# Deep learning and AI in traffic analytics: not hype but reality

A new approach opens possibilities for challenging environments and adapting old CCTV systems into smart ones

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The enormous amount of video data produced today needs to be transformed into enriched and searchable data for traffic management, traffic safety and urban mobility applications.

Traditional video analytics have tended to perform poorly in traffic safety applications because of bad weather conditions, poor illumination, fast lighting change, poor video quality and complex objects dynamics. However, in recent years, a branch of artificial intelligence (AI) called deep learning has dramatically improved video analytics performance, making them both effective and robust in complex scenarios.

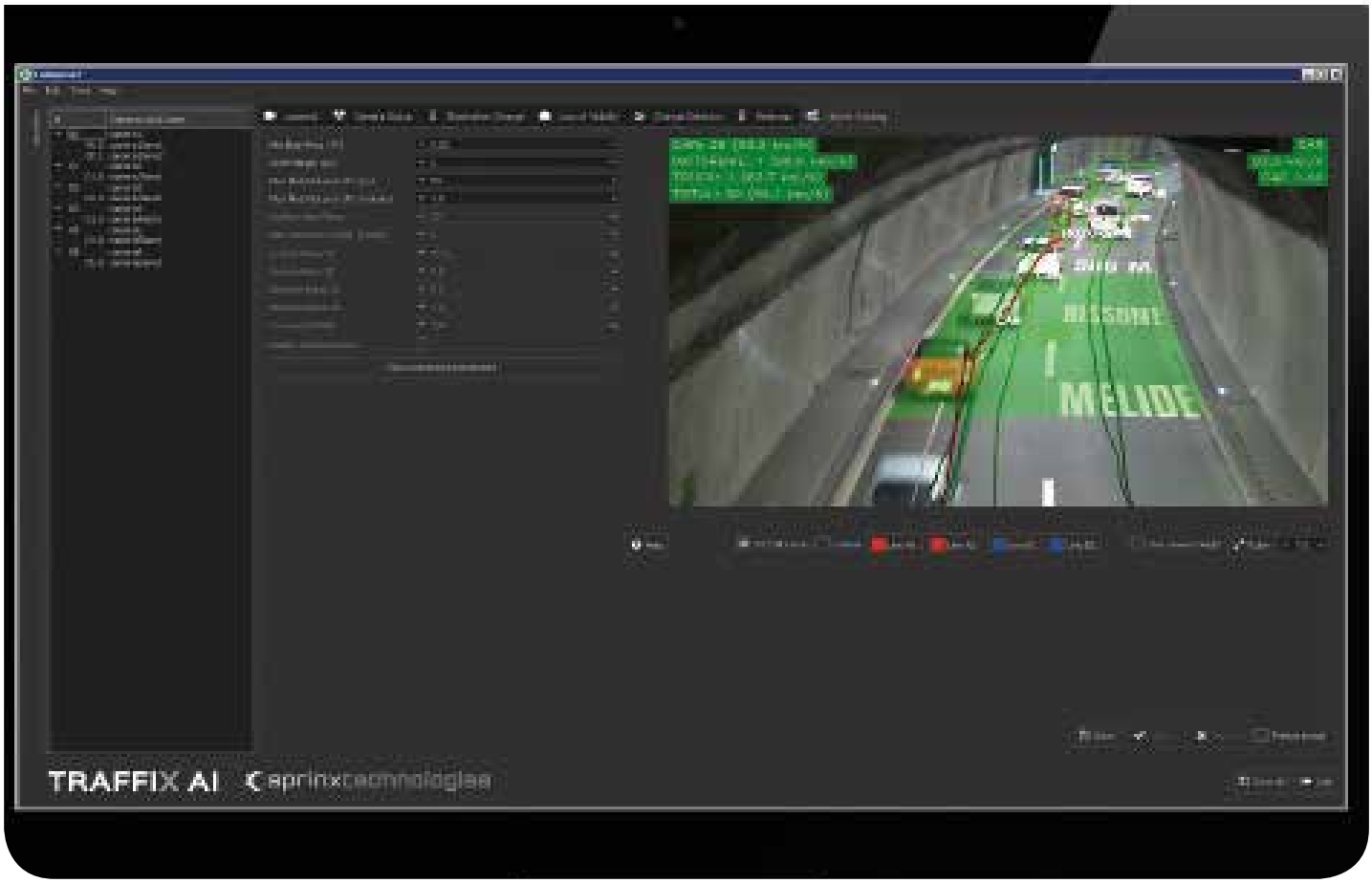
## Historical view

Theories of AI have existed since 1950. From the start two broad categories developed: symbolic AI, which focuses on the development of knowledge-based systems, and computational intelligence, which includes such methods as artificial neural networks (ANN), evolutionary computing and fuzzy systems.

Above: **An increase in computer power, a fall in the cost of hardware and the arrival of the cloud have led to the use of artificial intelligence in traffic management**

Symbolic AI was mainly researched during the 1960s and 70s. In a machine-learning approach, the algorithm is fed with raw data, recognizes patterns and creates its own high-dimensional representation of the data. The algorithm learns from data without relying on rules-based programming, allowing it to cope with a high number of possible situations that would be difficult to program. A machine learning algorithm – especially deep learning – is hungry for data and the learning process is computationally intensive.

In the past decade, an increase in computing power, the availability of relatively inexpensive hardware and large amounts of data in the cloud have together enabled the use of machine- learning algorithms in commercial applications.




Above: **Sprinx Technologies' Traffix AI platform uses deep learning to improve the filtering of data and analytics in busy areas**

## AI applied to traffic problems

Several AI methods have been applied to issues within the transportation industry. Monitoring traffic flow for evaluating congestion, routing and movement requires a real-time object detection algorithm to measure traffic parameter such as velocity, flow and trajectories, and detect anomalies such as stopped vehicles and wrong-way approaches.

However, most of the time, the computational power required to process video streams fails to offer punctual and useful alerts to control centers.

Following the recent advances in deep learning and especially computer vision, Sprinx Technologies has developed Traffix AI, a unique solution for AID and traffic data collection that includes a built-in deep-learning module in addition to 3D object tracking.

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Years over which theories of AI have been developed. They are broken down into two areas, symbolic AI and computational intelligence

Traffix AI is able to reduce false alarms and achieve strong performances in challenging environments such as busy city intersections where environmental conditions usually affect the analytics. The solution processes live video streams on standard PC-based solutions with just an additional GPU cards.

Convolutional Neural Networks (CNN) are networks where neurons are organized in layers and where each layer is connected to the next in such a way as to perform a filtering operation known as convolution. Such architectures resemble the organization of the visual cortex in animals.

Increasing the number of layers allows more complex patterns to be learned, increasing the accuracy of detection and reducing the number of false alarms.

Once the object of interest (pedestrian, car, truck, bus, bicycles) is detected a Multiple Object Tracking (MOT) algorithm is required to retrieve relevant traffic parameters. MOT tasks must handle appearance change, occlusions, disappear/re-enter objects as well as performing data association. The use of 3D information of objects and scene improves the performance of the MOT.

Deep neural networks have proven to detect and classify objects with low false alarm and in difficult conditions such as rain, sun, overcast, twilight and night-time.

This brand-new approach makes AID software more adaptive since with deep learning technology the quality of the analysis is less linked to a strict field of view, paying less attention to the installation. This makes it possible to turn existing and old CCTV cameras into smart new sensors, optimizing the investments of municipalities and national road authorities into making cities and highways smarter and safer. ■