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THE POTENTIAL OF AI IN CONTRIBUTING TO THE EFFICIENCY OF TOLL COLLECTION'S PROCESSES

Pietro Contegno – ASTM SpA – Chief Information and Digital Transformation Officer

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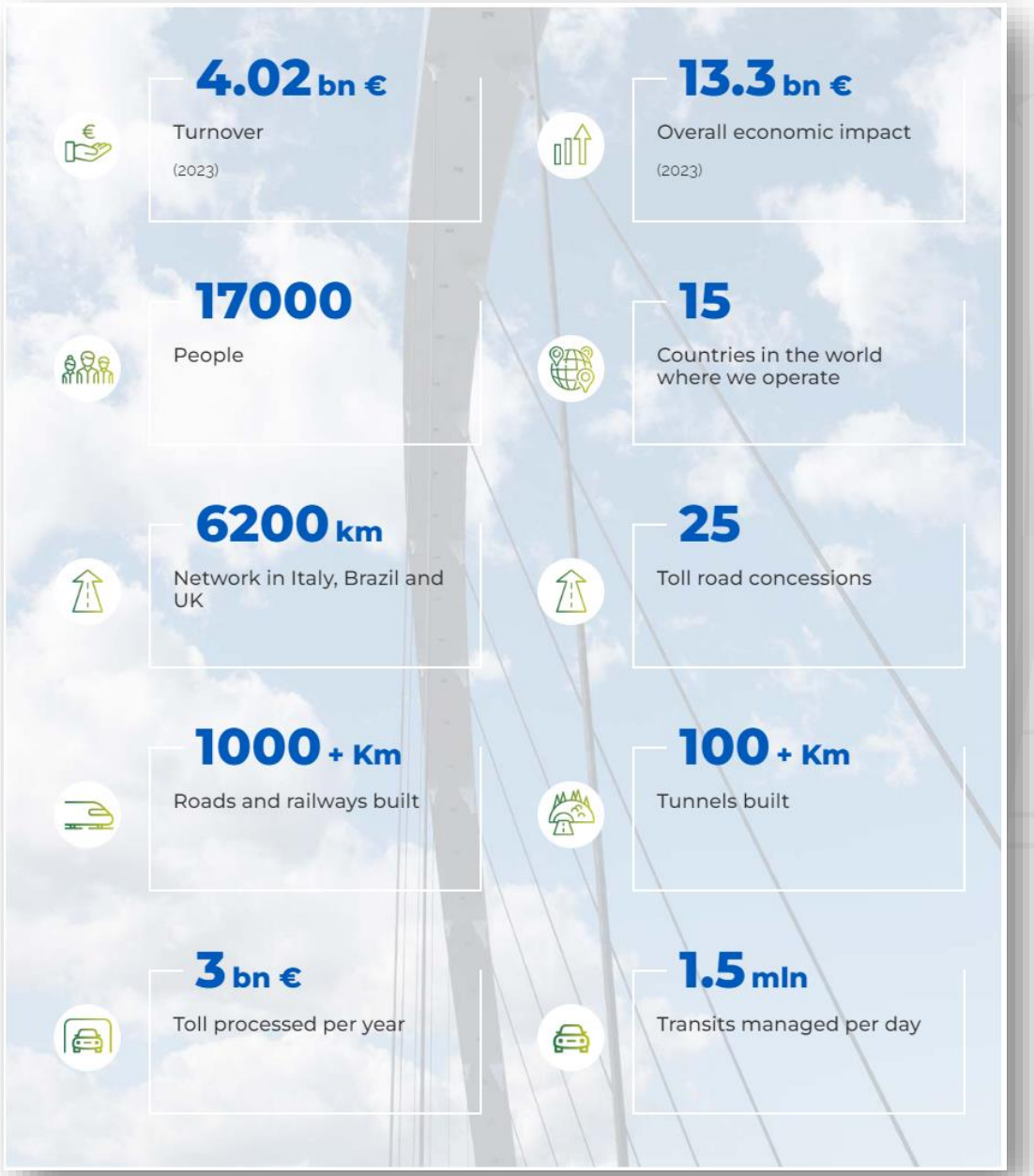

Who we are

The ASTM group is a global player in the infrastructure sector: second largest motorway concession operator in the world and a leader in the realization of large works and in mobility technology.

a "One Company" with an integrated business model that covers the entire value chain, ASTM wants to be a key player in the digital and ecological transformation of mobility, to build the infrastructure of tomorrow: innovative, resilient and sustainable.

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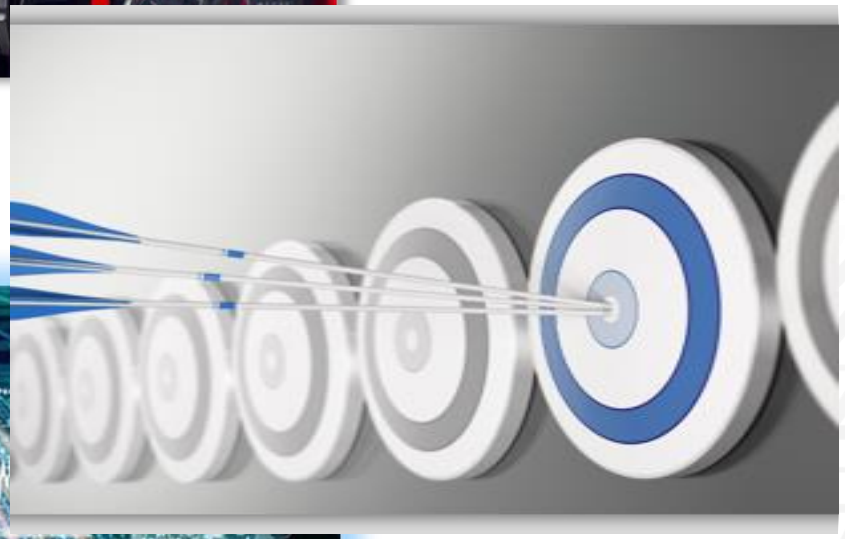
A bit of theory...

Artificial intelligence is a discipline belonging to computer science that studies the theoretical foundations, methodologies and techniques that allow the design of hardware systems and software program systems capable of providing the electronic computer with performances that, to a common observer, would seem be of exclusive relevance to human intelligence

Complex of psychic and mental faculties that allow us to think, understand or explain facts or actions, develop abstract models of reality, understand and be understood by others, judge, and adapt to the environment

- Act in a similar way to what humans do: the result of the operation carried out by the intelligent system is indistinguishable from that carried out by a human.
- Think in a similar way to what humans do: the process that leads the intelligent system to solve a problem is similar to the human one. This approach is associated with cognitive science.
- Think rationally: the process that leads the intelligent system to solve a problem is a formal procedure that refers to logic.
- Act rationally: the process that leads the intelligent system to solve the problem is the one that allows it to obtain the best expected result given the information available.



The Challenge

The ever-increasing traffic, the difficult to improve the capacity of the infrastructures , the obvious impossibility to continuously increase toll fees, the demand to keep costs under control and at the same time provide an increasingly better service...

Is it possible to use technology to face this impossible challenge, caught between irreconcilable requirements?

Can the road and the technological infrastructures we put in place become as smart as the vehicles and the users who use them?

Our industrial approach to AI & ML

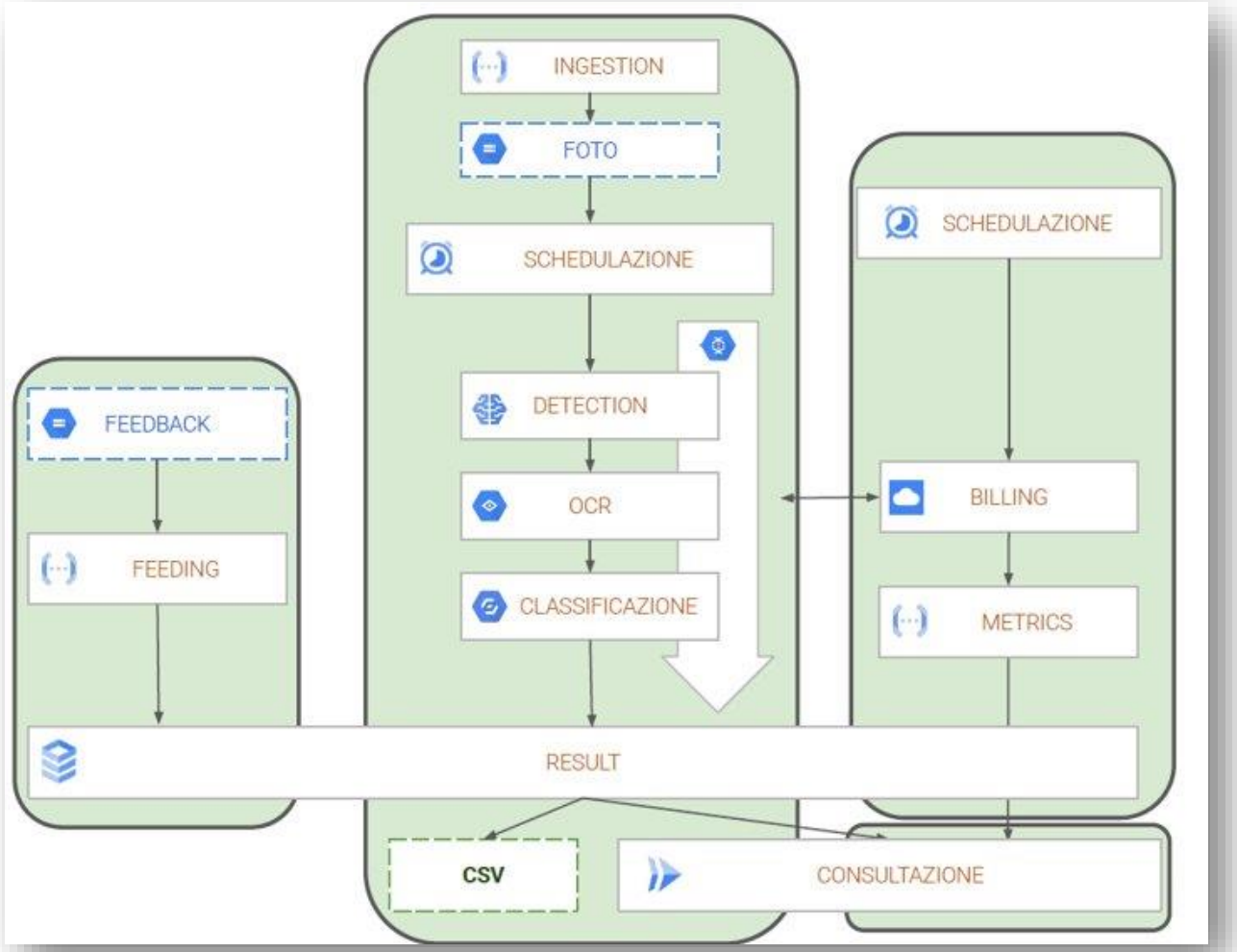
Think like a human, act like a human

- Improve work processes done by human beings: transfer repetitive and unrewarding activities to software processes and free up the work time for more productive and interesting activities.
- Avoid the application of 7x24 work shifts in favor of more performing software processes, limiting "human" activities to control processes
- Introduce advanced features into our solutions that allow us to make them distinctive when compared to competing ones, improving their weak points and introducing capabilities derived from human intelligence

Case #1: assisted image recognition

The automatic vision and the combination of different OCR engines, supported by appropriately trained neural networks, allowed to reduce the number of violation and non-payment images by over 50%, freeing up the time of people, recovered for more complex and rewarding activities.

The process was designed not as a mere OCR but, reflecting the modus operandi of the "human" team, with the aim of making the process more efficient.



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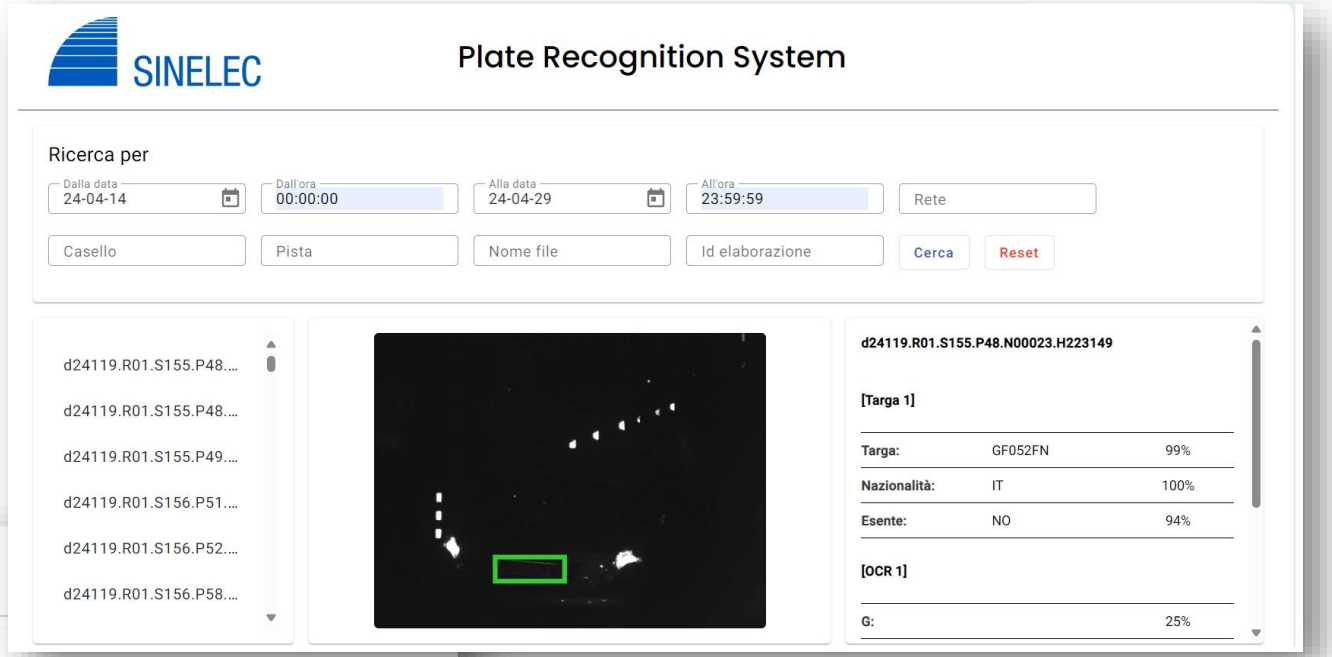
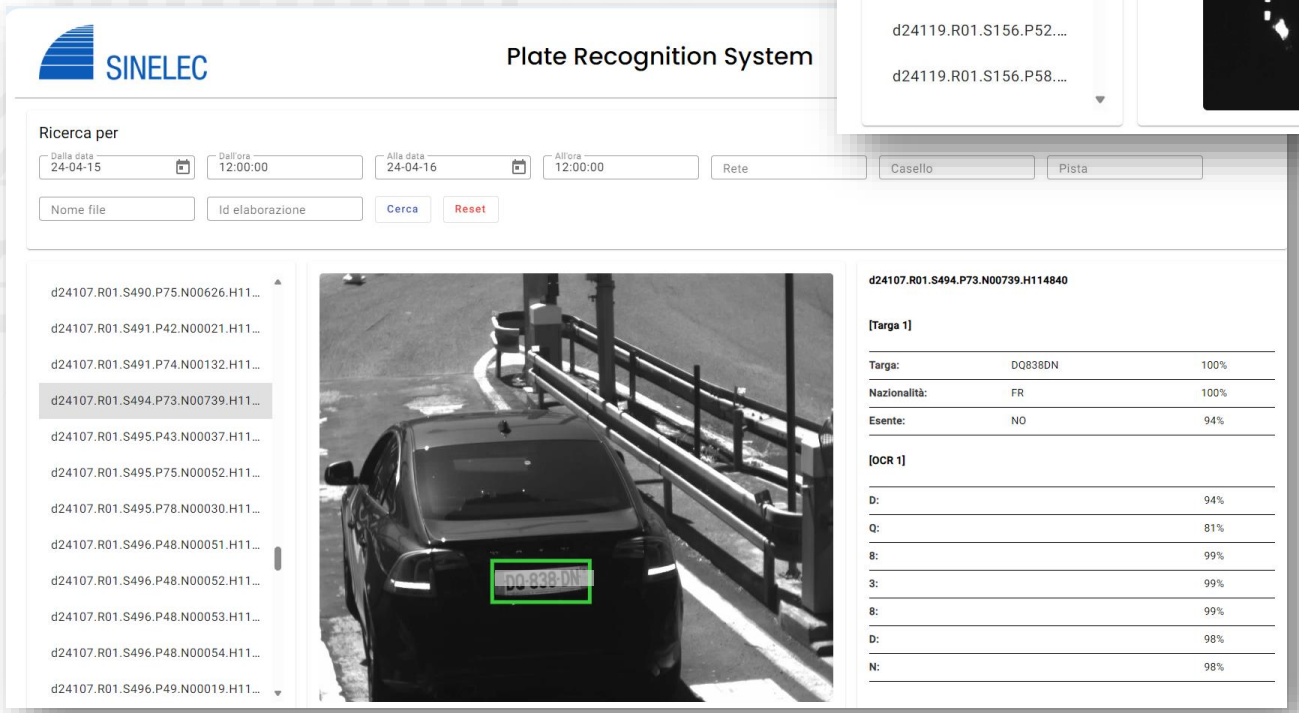
Case #1: examples and results

The described system is operating since beginning 2023





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Case #2: vehicle fingerprinting

A Cognitive Process

How to recognize a vehicle through its visual characteristics (number plate, model, brand, color, size) and electronic characteristics (presence of electronic toll equipment on board) among millions of its "similar"? While it may be easier for cars, it is certainly less so for a heavy vehicle that perhaps changes trailers every trip...

The "intelligent" correlation of all the distinctive parameters has allowed us to create an extremely efficient recognition engine, capable of **learning** from multiple consecutive detections and building over time an archive of "digital fingerprints", appropriately anonymized to comply with the GDPR requirements.

System is in regular operation in A33 MLFF environment and under testing in the forthcoming A21 MLFF in Brescia

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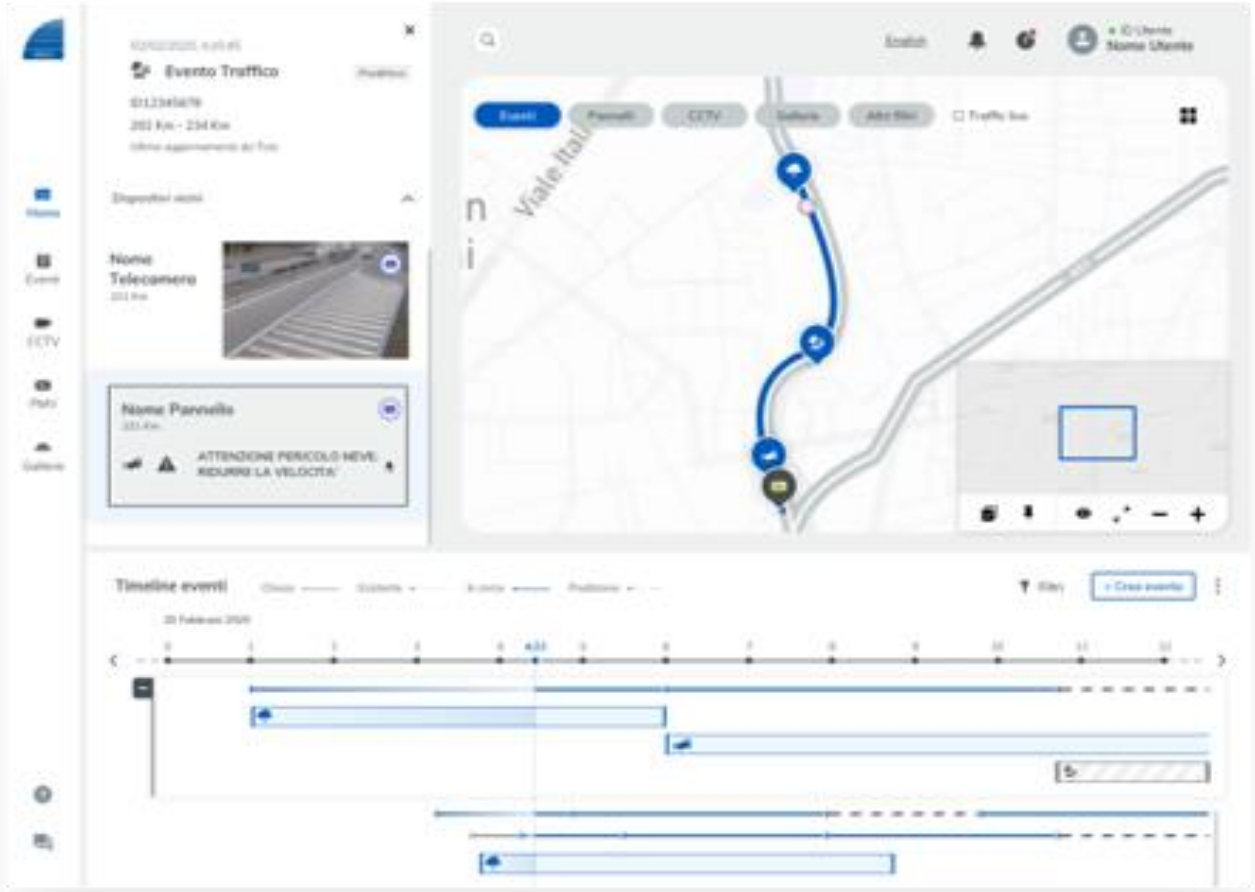
Case #3: automated remote assistance

About 50 remote assistance use cases are being analyzed by our business and dev teams:

probably we won't address all of them by thinking how to implement a Gen-AI enabled alternative to the human operator, but we can clearly see chances to address at least a part of those use cases to be managed faster and in a more efficient way by adding a 1st level AI based intervention and leave the operator to solve the most demanding cases.

Again, the main goal is to have people work better, in a safer way and avoid time consuming and poorly rewarded tasks.



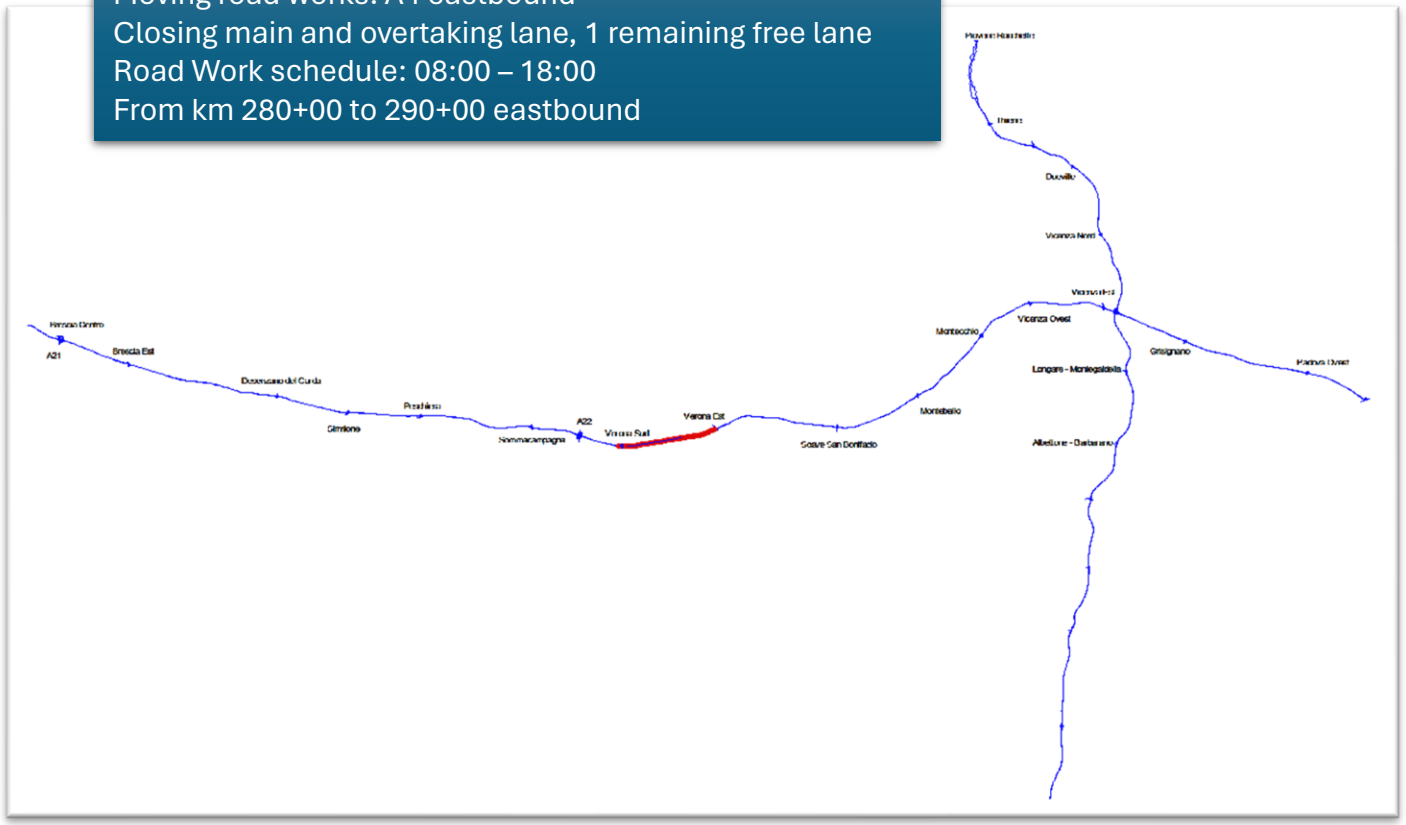
Case #4: short term forecasts and what-if scenarios

The possibility of predicting how an event on the motorway has an impact on traffic in the short term allows for more effective traffic management, especially in the event of a complex "scenario" in which multiple events, correlated with each other, occur.

The use of ML tools applied to traditional traffic simulation models allows us to obtain particularly effective short-term forecasts (30 minutes - 3 hours) to make the Motorway Control Center's operators' activities easier and more efficient.

The goal is to apply this technique also for "what-if" traffic impact evaluation tasks, such as road works medium-to-long term planning.

Simulation time: 04:00 - 23:00
Moving road works: A4 eastbound
Closing main and overtaking lane, 1 remaining free lane
Road Work schedule: 08:00 – 18:00
From km 280+00 to 290+00 eastbound



Case #4: A4 example

System has been tested in A4 BS-PD since 2023 and in regular operation from 2024

Operations in A4 TO-MI is ready to start

Evaluation and testing in more complex scenarios (more interconnections, more interactions with ordinary roads, more complex geographic constraints, ...) is undergoing

One last word…

Innovation is about technology.

Experience is human.

AI is reality, now it's time for us to face the change.

"It is not the strongest of the species that survives,
nor the most intelligent, but the one most responsive to ***change***"
- Charles Darwin, 1809

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THANK YOU

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