On-demand public transport

is making us mobile

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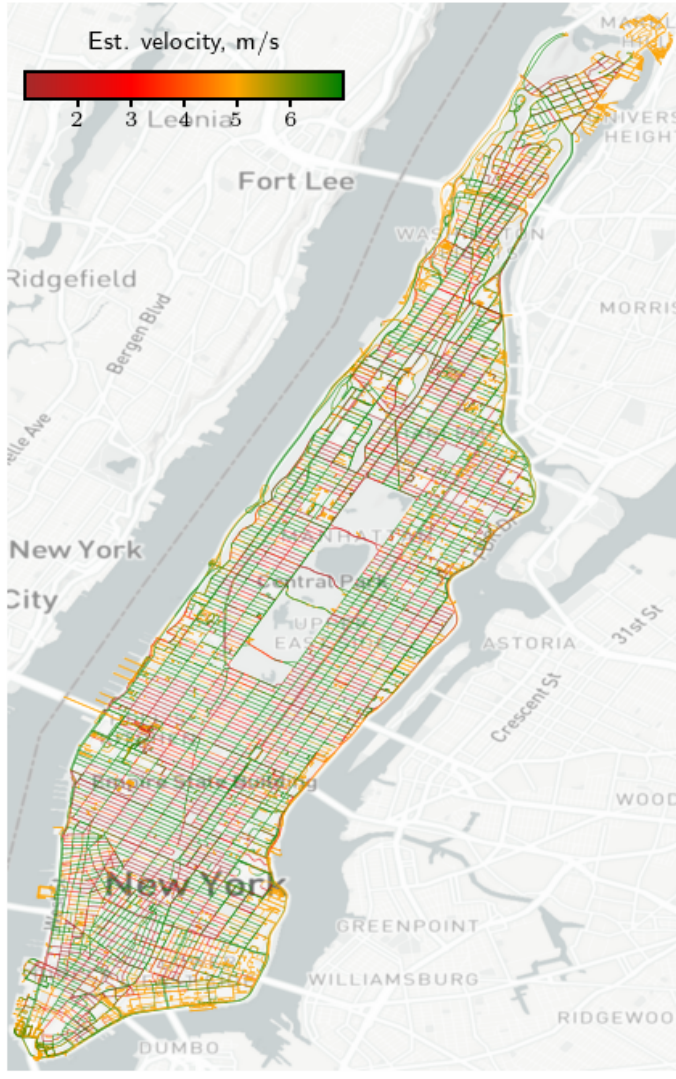
NYC TLC taxi data, May 2016:

pickup	dropoff	xa_lat	xa_lon	xb_lat	xb_lon	n	meters	seconds	$
2016-05-01 00:00:04	2016-05-01 00:06:22	40.839329	-73.940842	40.850304	-73.932976	1	1368	378	7.3
2016-05-01 00:00:07	2016-05-01 00:01:58	40.859612	-73.930199	40.863338	-73.929977	1	531	111	4.8
2016-05-01 00:00:14	2016-05-01 00:14:37	40.828629	-73.942215	40.763519	-73.996788	1	10783	863	22.3
2016-05-01 00:00:25	2016-05-01 00:04:37	40.807968	-73.945488	40.804539	-73.955505	1	1287	252	7.3
2016-05-01 00:00:28	2016-05-01 00:23:02	40.785992	-73.948799	40.763748	-73.988724	1	6598	1354	23.16
2016-05-01 00:00:30	2016-05-01 00:05:19	40.785416	-73.949669	40.776234	-73.952744	1	1255	289	8.16
...									

How many minibuses could meet the same demand?

From trip endpoints and travel time we infer traffic conditions:



Use this for quickest routes.

Case study:

- 100 requests during 18:00–18:17 within 1km of Times Square
- Allow -2min/+5min pickup and +10min dropoff windows
- Assume good traffic conditions

Excess travel times (wrt quickest route) computed by optimizer:

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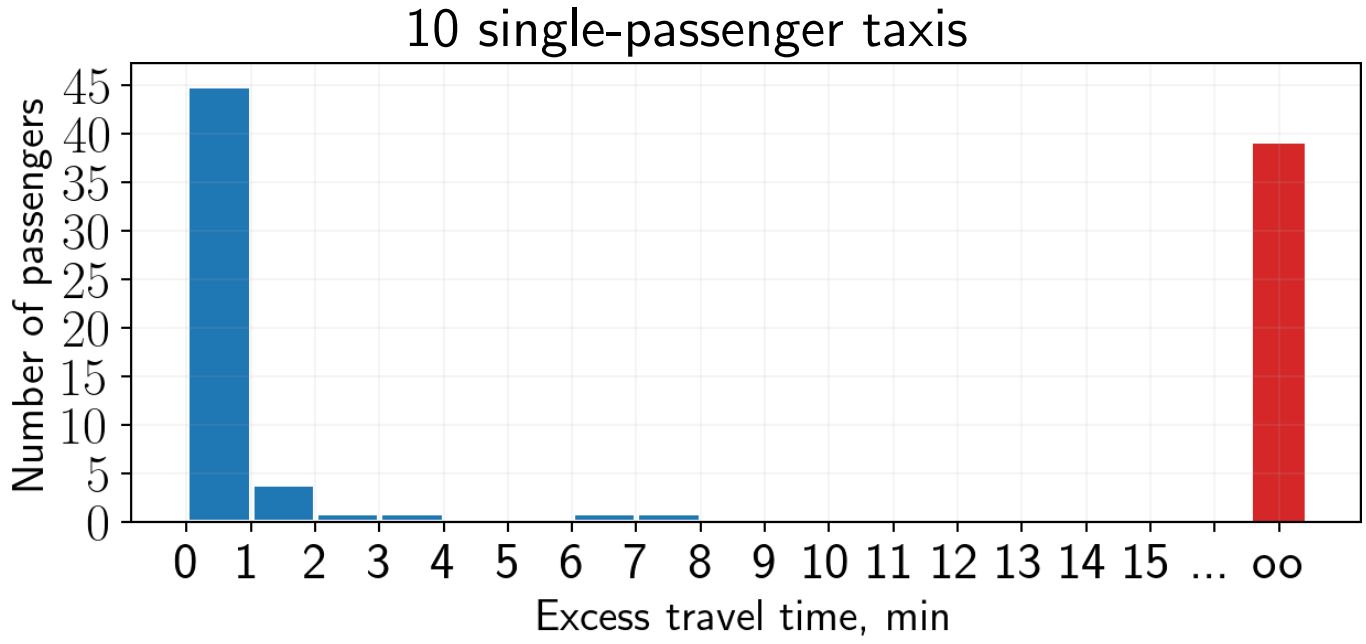

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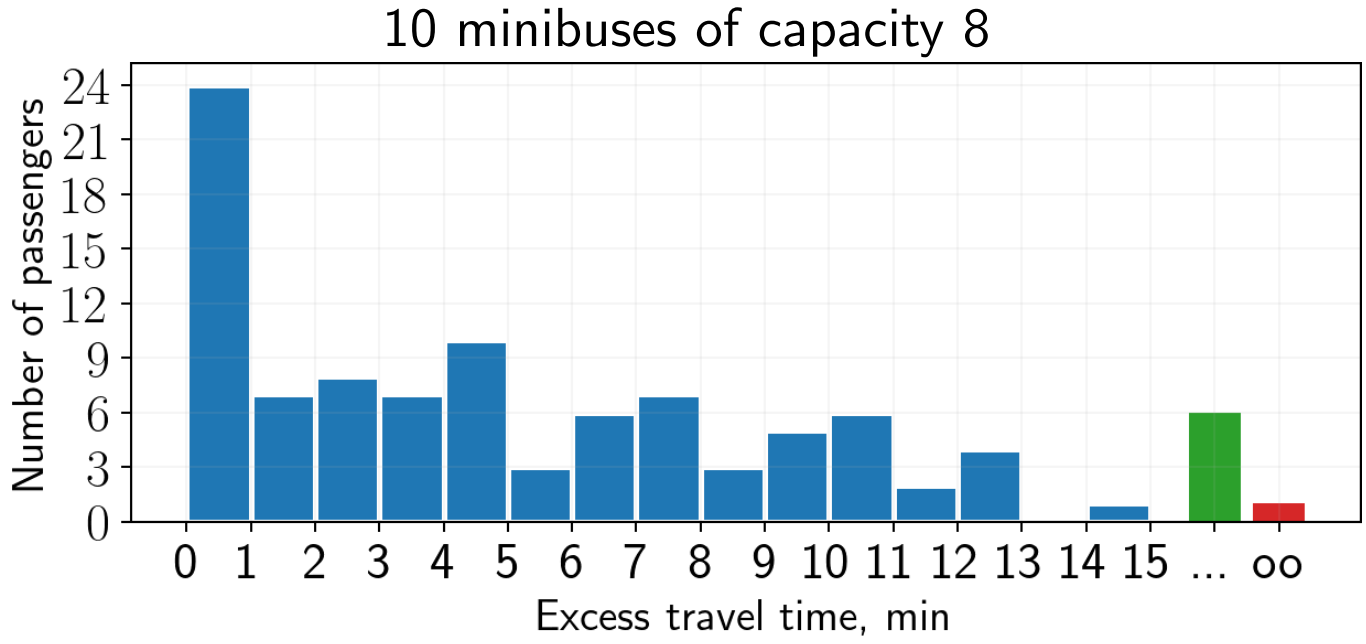

Hence: 20 taxis $\approx$ 10 minibuses, if allow detours.

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- Excess travel times in dollars according to 2019 income census.
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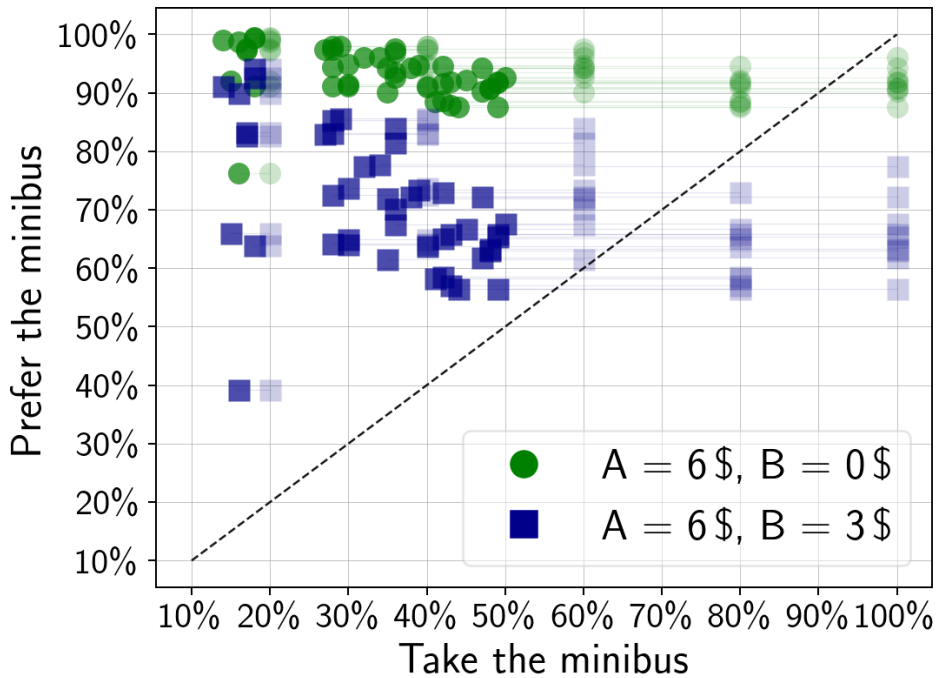

Assume bad traffic conditions (6pm traffic).
Minibuses can meet only half of the demand.
Faint: imposed fraction of bus takers. Solid: net the unserviced requests.
A = taxi price, B = minibus ride price

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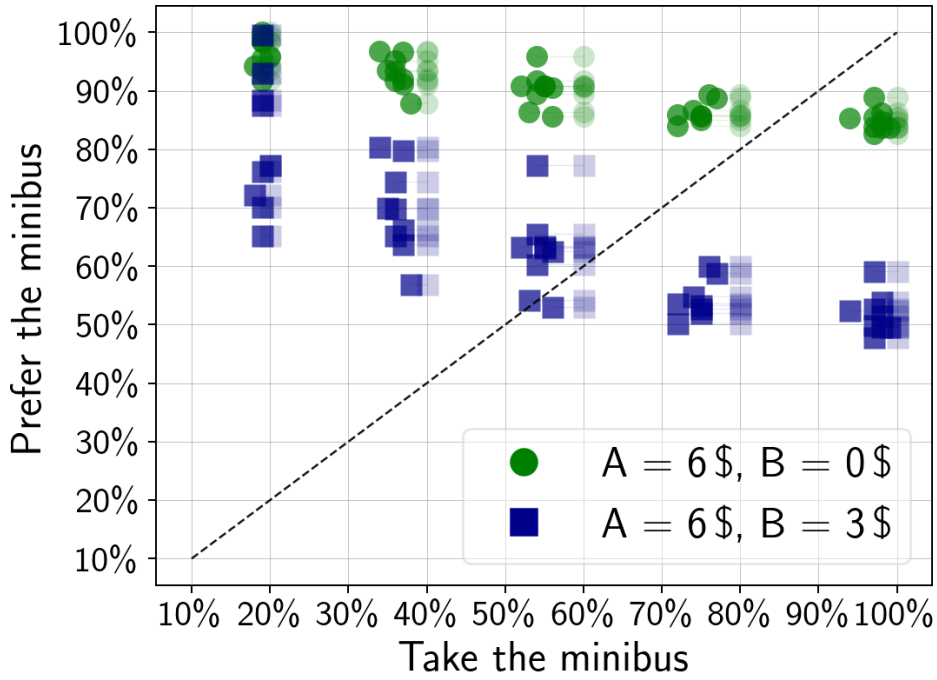

Assume traffic improves (6pm $\rightsquigarrow$ 6am) as more people take the minibus.
Equilibrium at 50-90% bus takers, depending on the price.

The paradigm shift is feasible – if it improves the traffic conditions.

Details: `http://bit.ly/optimum-2021`