recordings contain human faces and license plates, our anonymization software protects the identities of individuals and passing vehicles, ensuring the process complies with the GDPR.



Deep Natural anonymization allows Deutsche Bahn to fully meet our data protection goals. At the moment, we are performing a very innovative pilot project with brighter AI. The first impressions are very promising. The collaboration is very positive, effective, and most importantly agile – which we really appreciate.

– Steven Schmidt, Engineering & Operations,
Deutsche Bahn



brighter AI has solved a fundamental problem of using and storing image and video data in compliance with data protection regulations.

- Handelsblatt, Nov. 23rd, 2019

We use deep learning to recognize objects: artificial neural networks trained on large data sets including a range of resolutions and perspectives. This offers a higher degree of accuracy and robustness compared to conventional approaches.

Find this interesting? [Download our report](#) on the accuracy of machine learning models trained on anonymized data.

Approved by privacy professionals and research scientists, our anonymization software seamlessly integrates into any platform from on-premise to cloud. And it is backed up by cloud compliance & data protection warranties, full support, and zero maintenance costs.

Section 5

Meet brighter AI

brighter AI's DNAT is the only certified value-preserving video redaction software to assure GDPR compliance. In doing so, we end the trade-off between privacy and video analytics.

Our highly advanced anonymization software protects personally identifiable information (PII) in image and video data. That guarantees that the data generated by smart cities complies with privacy regulations such as GDPR, CCPA, APPI and PIPL. At the same time, our software preserves the data quality of the original image to drive AI innovation and machine learning.



Our unique Deep Natural Anonymization automatically detects a personal identifier such as a face and generates a synthetic replacement, protecting identities while keeping necessary information for analytics or machine learning. Quite simply, brighter AI provides smart cities with the world's most advanced image and video redaction technology.

- Marian Gläser, CEO & Co-founder

Want to know more?

Contact us

Would you like to see [brighter AI](#) in action? Or discover how we can help you power your AI innovation, smart analytics, and machine learning while remaining compliant with global privacy standards? Just get in touch and we'll be happy to help.