

Computer Vision for Traffic Management



Real-Time Traffic Event Detection Throughout a Distributed Highway Network.

AI at scale for Operational Excellence

Autostrade per l'Italia - Overview



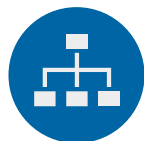
The Network

- **3.000 km**  **23%**  **77%**
- **47%** Italian Tollway Network
- **15/20** Italian regions crossed





Technologies

- **1.922** Highway Message Boards
- **5.000** Traffic Monitoring Cameras
- **1.800 km** covered by Tutor System



Organization

- **9** Regional Headquarters 
- **2** Central Headquarters 
- **10** Traffic Control Centers



Resources

- **700** internal operational personnel
- **1.500** external operational personnel
- **1.000** operative vehicles



Traffic

- **> 50 Billion km** travelled in 2025
- **2,6 Million** daily transits



1. Traffic management: challenges

EVENTS

+400k

events managed every year
(~400 wrong way events)

CAMERAS

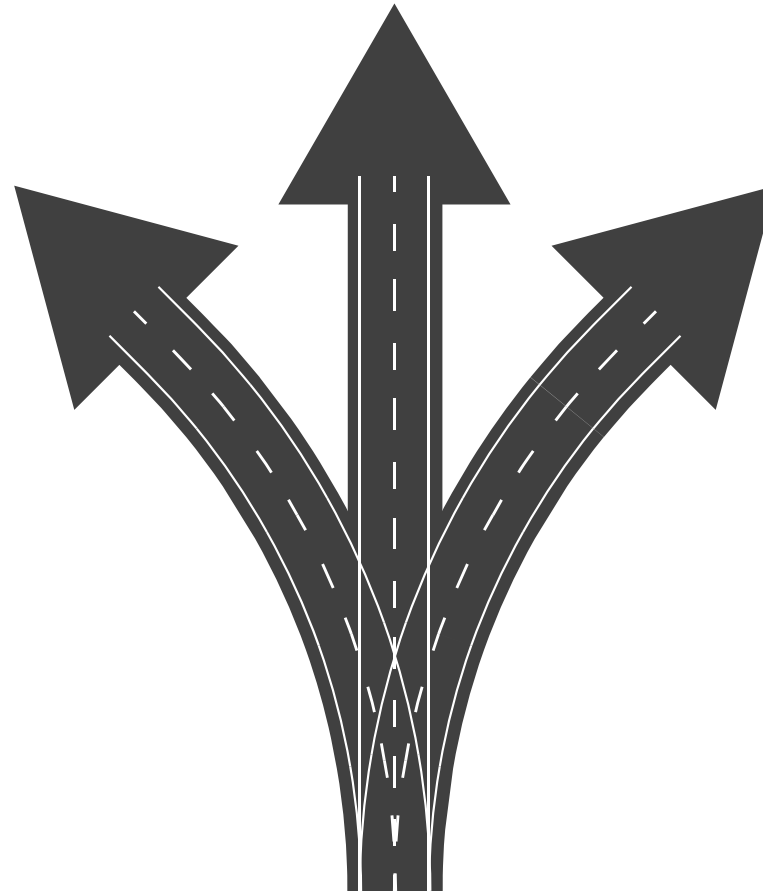
+1k

Localized on the mainline/mid-segment

CUSTOMERS

+4.3M

of customers every day



1. Traffic management: challenges & monitoring

- Each skilled **operator** monitoring **+50 cameras** all day?
 - What about **reactivity**?
- How can we get an **alert** as soon as a **wrong way happens**?
- How to use **existing infrastructure** with **SW development** for Operations improvement?



**+1000 cameras
monitoring on the VMS**



1. Traffic management: event management

Video event detection – role of the camera

AS-IS

PASSIVE

- Human detection
- **Few cameras** monitored in **real time** by humans
- Combine **efforts** between **video monitoring** and **traffic management** systems activities



TO-BE

ACTIVE

- **Fast and automatic event detection**
- **Free up time for important activities**

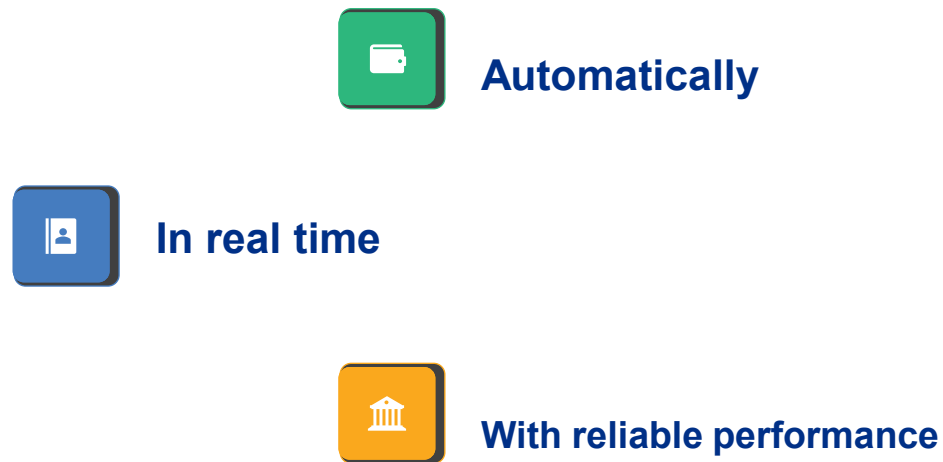
2. Technological complexity

Detection, behaviour, and camera management

How to **detect the events**...?

SW development in place of HW investments

PoP project (PTZ Observer Platform)

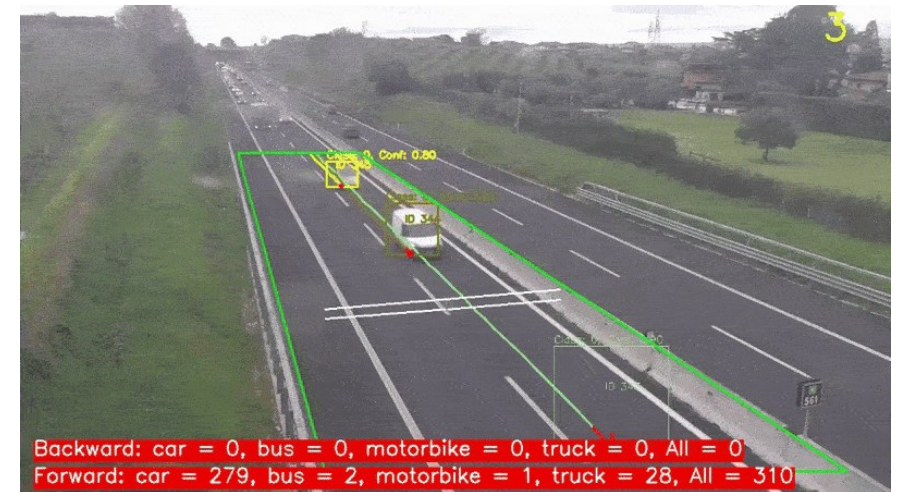


2. Technological complexity – AI on real application ^(1/3)

Detection, behaviour, and camera management

Artificial Neural Networks for:

- **Wrong way/U-turn**
- Vehicle stopped
- **Traffic/queue**
- Area monitoring (vehicle counting/% occupation area)
- **Vehicle counting**, classification, and speed monitoring



2. Technological complexity – AI on real application ^(2/3)

Detection, behaviour, and camera management

Focus on wrong way/U-turn



3. Technological complexity – AI on real application ^(3/3)

Detectin, behaviour, and camera management

Need to ensure the best performance while the camera si moving → How to manage it?

Need for a dynamic Region of Interest: **DynaRoI**



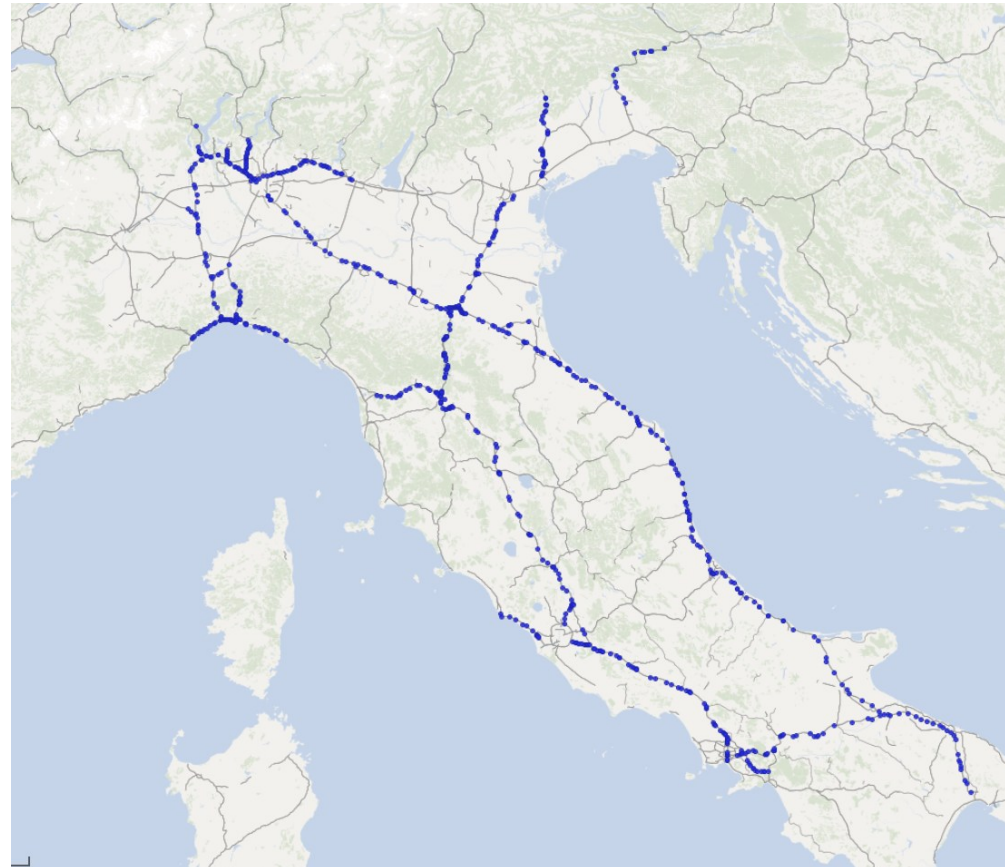
4. Coverage – the HW Infrastructure

Enable the video quality for traffic monitoring

How to do that at scale? → High quality Cameras and event detection available on all cameras

2027 target

~ 1000 cameras used by *PoP*



Now PoP is using 25 cameras
for testing

5. Real Value & Project Goal

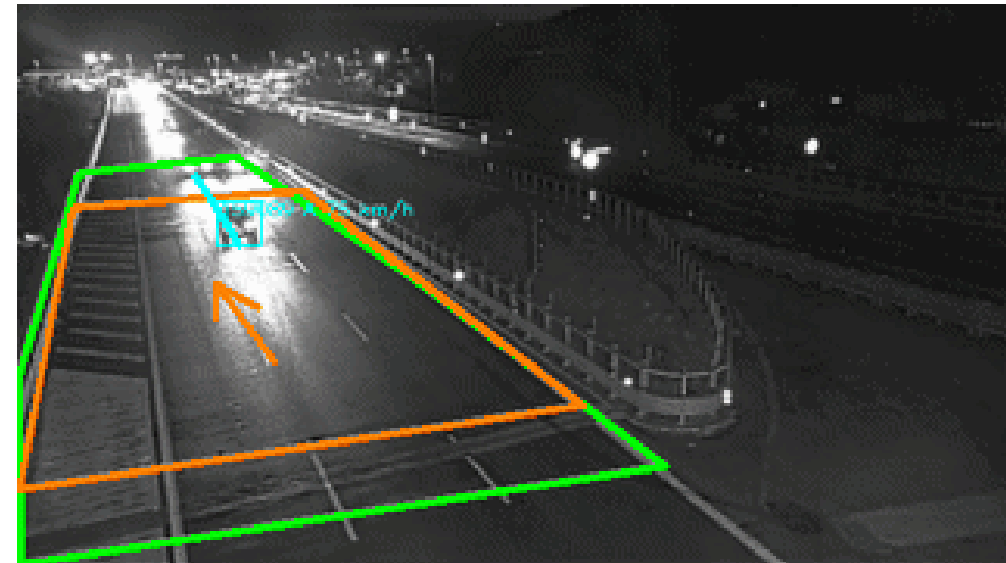
Detection and quality of service

Performance to support a real impact on the traffic management process:

- **Wrong way/U-turn** → Precision up to 98% (90% during the night)
- **Vehicle stopped/traffic** → Precision up to 93% (99% during night)
- **Classification performance** → Precision and Recall up to 98%

Next steps and project Goal:

- By **2027**, reach the **full coverage of our network with PoP**
- By **Q3 2026**, final **integration** within the **traffic management system**



Merci pour votre attention.

Thank you for your attention.