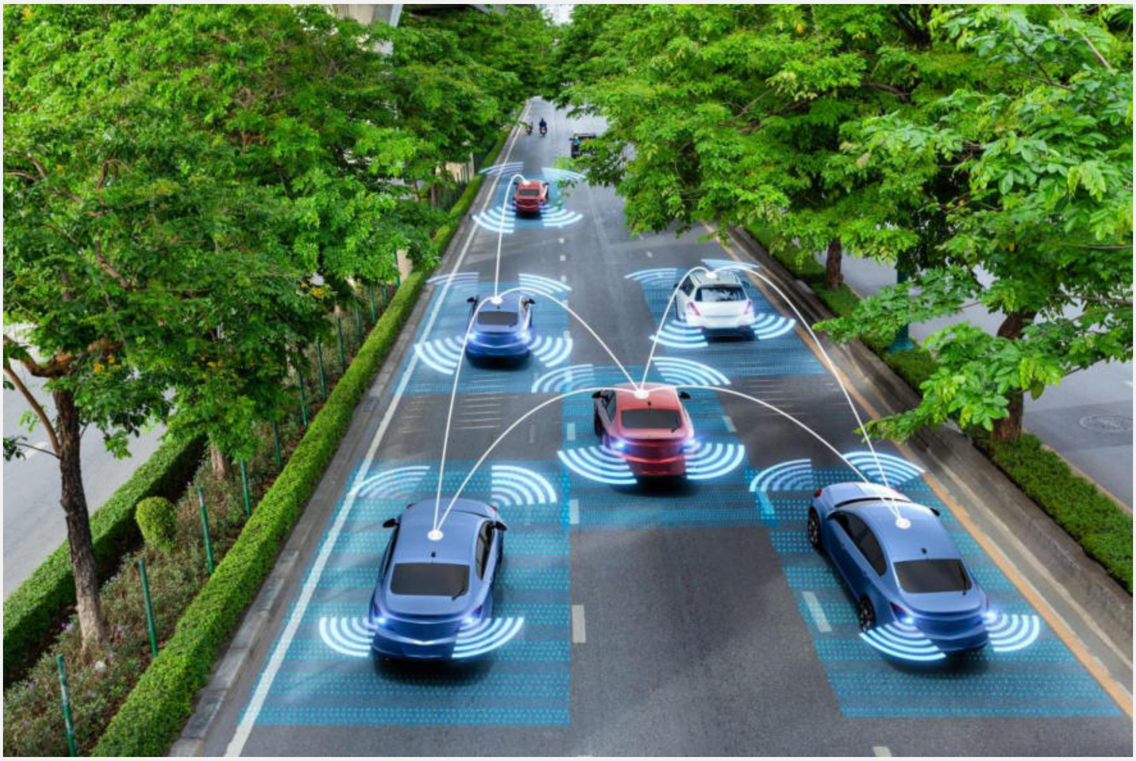
How AI Traffic Flow Detection Makes Transport Safer and More Efficient

Our cities are changing. Our road networks are changing too, getting people from A to B in a safer, more efficient, more reliable manner.

At the heart of all of this is technology – specifically, AI computing technology and high performance computing networks. These solutions are supporting the effective deployment of AI traffic flow detection, increasing safety and efficiency in our urban spaces and way beyond.



How Does AI Traffic Flow Work?

AI traffic flow technology depends on multiple levels of data collection and processing.

- At the beginning of the process, we have the data collection point. This may be a sensor built into a vehicle or an asset deployed on the road, like a camera.
- This data collection point is connected to an AI box PC via a local area network (LAN).
- The AI box runs the data through the in-built vision processing unit (VPU), which is specifically designed to support machine learning within the system.
- The VPU sends data to the AI box's computing processing unit (CPU).
- Data is shared across the LAN, moving from the AI box to a system embedded within a specific device. This device may be an intelligent traffic signal or another piece of smart infrastructure.
- The embedded system collects the data and processes it with its own CPU.
- The data is delivered via the message queuing telemetry transport (MQTT) protocol. This reduces the data intensity of the process, making AI traffic flow sustainable even across large areas.
- The traffic signal or other device draws upon artificial intelligence and the latest data, making smart decisions in real time.
- Data is transferred to the cloud analyzing system via 4G or 5G connectivity. Here, the data can undergo analysis and be backed up securely.

A Real-World Example

We've looked at the technical process of AI traffic flow, but how is this experienced by drivers and road users? To understand this, let's look at how a dynamic signal control system might work.

- A vehicle approaches the traffic signal and is picked up by the camera.
- The camera sends this data via the LAN to the AI box.
- The VPU decides what this object is (a car) and how frequently these objects are appearing (perhaps several times a minute).
- The AI box sends its processed data to the embedded system within a traffic signal.
- The traffic signal's embedded system processes this data via the manageable MQTT protocol.
- The AI computing processing unit decides what action to take. This might involve extending or decreasing the display time of the red and green signals.

The Role of AI Edge Computing

AI traffic flow detection shows us just how AI edge computing can be deployed in a real-world scenario.

Edge computing components are pieces of hardware that sit as close to the initial data source as possible. This enables swift collection of data, followed by rapid processing and application.

In the example we've looked at, the camera and AI box serve as AI edge computing components, as they are collecting and utilizing data just a short distance away from the source (in this case, the car approaching the intersection).

Across the smart city, AI edge computing components can capture vast amounts of different data, from an array of different points. This data is then made more manageable and usable via the MQTT protocol.

The Key Benefits of AI Traffic Flow Detection in Transport

What are the advantages when we deploy AI networks in this way? How can road users and all members of society expect to benefit? Read on to discover more.

Enhanced Safety

Perhaps the most obvious benefit of AI traffic flow detection is improved safety. This is achieved in a number of different ways:

- Automated traffic infrastructure, like traffic signals and other active components, operates within safe parameters. This reduces the potential for collisions and road traffic accidents.
- Onboard components can relay data back to drivers in the form of reminders – for example, reminding drivers to reduce speed as they approach an intersection or an area of congestion.
- Onboard components can also capture driving data in some cases. This enables analysis of driving patterns, which can in turn support enhanced safety.
- Remote monitoring and management systems allow ongoing performance appraisals, ensuring the technology is performing in the right way.

Improved Efficiency

Traffic displays highly complex fluid dynamics as it moves through the city. Whenever traffic arrives at an intersection or a bottleneck, there is the potential for blockages and inefficiencies. An AI network supported by high performance computing can eliminate this.

- Drawing on data in real time, smart traffic signals reduce congestion and enhance compliance with traffic regulations.
- Monitoring and management enable improved traffic flow with a combination of AI and manual processes.
- For public transport or for connected vehicles, drivers can gain insights from AI-enabled systems, improving their driving patterns in a way that supports more efficient journeys.

Transport Networks that Support Society

Society's dependence on transportation extends far beyond individual road users. AI traffic flow detection also supports effective transport networks in the following ways:

- Flow detection and efficiency for in-the-city public transportation, such as public buses, school buses, tram networks, and other solutions.

- Optimal movement of foot traffic into and out of public transportation infrastructure, with smart gates to manage access to stations, hubs and depots.
- Parking solutions to create seamless connections between individual vehicles and public transport networks.
- Management of complex logistical networks, delivering goods wherever they are needed.
- Traffic flow detection for heavy machinery and plants in transit and en route to worksites – including mining, logging, construction, agriculture, and other industries.

Accelerated Rollout of the Smart City

The smart city – i.e., a collection of IoT devices and AI feedback loops supported by high performance computing networks – is the future of the urban environment. By deploying AI edge computing systems on a small scale, around intersections, and other key areas within the traffic network, city planners are making significant strides toward a complete rollout of this technology.

The more smart intersections and other features are deployed, the closer we come to realizing the dream of the smart city. This in turn will accelerate improvements in public safety and logistical efficiency.

Supporting AI Traffic Flow Detection with High Performance Computing

Here at Avalue, AI traffic flow detection is one of our main focuses of specialization. We are firm believers in the power and potential of AI computing networks as a force for good, revolutionizing life and work in our major population centers.

Related Products

Avalue ACS10-TGU

- 11th Gen Intel® Core™ i5/i3 Tiger Lake-UP3 Processor
- Intel® Iris® Xe/ UHD Graphics Engine
- 1-260-pin DDR4 3200MHz SO-DIMM, Supports Up to 32GB
- 2-Gigabit Ethernet, 1 x 2.5GbE, 1 x 1GbE
- 2-COM Port (RS-232/422/485 & RS-232)
- 2-Audio Jack (Line-Out & Mic-In)
- 2-Storage (M.2 Key-M NVMe & M.2 Key-B SATA)
- 2-Expansion Slot (M.2 Key-E, Key-B)
- 6-USB Port (3-USB 3.2 & 3-USB 2.0)
- CE, FCC Class A, UKCA

Avalue NUC-TGU

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- Dual Display, HDMI 2.0b
- Dual Intel® Gigabit Ethernet, 2.5GbE, 1GbE
- Triple M.2 Slot, Key-E/B/M for Wi-Fi, LTE, SSD, I/O module
- Supports iAMT, Kensington Lock, IP40
- Default dTPM 2.0, Mounting Kit, Wi-Fi (CE/FCC) certificated

Avalue EPC-TGU

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- Intel® Iris® Xe/UHD Graphics
- Single Memory Socket, Max. Up to 32GB DDR4 3200MT/s
- Dual Display, DP++ 1.4
- Dual Intel® Gigabit Ethernet, Dual 2.5GbE
- Triple Storage, 2.5” Drive Bay, 2-M.2 SSD
- Triple M.2 Slot, Key-E/B/M for Wi-Fi, LTE, SSD and I/O module
- Support iAMT, SATA RAID 0/1
- Default dTPM 2.0, Wall Mount Kit

Related Products

Avalue HPM-ERSUA

- Intel LGA4677 Socket supports 4th/5th Generation Intel® Xeon® Scalable Processor (Max. TDP at 270W)
- Intel® C741 Chipset
- 6 x DDR5 5600 MHz RDIMM up to 1.5TB
- TPM 2.0 onboard
- IPMI 2.0 with AST 2600 BMC controller onboard
- 1 x Intel I210AT 1GbE controller
- 1 x Intel I226-LM 2.5GbE controller
- 1 x Intel X550AT2 10GbE controller supports 2 x 10GbE Ethernet ports
- 5 x SATA III Support RAID 0,1,5,10
- 1 x RS232 port
- 4 x USB 3.2 Gen1 ports & 2 x USB 2.0 ports at Edge I/O
- 4 x Internal USB 3.2 Gen1 ports
- 1 x M.2 M-Key PCIe 3.0 x4 NVMe SSD, 2242/2260/2280/22110 form factor
- 12" x 9.6" (304.8mm x 243.84mm), PCB thickness is 2.54mm

Avalue HPM-ERSDE

- Dual Intel LGA4677 Sockets support 4th/5th Generation Intel® Xeon® Scalable Processor (Max. TDP at 270W)
- Intel® C741 Chipset
- 12 x DDR5 5600 MHz RDIMM up to 3TB
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- 1 x Intel I210AT 1GbE controller
- 1 x Intel I226-LM 2.5GbE controller
- 1 x Intel X550AT2 10GbE controller supports 2 x 10GbE Ethernet ports
- 5 x SATA III Support RAID 0,1,5,10
- 1 x RS232 port
- 6 x USB 3.2 Gen1 ports at Edge I/O
- 2 x Internal USB 3.2 Gen1 port & 2 x USB 2.0 type A receptacle & 2 x internal USB 2.0 ports
- 1 x M.2 M-Key PCIe 5.0 x4 NVMe SSD,2242/2260/2280/22110 form factor
- 12” x 16.452” (304.8mm x 417.88mm), PCB thickness is 2.86mm