Introduction:

The Liverpool Smart Pedestrians Project was a project to use existing systems (CCTV) in order to develop an effective real time monitoring system dedicated to combat congestion issues that had been growing. The goal was to use edge computing and AI in order to create an effective yet inexpensive way to monitor pedestrian traffic and develop better urban planning systems.

Method:

Beginning with community workshops, the project looked to make use of multi modal tracking, privacy compliance, infrastructure reuse, and scalability. They also wanted to use low cost sensors that would still serve as a viable source of data.

Technology:

For the hardware, they settled on the NVIDIA Jetson TX2 (GPU accelerated computing), LoPy 4 module (for LoRaWAN, connectivity), and IP67 casing (weatherproof). On the software end, they made use of YOLO v3 (object detection library/models), SORT (real time multi object tracking), and pytorch 1.1. The goal was to do all processing on edge devices, where anonymized metadata would later be sent to central data servers.

Performance:

Using both the Oxford Town Center Dataset and real-time feeds from Liverpool, the project system marked down an accuracy of ~70% with a median error of ~33% with a framerate of about 20 fps. There were issues with recognition in groups of crowds, and with SORT being built around the CPU, it didn’t fully make use of GPU resources making it slower. Generally thought, this was a great MVP for the time.

Applications:

While this was good for the time, there have been many improvements to hardware, software, anad methodology since 2019. In hardware, you could easily get more power from the newer Jetson nano. Software, you can use a more recent version of YOLO like v7 or v8 (though they are more demanding.) There is also a lot more GPU support for different tools now and so you could replace the CPU intensive SORT algorithm with newer algorithms like BYTETrack. These and taking better advantage of faster connections with things like 5-6g would greatly improve the project's baseline and make it far more viable for more use cases like vehicular traffic control.

What I believe this project provides is the proof of concept of a new application of AI, and serves as the foundation that others can use when better technology gets developed. We can easily use this to determine not only things like when foot traffic is increased, to then make changes to light systems for ease of travel, but also adapt it to control traffic lights so people might wait less at lights. Overall, while the premise is simple, the technology behind it is far from that, and this project proved a vital use case and laid the foundation for smarter cities.

Abewly, SORT, (2015), GitHub Repository, <https://github.com/abewley/sort>

ifzhang, BYTETrack, (2021), GitHub Repository, [https://github.com/FoundationVision/ByteTrack](https://github.com/FoundationVision/ByteTrack?utm_source=chatgpt.com)