

Implications of automation on parking

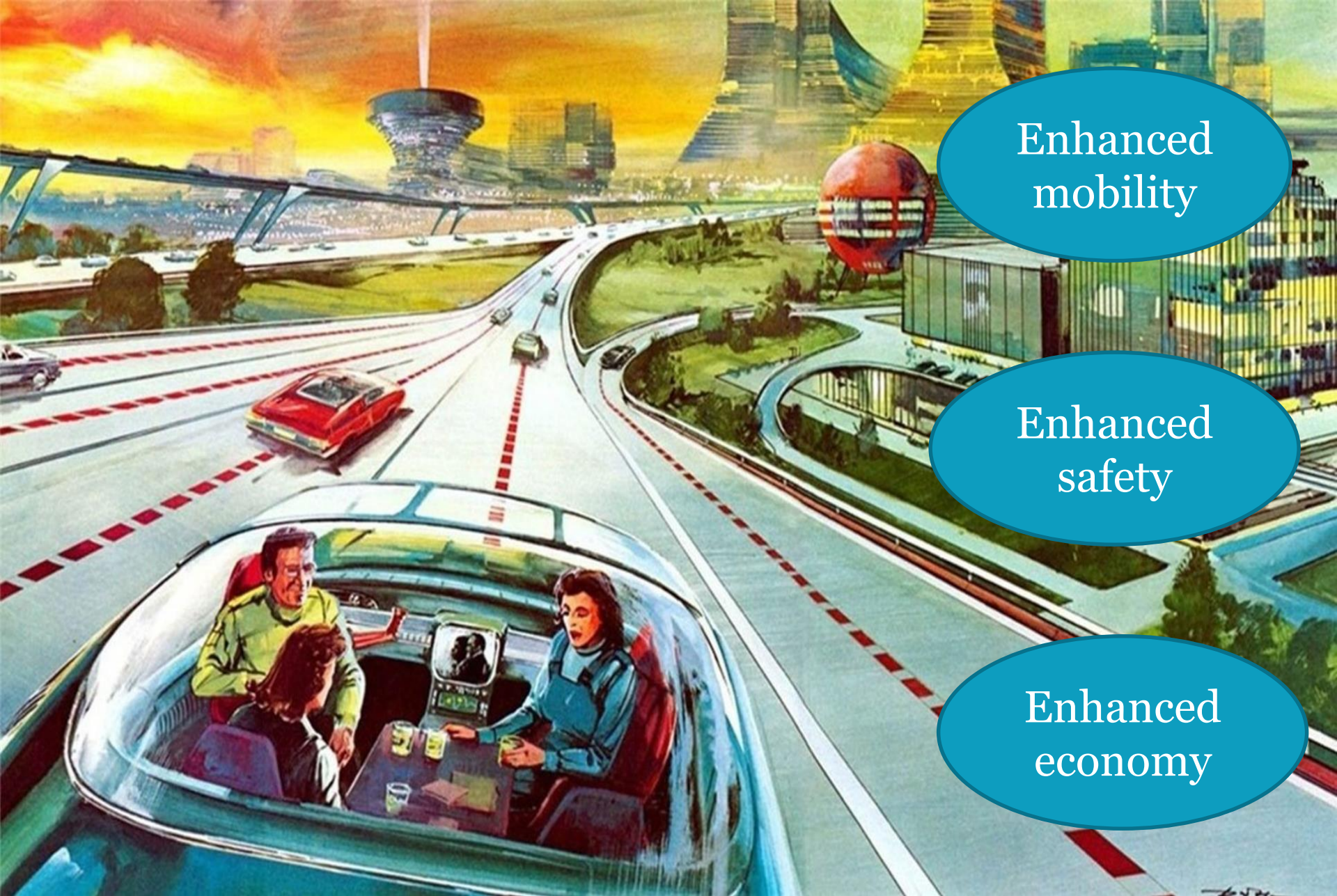
Sina Bahrami, Ph.D. Candidate

Matthew J. Roorda, Professor



UNIVERSITY OF TORONTO
FACULTY OF APPLIED SCIENCE & ENGINEERING
Transportation Research Institute





Enhanced
mobility

Enhanced
safety

Enhanced
economy

AVs legislation and policy

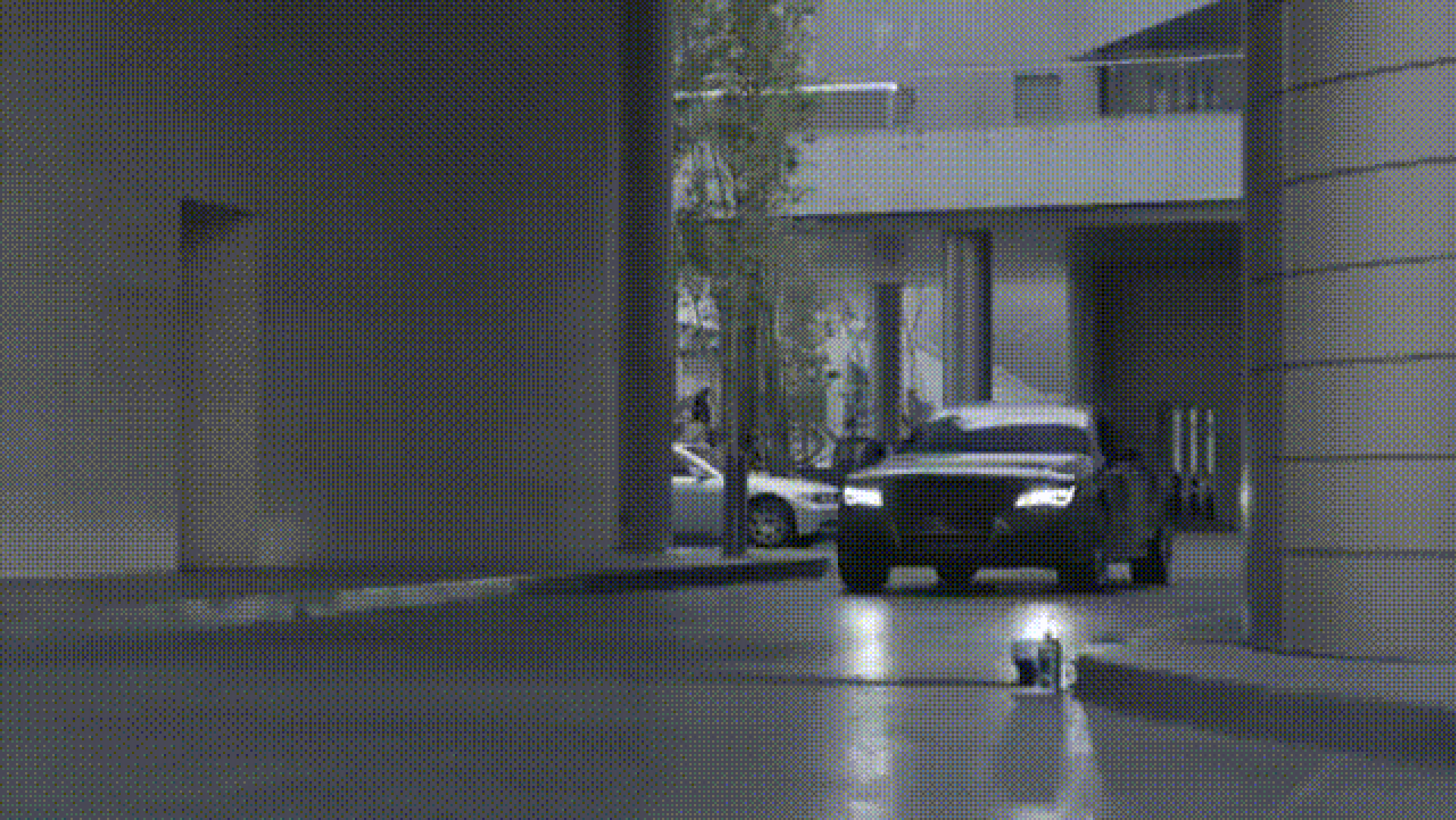


First ride in driverless car is a bit jerky, but still 'pretty cool'

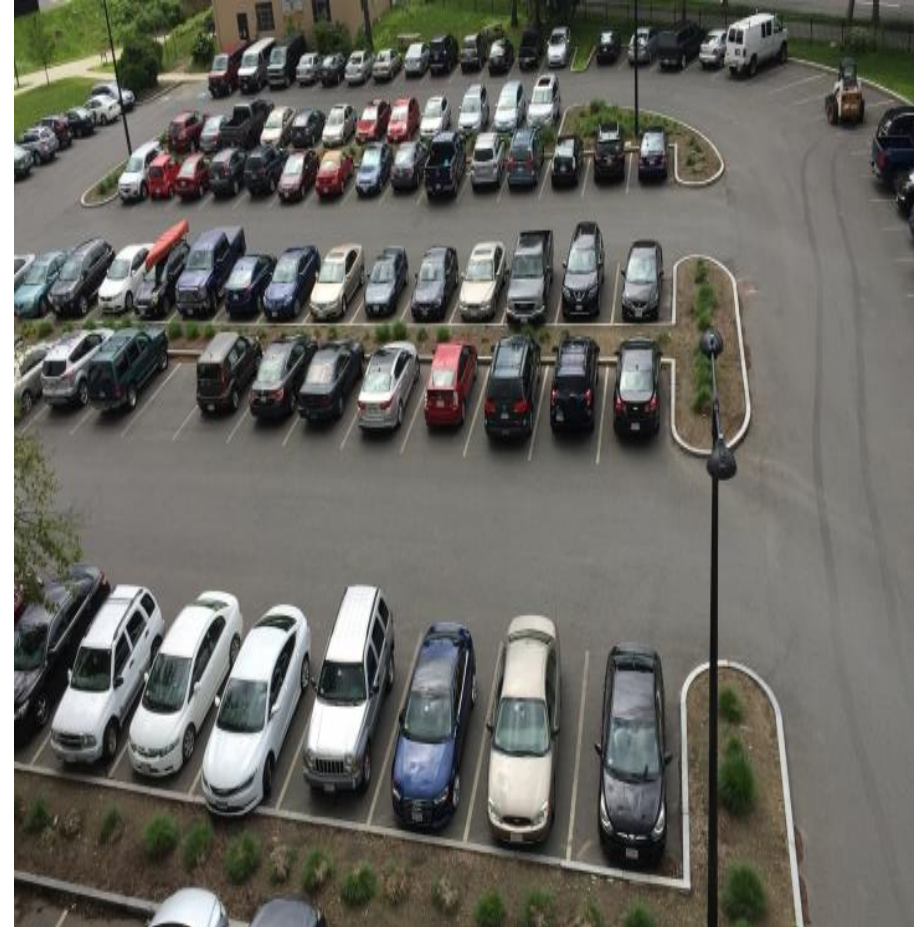
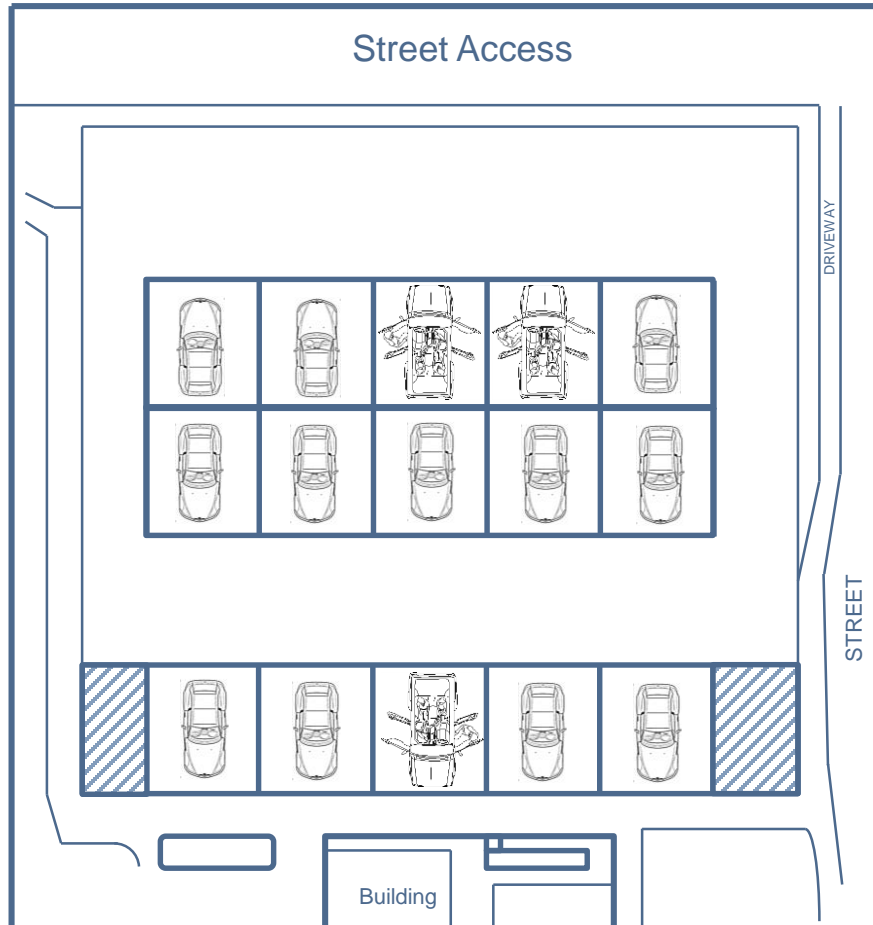
The New York Times

*Wielding Rocks and Knives,
Arizonans Attack Self-Driving Cars*

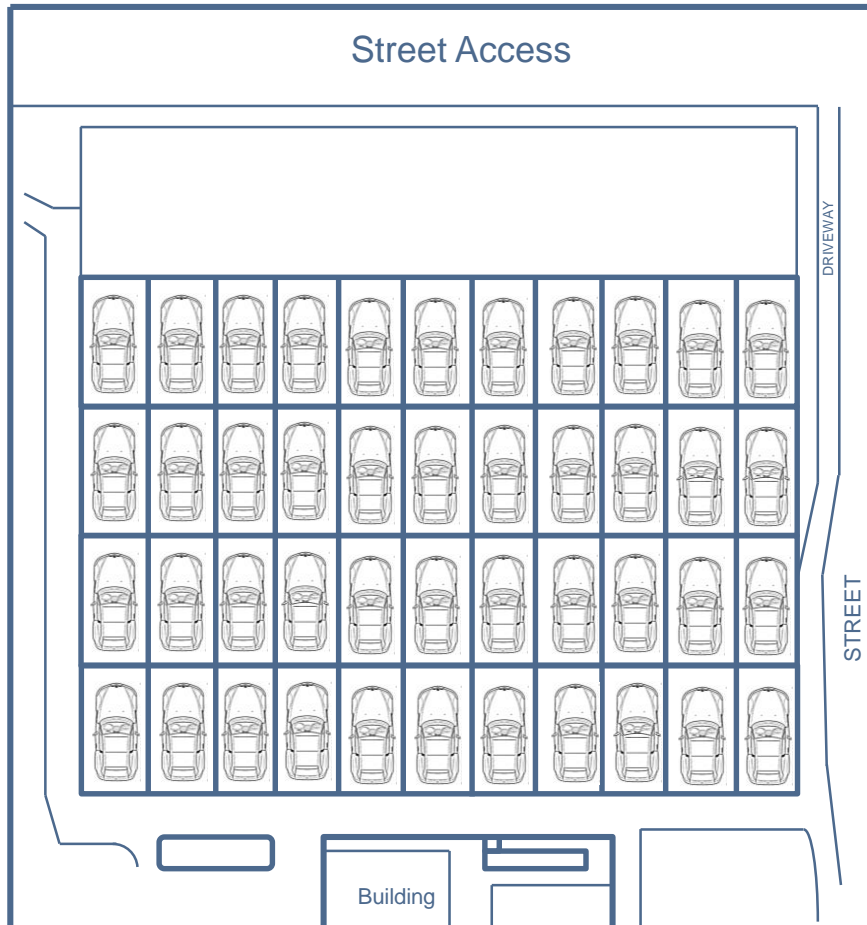
Speed up the integration of AVs



Conventional Car-parks

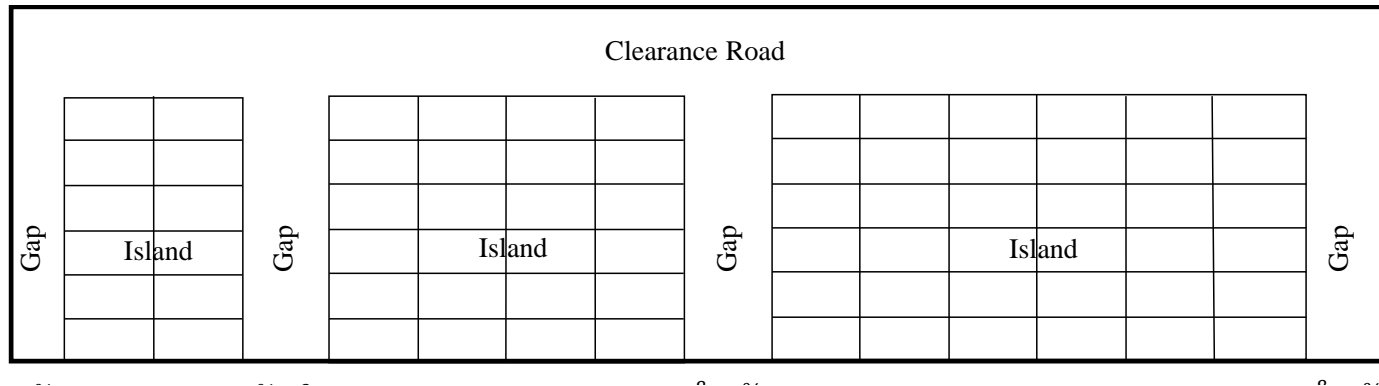


AV Car-parks

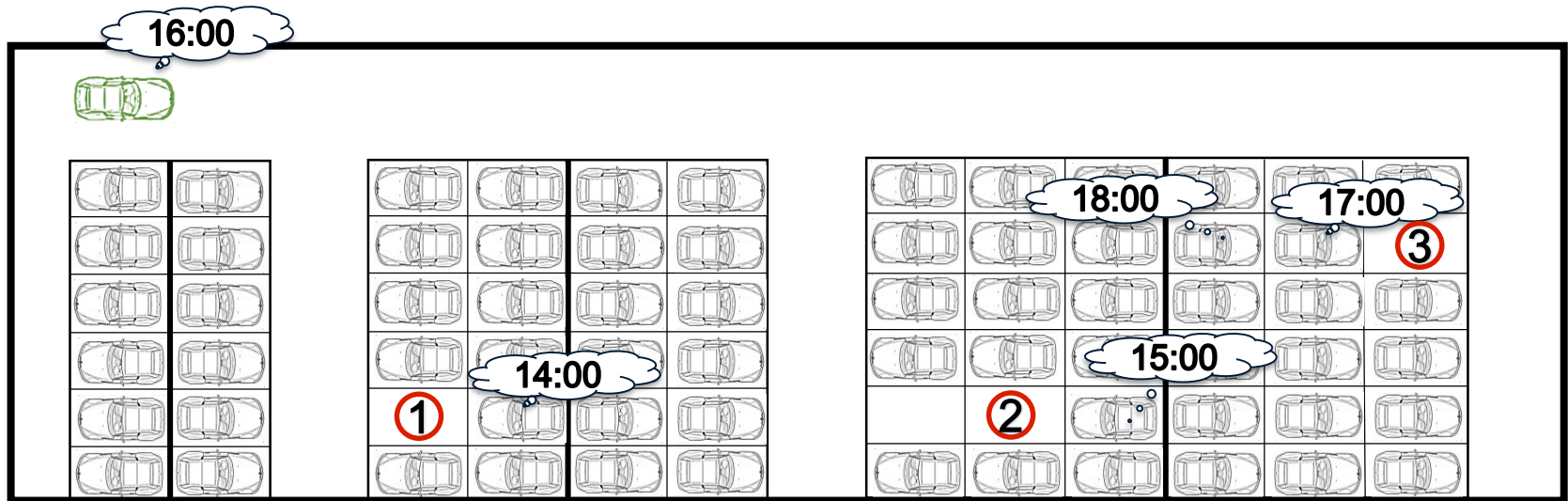


Optimal Parking Facility Design

1- Design Demand
2- Plot Dimensions



Optimal Parking Facility Operation

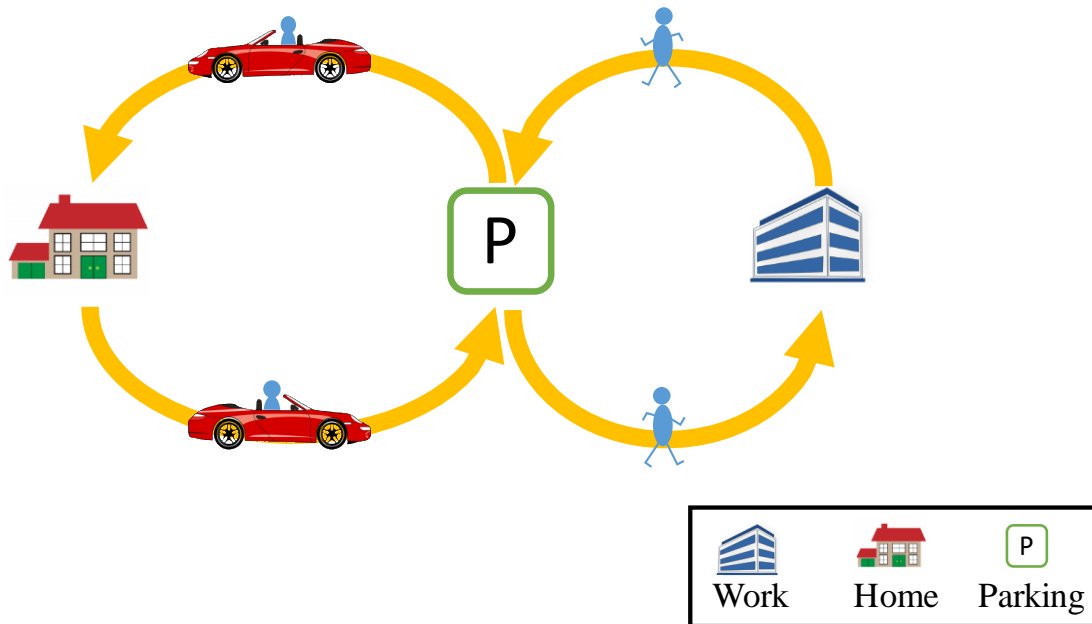


Robot parking



Regular Vehicle Parking

Conventional
Vehicle Driver



Parking options

- Home

- $C_h = 2x_h c_t$

- Car-park

- $C_p = 2x_p c_t + r_p(t_p - 2x_p)$

- Cruise

- $C_c = t_p c_t$

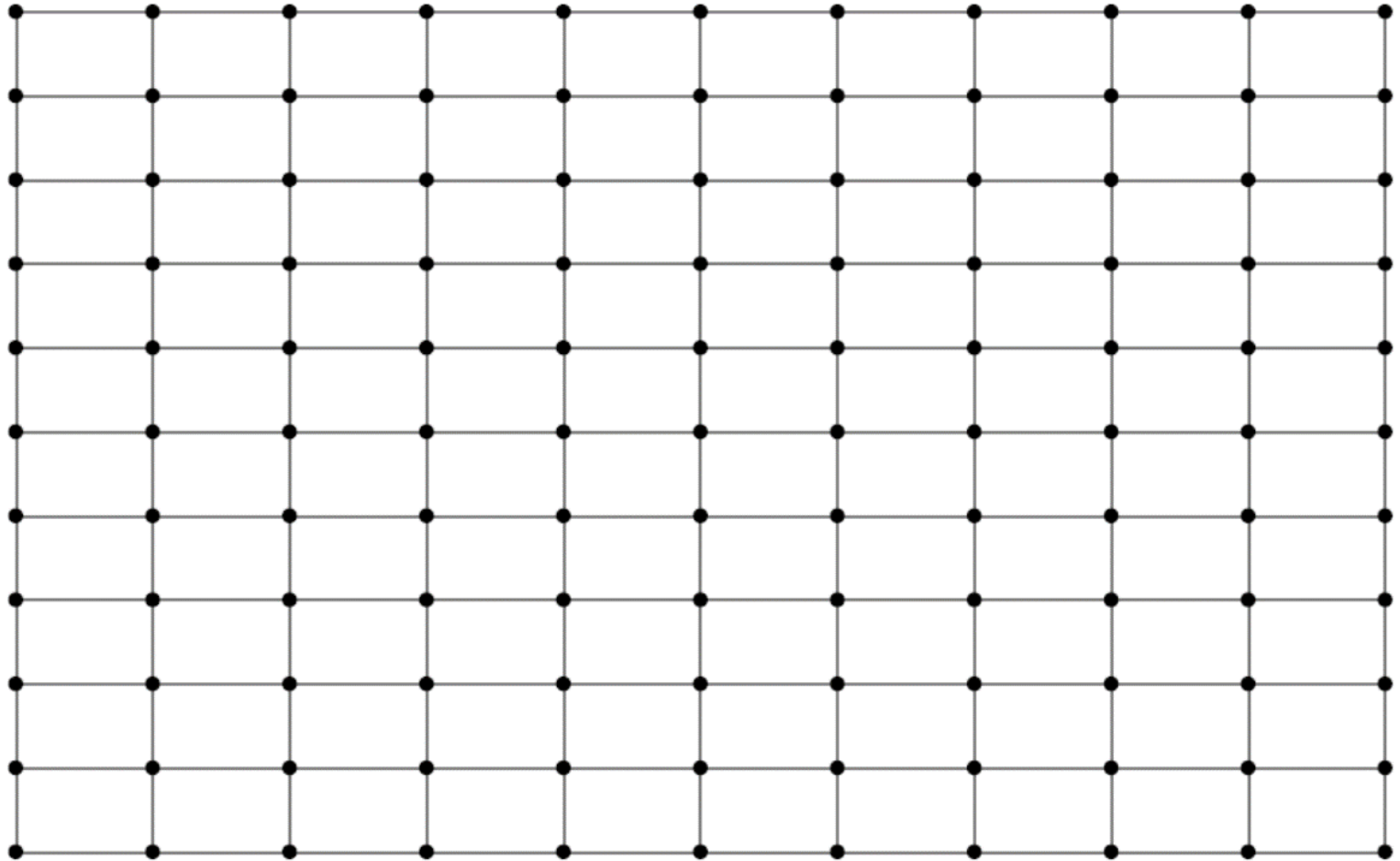
x Travel time

c Travel cost

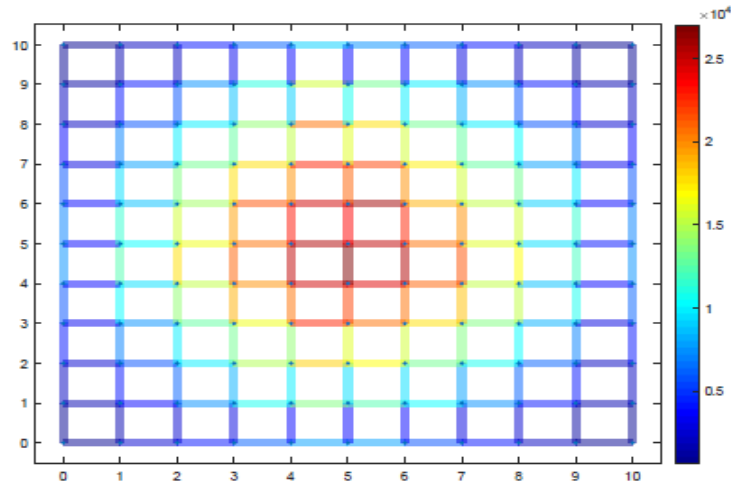
r Parking rate

t Activity time

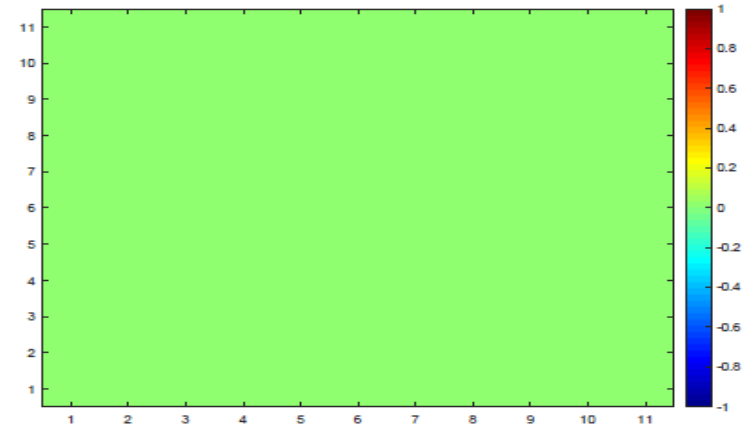
Hypothetical city



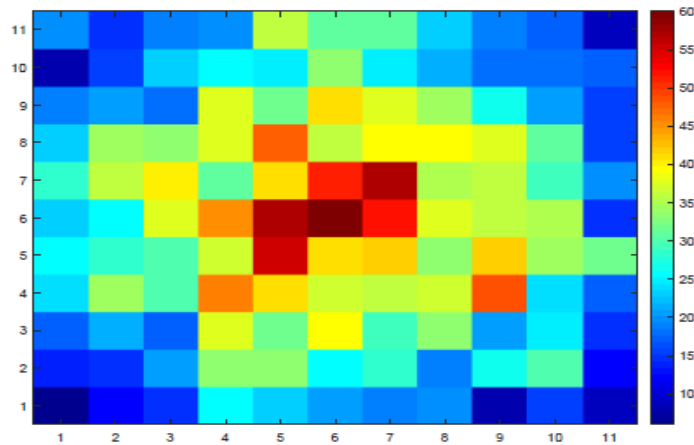
Base case scenario with $r_p = 3[\frac{\$}{hr}]$ and $t_p = 12[\frac{\$}{hr}]$



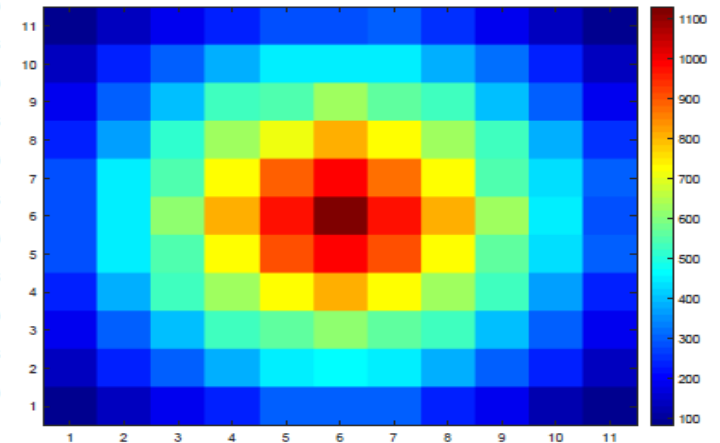
Daily link traffic flow.



Daily spatial distribution of cruising.

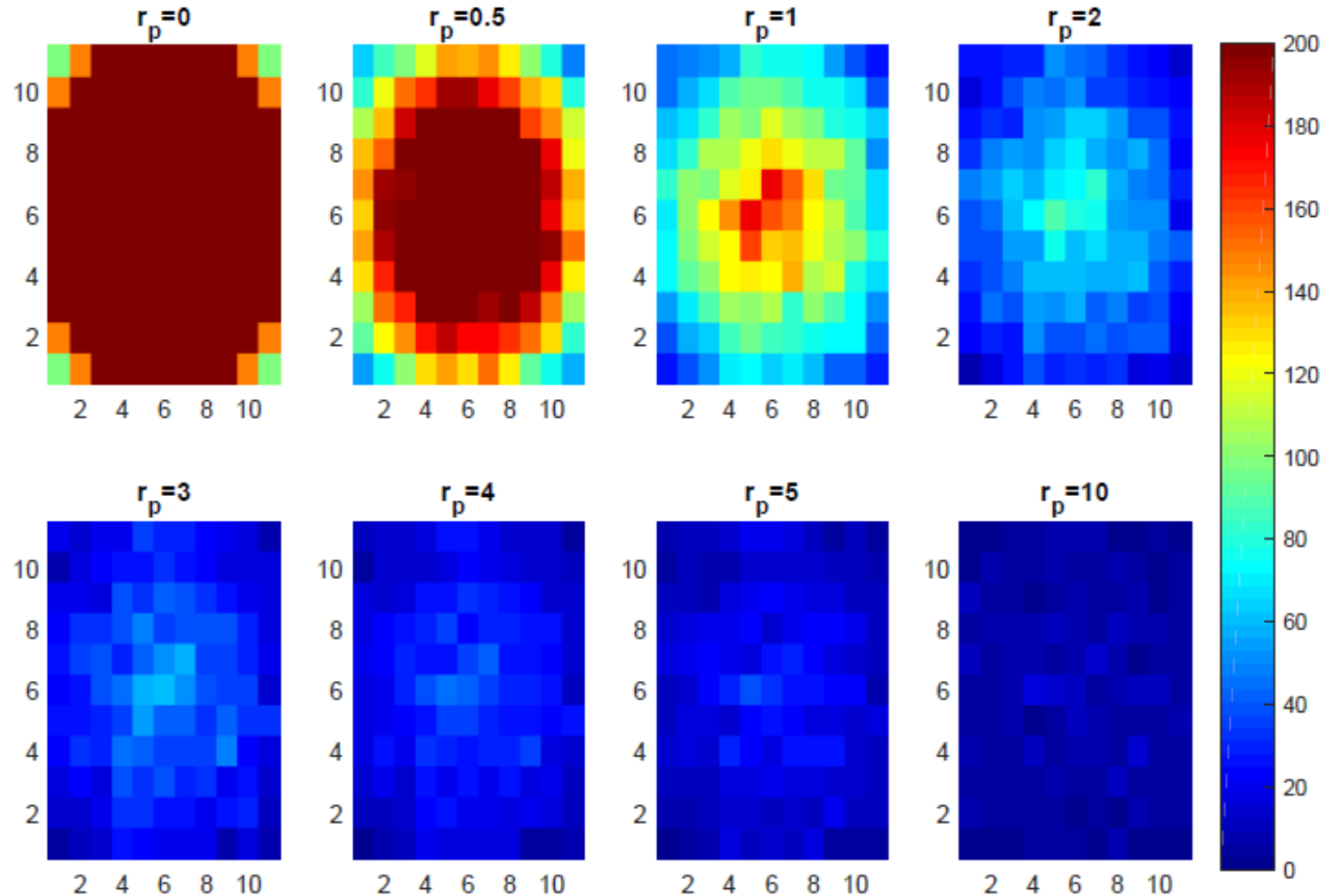


Daily spatial distribution of Parking



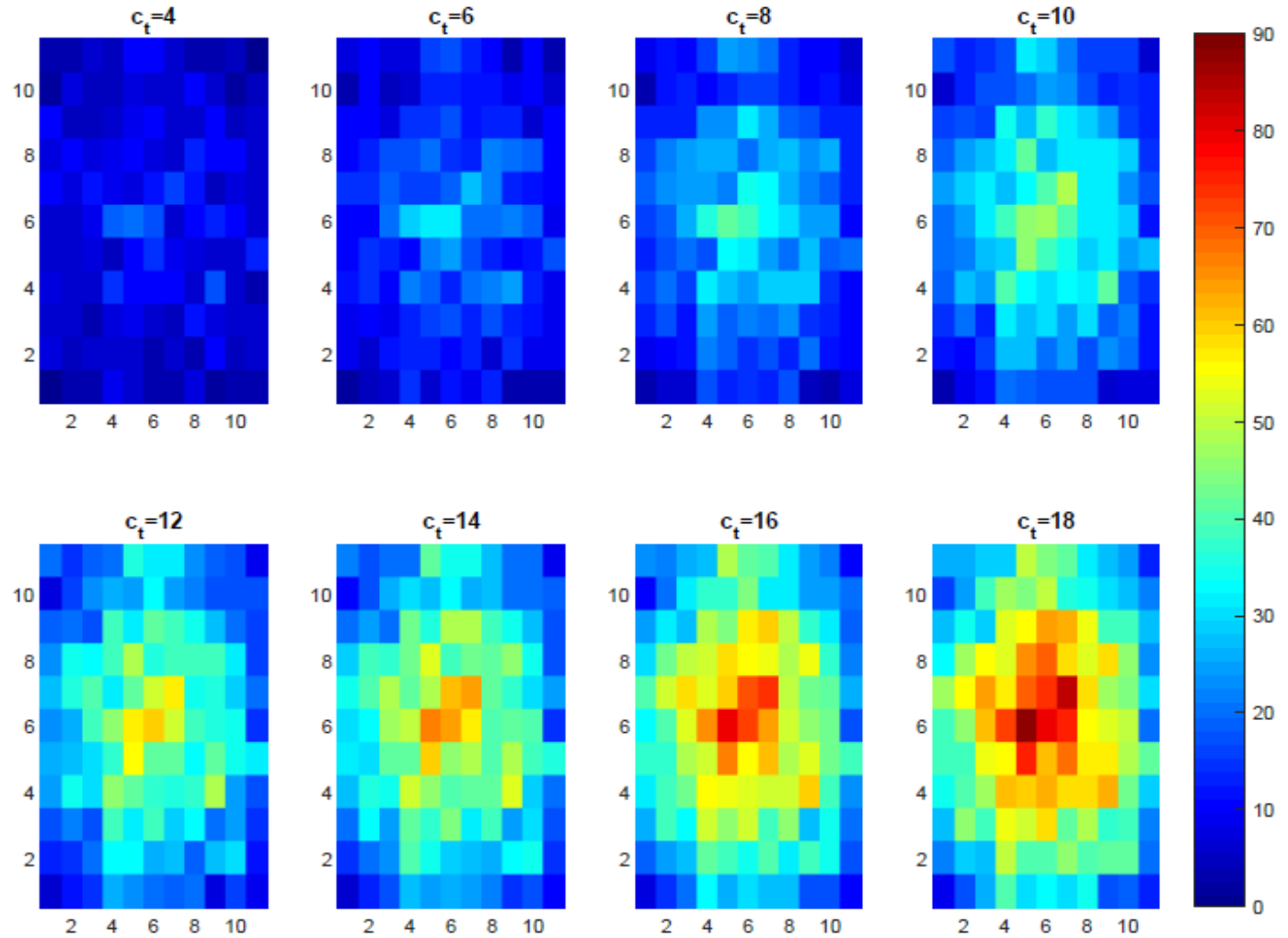
Daily spatial distribution of home

Parking cost sensitivity analysis



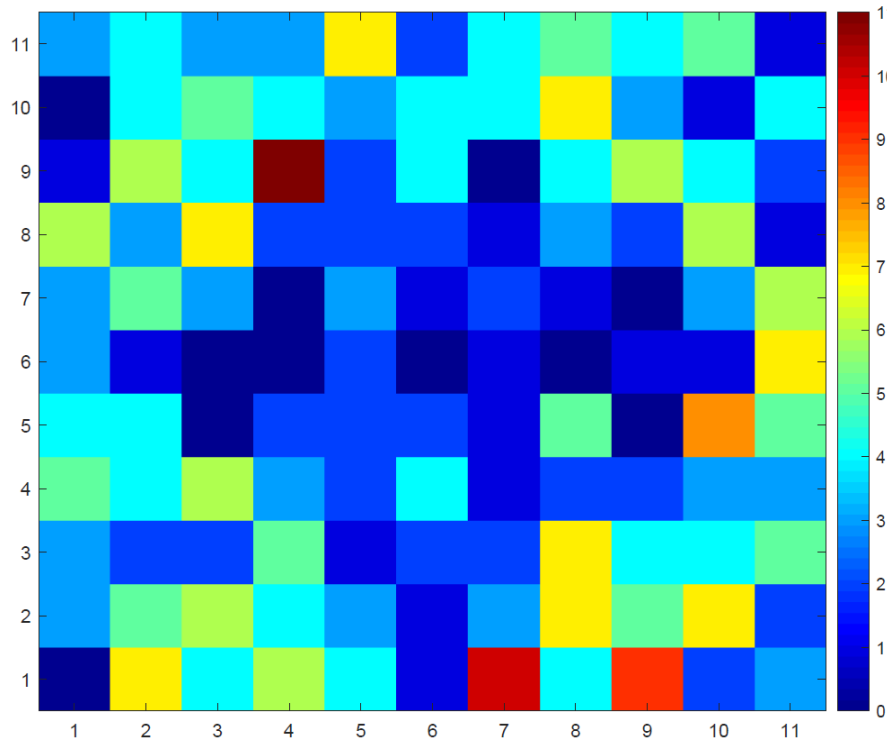
Daily spatial
distribution
of Parking

Travel cost sensitivity analysis

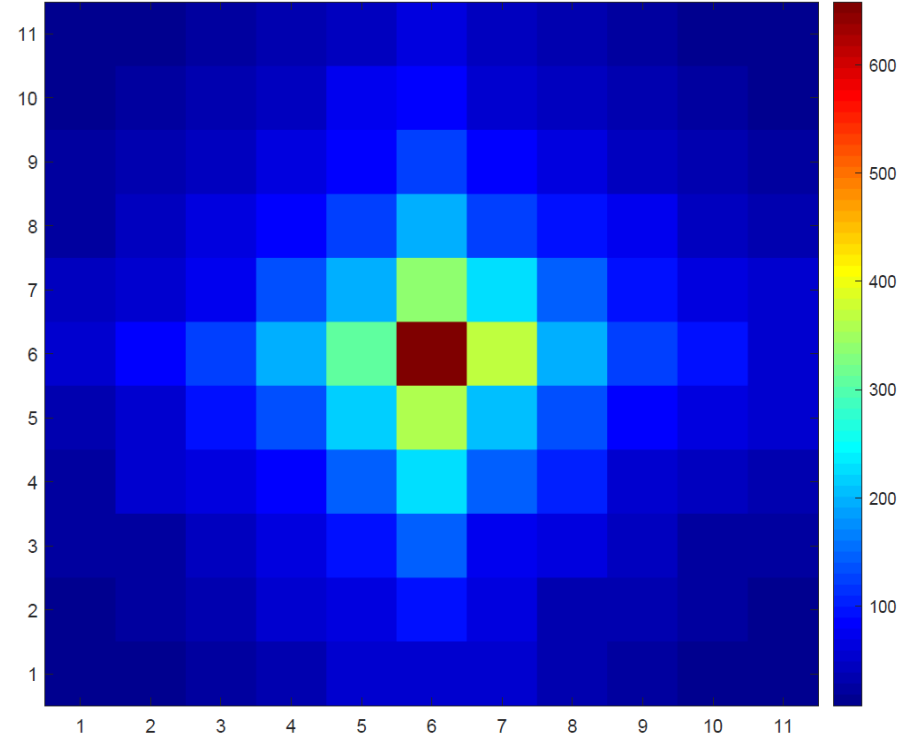


Daily spatial
distribution
of Parking

Parking location analysis – Center

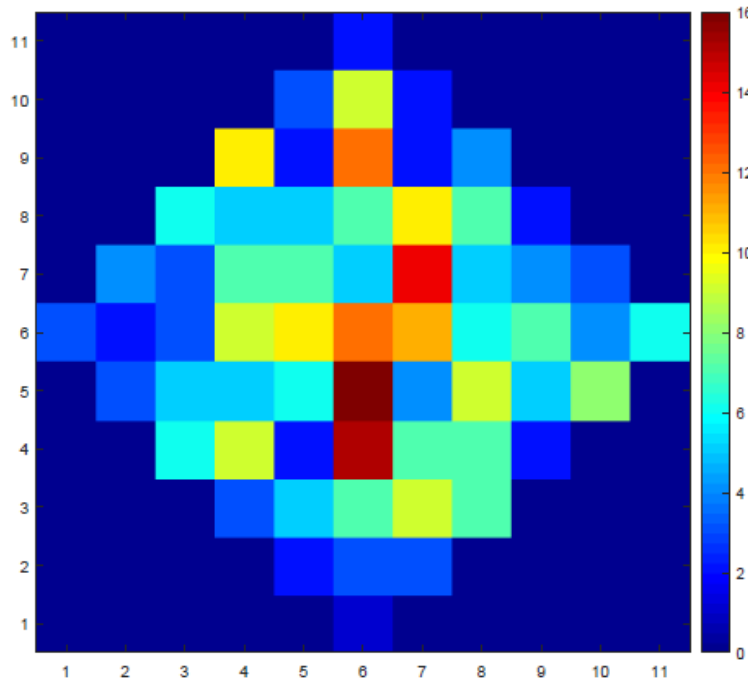


Daily spatial distribution
of cruising

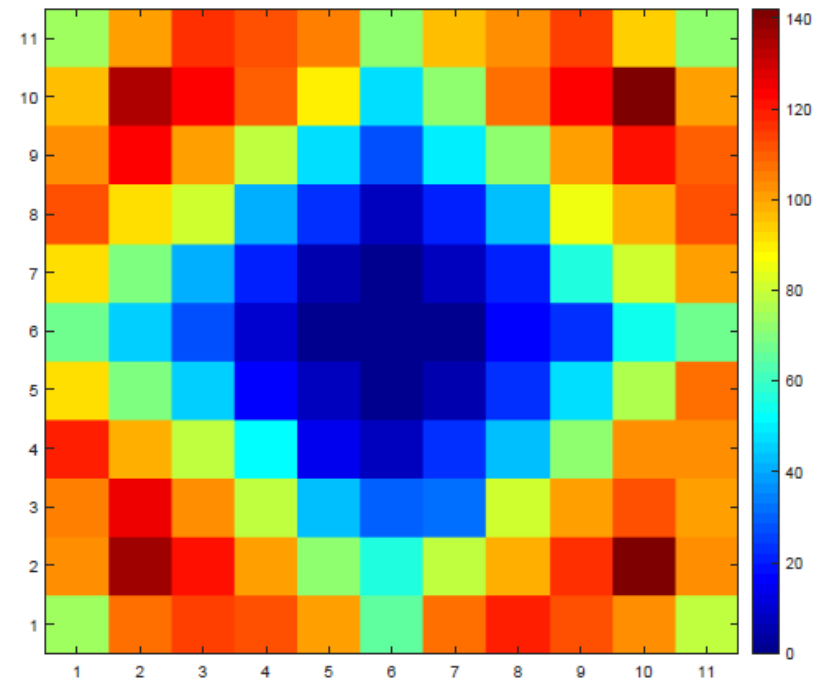


Daily spatial distribution
of Parking

Parking location analysis – 4 corners



Daily spatial distribution
of cruising



Daily spatial distribution
of Parking

Key findings

10 pm traffic flow snapshot



	No policy	Same parking price	Zero-occupant toll
Maximum cruising time	18 min	30 min	15 min
Average travel time to car-parks	12 min	10 min	11.5 min
Maximum travel time to car-parks	47 min	50 min	43 min
Change in VKT	-	+1 %	- 3.5 %

Thank You!

Sina Bahrami

Email: sina.bahrami@mail.utoronto.ca

LinkedIn: www.linkedin.com/in/bahrami-sina



UNIVERSITY OF TORONTO
FACULTY OF APPLIED SCIENCE & ENGINEERING
Transportation Research Institute

UTTRI