

Automated Vehicles for Sustainable Cities

Solar Decathlon Europe
Urban Mobility Challenge

Nicolas Saunier
nicolas.saunier@polymtl.ca
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**POLYTECHNIQUE
MONTRÉAL**

TECHNOLOGICAL
UNIVERSITY



Why Automating Road Vehicles?

Road transport is not safe

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Road transport is **not safe**

- 1.35 million people die each year on the world's roads
- millions more are severely injured
- 54 % of those dying on the world's roads are vulnerable road users

(Road Traffic Injuries, World Health Organization)

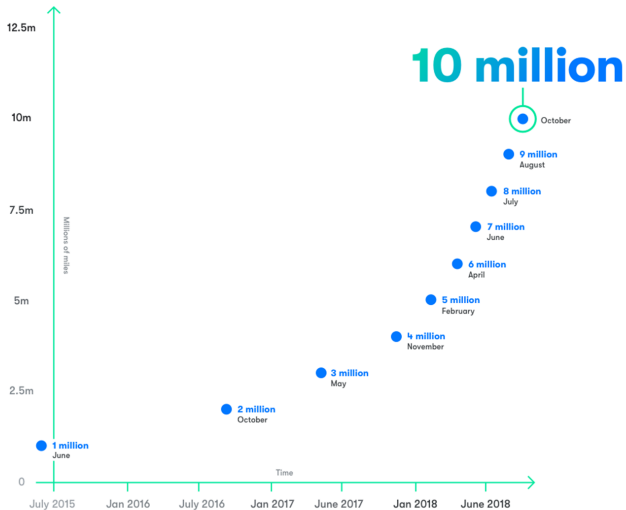
Why Automating Road Vehicles?

≈ 95 % of accidents involve human factors

But Are AVs Really Safer?

It's not easy to know

But Are AVs Really Safer?



10 million miles and counting

But Are AVs Really Safer?



Waymo engineers build virtual scenarios that allow our self-driving vehicles to drive up to 8 million simulated miles each day.

Simulation: How the Virtual World Helps Our Cars Learn Advanced Real-World Driving Skills

Waymo's simulator can replay the real-world miles we have driven with each new software version, but also can build completely new realistic virtual scenarios for our software to be tested against. Each day, as many as 25,000 virtual Waymo self-driving vehicles drive up to eight million miles in simulation, refining old skills and testing out new maneuvers that help them navigate the real world safely.

For example: at the corner of South Longmore Street and West Southern Avenue in Mesa, Arizona, there's a flashing yellow arrow for left turns. This type of intersection can be tricky for humans and self-driving vehicles alike—drivers must move into a five-lane intersection and then find a gap in oncoming traffic. A left turn made too early may pose a hazard for oncoming traffic; a turn made too late may frustrate drivers behind.

Simulation lets us turn a single real-world encounter like this into thousands of opportunities to practice and master a skill.

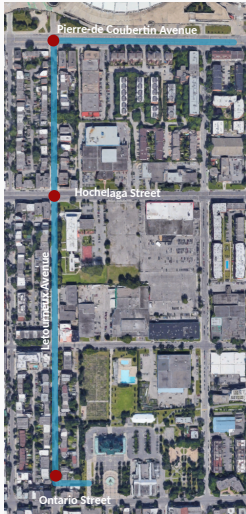
But Are AVs Really Safer?

“With millions of miles driven through countless situations on public roads, and billions more in simulation, we’ve gathered incredible amounts of data and invaluable lessons to develop autonomous driving technology further than anyone else”

“The Waymo Driver takes the information it gathers in real time, as well as the experience it has built up over its 20+ million miles of real world driving and 20+ billion miles in simulation, to anticipate what other road users might do”

(<https://waymo.com/waymo-driver/>, January 2022)

Study of Low-Speed Automated Shuttles in Montreal and Candiac



Work with Étienne Beauchamp and Marie-Soleil Cloutier, INRS

Study of Low-Speed Automated Shuttles

Montreal

Pierre-de-Coubertin



Hochelaga



Ontario



Study of Low-Speed Automated Shuttles

Candiac

Residence



Inverness



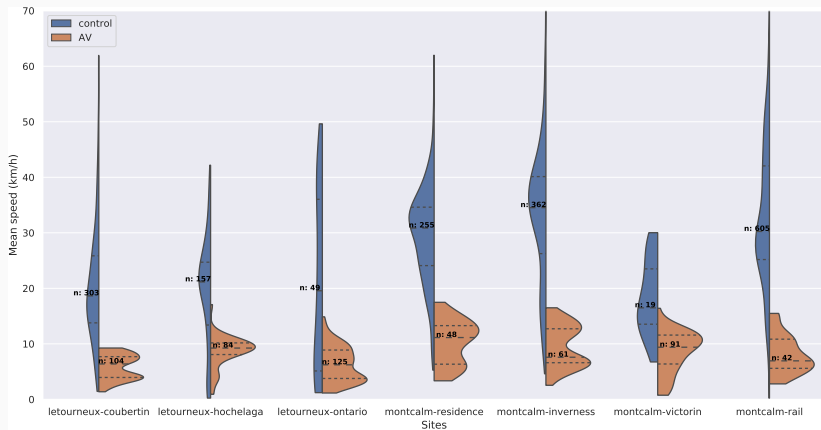
Marie-Victorin



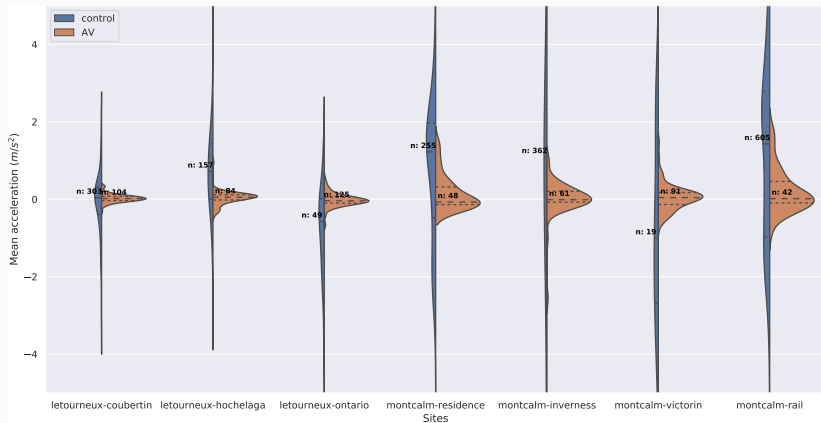
Rail



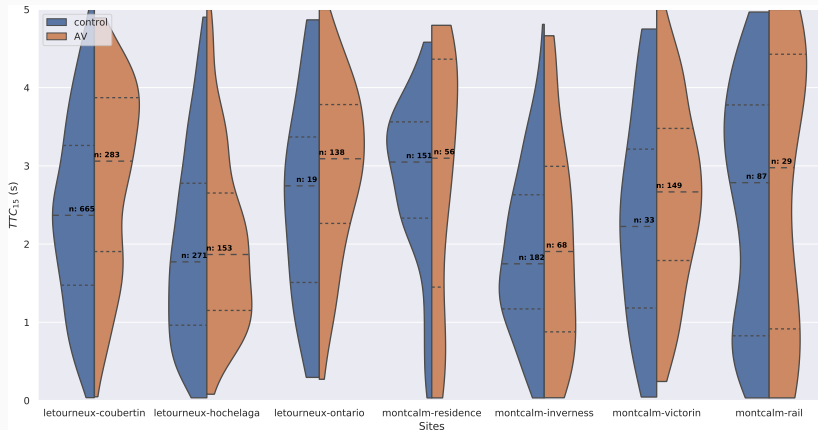
Study of Low-Speed Automated Shuttles



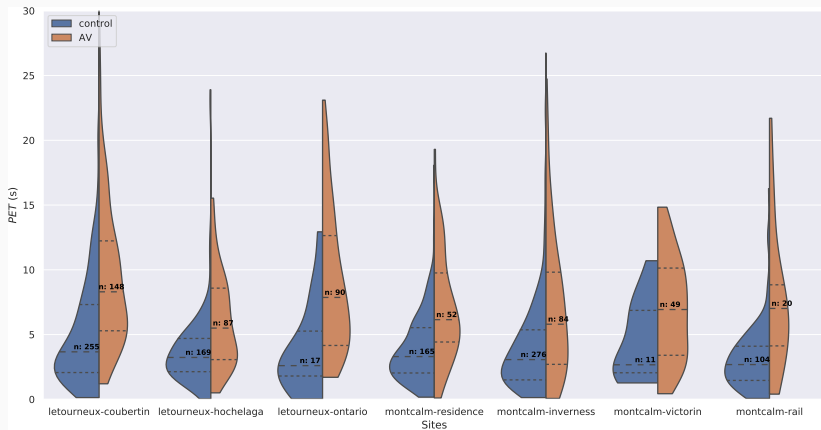
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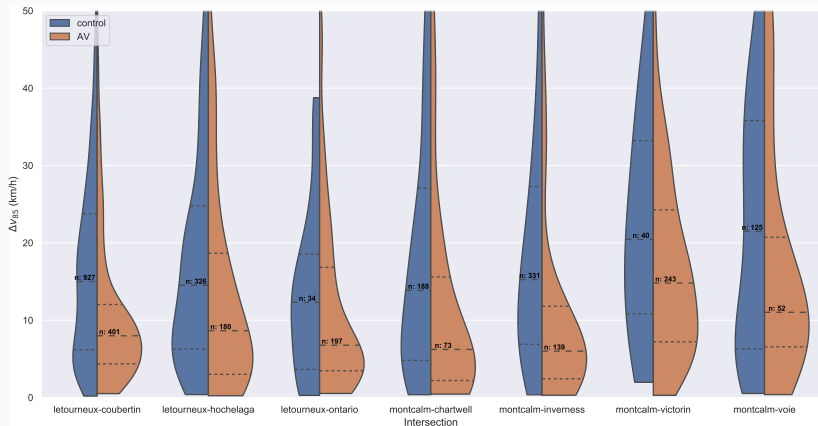
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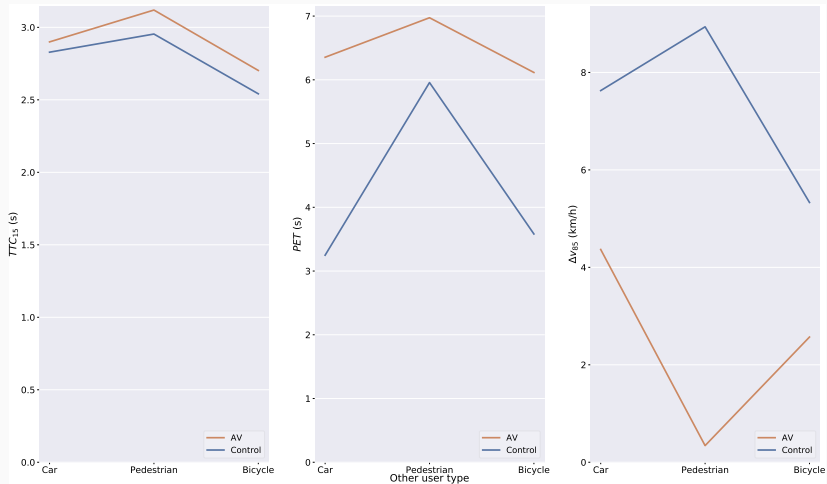
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Study of Low-Speed Automated Shuttles



Other Advantages

- **Mobility gains** for persons with disabilities

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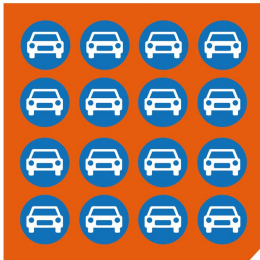
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- **Capacity gains** on currently “empty” roads

Other Advantages

- **Mobility gains** for persons with disabilities
- **Capacity gains** on currently “empty” roads
- Reclaim parking space for other uses

But...

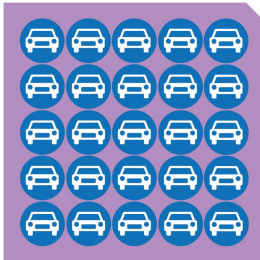
Life with cars.



Life with electric cars.



Life with autonomous cars.



Life in a modern city.



What Happens If You Only Provide Alternatives?



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- electric, automated, on-demand **public transit** vehicles

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But technology will not get us there **by itself**

Questions?