

On-demand transit can disrupt commuting as much as Uber did taxis, say researchers

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Is public transit ready for a gig economy-style shake up? A group of researchers at Concordia believes that the ride-share model made popular by companies like Uber and Lyft might be a useful, innovative

and savings-based approach for suburban commuters as they trudge to work.

In a paper [published](#) in the journal *Transportation Research Record*, the authors outline a new solution to the often slow, unreliable and wasteful bus routes that service suburban and exurban communities.

On-demand transit (ODT) is an algorithm-based system that replaces buses with a fleet of [passenger](#) vans. Drivers respond to rider requests made through smart devices at existing bus stops. The drivers pick up one or more passengers at the stops and deliver them to the nearest public transit hub, usually a commuter rail or metro station.

The system is designed to optimize "first-mile" trips—the initial stage of a commute when passengers leave their home for the transit hub where they will embark on the next stage of travel that brings them to work.

Co-lead author Seyed Mehdi Meshkani says ODT presents several advantages over current bus-based fixed routes.

"From the passenger perspective, it improves passenger flexibility, wait times and total travel time, because the vehicle does not have to stop often. It simply collects a few passengers at requested stops and brings them to the public transit hub.

"There are benefits for transit agencies as well. It significantly reduces capital and operating costs and reduces overall greenhouse gas emissions as well."

Transit van life

The researchers used the town of Terrebonne, Quebec, a suburb of Montreal on the North Shore of the St. Lawrence River, as a model for

their system. The moderately sized community is serviced by a commuter rail line and bus system that connects it to the larger suburb of Laval and the island of Montreal. This gave it the criteria the researchers needed to detail their system without installing actual physical prototypes of the system's hardware.

The ODT model relies on smart devices installed at existing [bus stops](#) that are linked via the cloud to a right-matching dispatch algorithm. The passenger uses the device to place their request. The algorithm then matches the request based on wait time, proximity and other passenger requests and assigns the appropriate vehicle to pick them up and drive them to the [public transit](#) hub.

The vehicle used in ODT is a passenger van, which requires less fuel, training and maintenance to operate than a city bus. The latter can often ride empty during low-use hours but can still cost up to \$8.98 per kilometer to keep on the road.

The comparison analysis performed by the researchers revealed that the proposed ODT service could result in up to a 36% reduction in total travel time and 41% in detour time compared with existing bus-based services.

Unlike [dynamic pricing](#) used by ride-share services like Uber or Lyft, the cost per trip would remain fixed.

Ph.D. student Siavash Farazmand is the first co-author of the paper. Nizar Bouguila and Zachary Patterson, both professors at the Concordia Institute for Information Systems Engineering, contributed as well.

More information: Seyed Mehdi Meshkani et al, Innovative On-Demand Transit for First-Mile Trips: A Cutting-Edge Approach, *Transportation Research Record: Journal of the Transportation Research*

Board (2024). [DOI: 10.1177/03611981241239970](https://doi.org/10.1177/03611981241239970)

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