Smart Cities, Predicting Traffic with **AI**

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Future Proofing Transport for London

Transport for London (TfL), the governing body responsible for managing the roadways and public transportation systems in and around London, estimates that by 2031 congestion will have increased by at least 15% in outer areas and as much as 60% in the major city centres.

In order to better manage and mitigate the impact of increased network usage, TfL devised the Surface Intelligent Transport System (SITS) project. This project was designed to seek out and identify companies with technologies and methods that could be implemented to improve network travel despite future increases in usage. Massive Analytic Limited (MAL) was one of those companies and together with others such as Lockheed Martin, Citi Logik and Vodafone, devised a solution for smarter traffic management in London.

The project used machine learning and big data technologies for the improvement of network visibility and prediction by mining non-traditional data sources. The initial use case focused on improving situational information for TfL's operators by giving them early warning of network issues before such issues could manifest as heavy congestion.

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Artificial Precognition an Adaptive Response to Traffic Disruption

One challenge that had to be solved as part of the SITS project was how to increase visibility of people movement in all areas of London, so that flow into and out of the city along major roads could be monitored and improved. Inner London is monitored by a dense installation of sensors on the road network and provides adequate information for anticipated increases in congestion levels. However the lack of sensors in outer London meant less visibility and capability to measure network performance for events taking place outside the city centre, as well as less capability to predict their effects on the city as a whole.

To solve this Vodafone mobile phone data was used to capture information about the number of mobile phones moving along pre-determined road segments in the South-west of London. However during the course of the project it was determined that even Vodafone mobile data on its own wasn't granular enough to predict all the potential issues. To up the accuracy of the predictions Vodafone's data was combined with data from social media, specifically tweets, in order to give the platform more awareness of potential issues for predictions.

The combined data was analysed by MAL's Oscar:DataScience platform (Oscar) to determine normal traffic flow throughout the course of any given day of the week. When new events arrived the AI, Artificial Precognition, determined the updated mobile and tweet data's impact on traffic conditions and predicted when and where issues might arise. The predictions were then made available to operators through specialised dashboard, providing operators and supervisors with improved situational awareness, and allowing them to proactively manage the London road network.

Mark Whitaker, Formerly TfL Head of Operation for Road Space and 'Senior User" had this to say on the Surface Intelligent Transport System (SITS) project and it's benefits

"Whilst I was at Transport for London (as the Head of Operation for Road Space and 'Senior User" on the Surface Intelligent Transport System (SITS) procurement) I was fortunate to be briefed on the "Smart Cities: Urban Analytics IRAD Experiment" project; that Massive Analytic and Citi Analytics worked on. This was a compelling piece of work that very much informed our thinking as to the potential gains to be had of using a 'Big Data'/Artificial Intelligence (AI)/Machine Learning approach to SITS. Notably the benefits identified were compelling:

Benefits of machine learning

If machine learning is applied to sufficiently large, real-time movement data, then patterns may be discerned and events that can impact on the performance of surface transport systems can be predicted or detected earlier than systems that depend upon existing sensors and analytics. Machine learning should also be able to classify these events into a discrete ontology without human intervention.

Operator ability to manage network performance

If Operators can access and explore the multi-dimensional data sets in real-time, then their situational awareness and decision making ability at the tactical level is improved. This improvement leads to increased rates of detection and earlier intervention times, enhancing overall network performance.

Executive ability to manage organizational performance

If Executive Stakeholders can access and explore the multi-dimensional data in real-time, then this improves organizational situational awareness and decision making at the strategic level.

Increased Value of Existing Data

If machine learning is able to contribute to improved situational awareness and better decision making, then it is possible to eliminate the requirement for increased sensor density on the outskirts of London."

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