CENTER FOR ADVANCED TRANSPORTATION TECHNOLOGY

MARYLAND TRANSPORTATION INSTITUTE

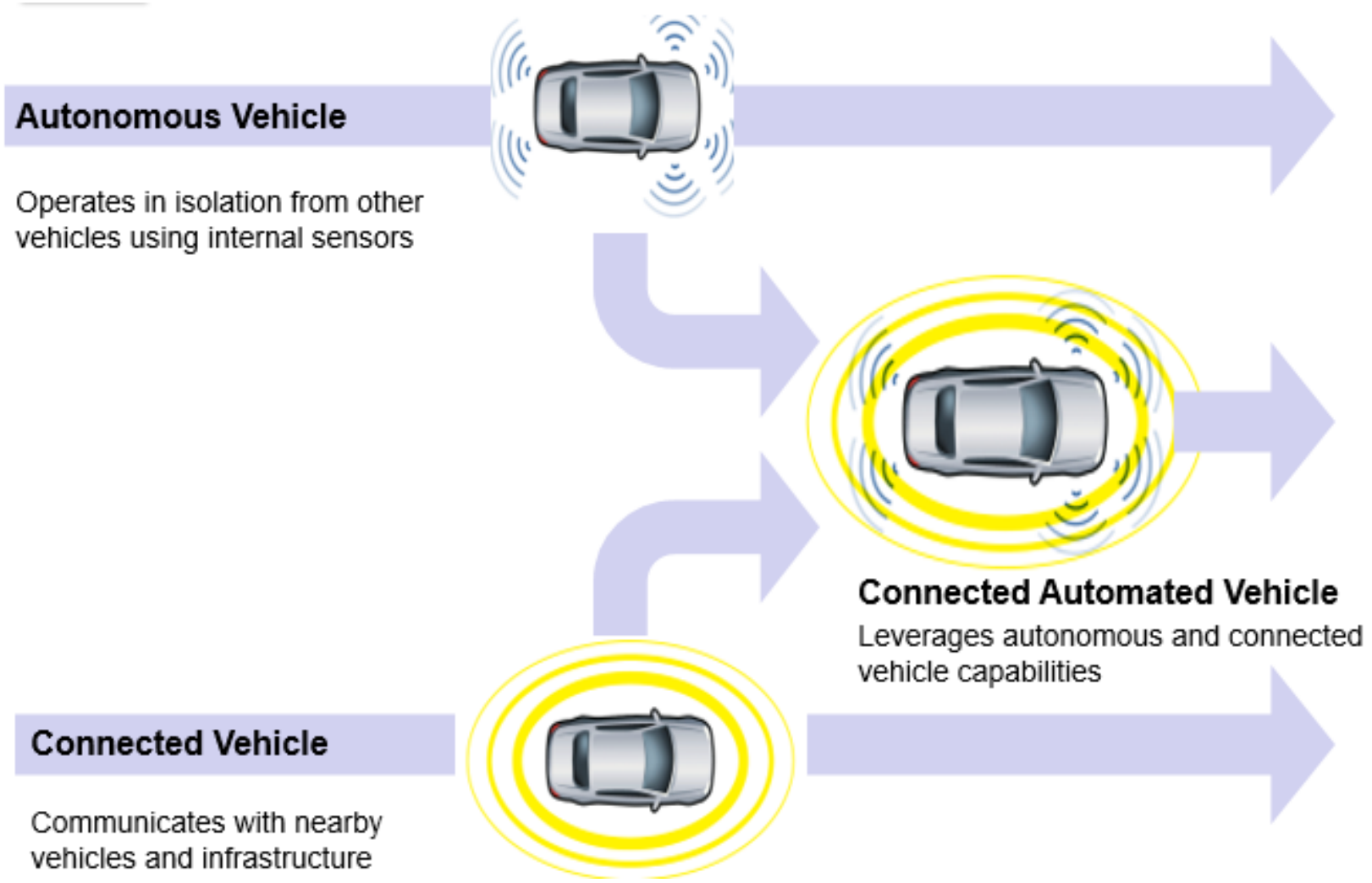
# UMD CATT Connected Autonomous Vehicle (CAV) Research

Smart Cities Symposium

September 2019

A. JAMES CLARK SCHOOL OF ENGINEERING

# Connected Automated Vehicles



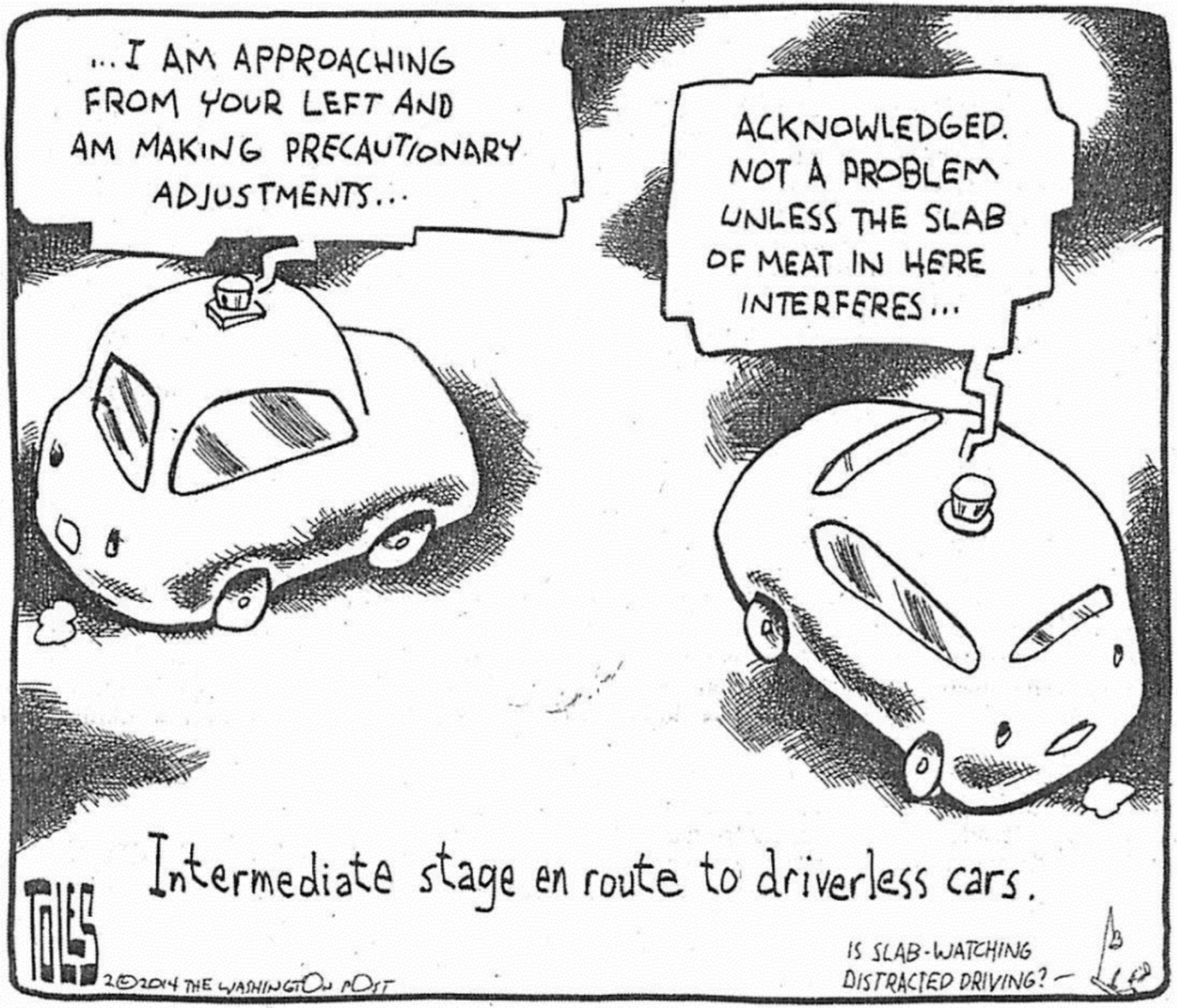
# SAE Levels of Automation

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE) AUTOMATION LEVELS

Full Automation

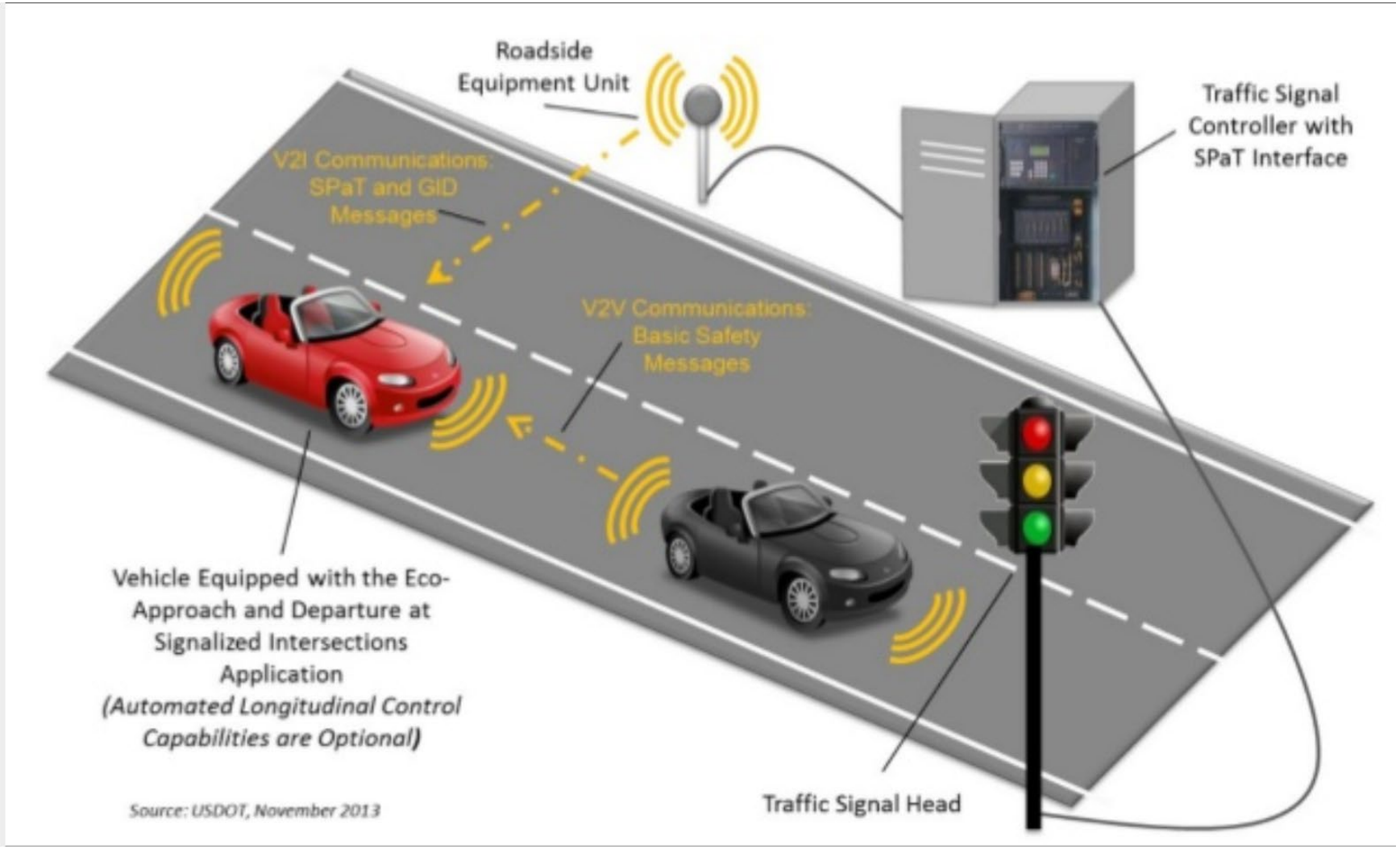
| 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| **No Automation** | **Driver Assistance** | **Partial Automation** | **Conditional Automation** | **High Automation** | **Full Automation** |
| Zero autonomy; the driver performs all driving tasks. | Vehicle is controlled by the driver, but some driving assist features may be included in the vehicle design. | Vehicle has combined automated functions, like acceleration and steering, but the driver must remain engaged with the driving task and monitor the environment at all times. | Driver is a necessity, but is not required to monitor the environment. The driver must be ready to take control of the vehicle at all times with notice. | The vehicle is capable of performing all driving functions under certain conditions. The driver may have the option to control the vehicle. | The vehicle is capable of performing all driving functions under all conditions. The driver may have the option to control the vehicle. |

*Source: https://www.nhtsa.gov/technology-innovation/automated-vehicles-safety*

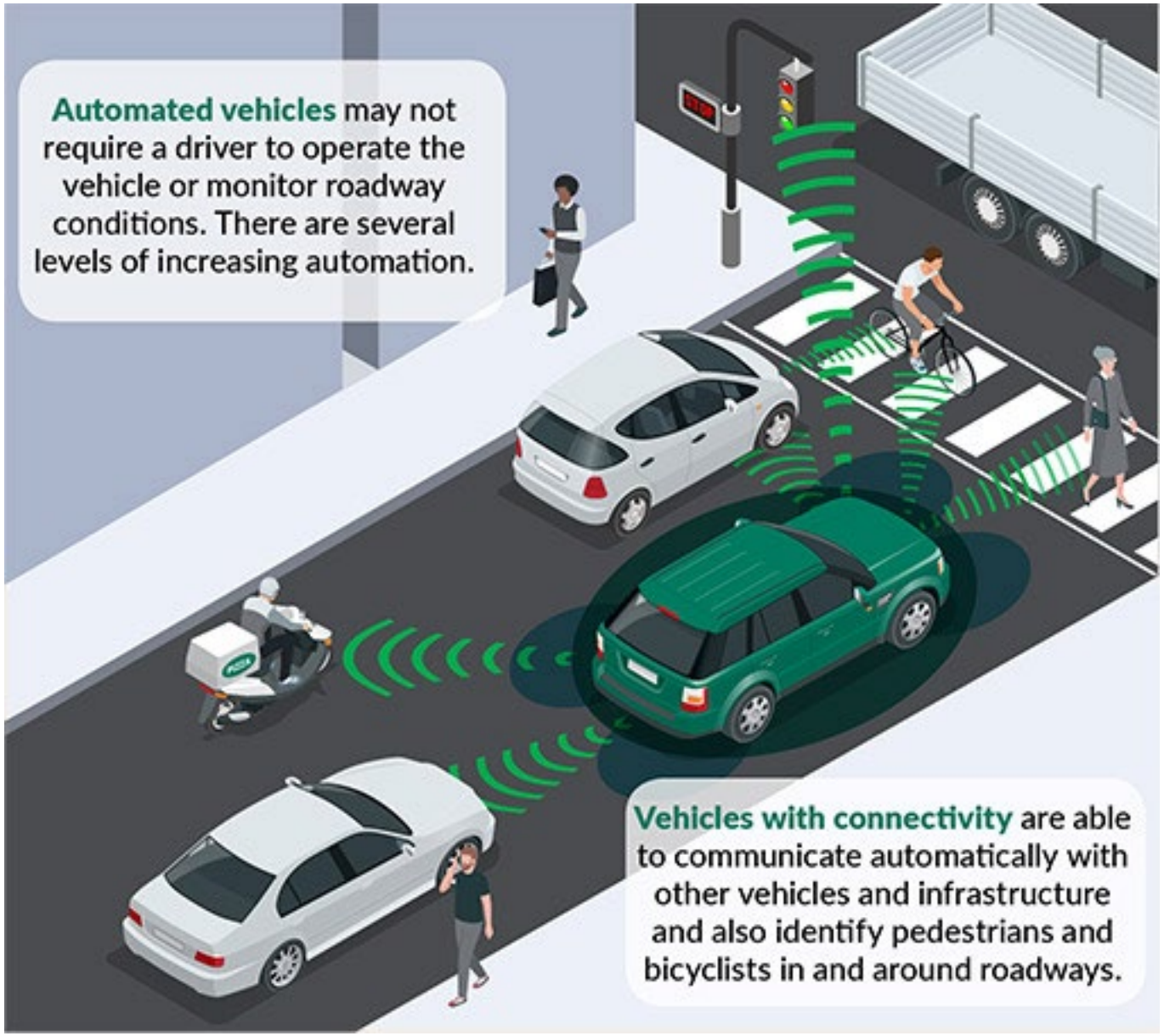

...I AM APPROACHING FROM YOUR LEFT AND AM MAKING PRECAUTIONARY ADJUSTMENTS...
ACKNOWLEDGED. NOT A PROBLEM UNLESS THE SLAB OF MEAT IN HERE INTERFERES...
Intermediate stage en route to driverless cars.
TOLES
©2014 THE WASHINGTON POST
IS SLAB-WATCHING DISTRACTED DRIVING?

# Arterial Use Case





# Arterial Use Case



# UMD CATT CAV Research Areas

Pedestrian/Bike/Other Detection

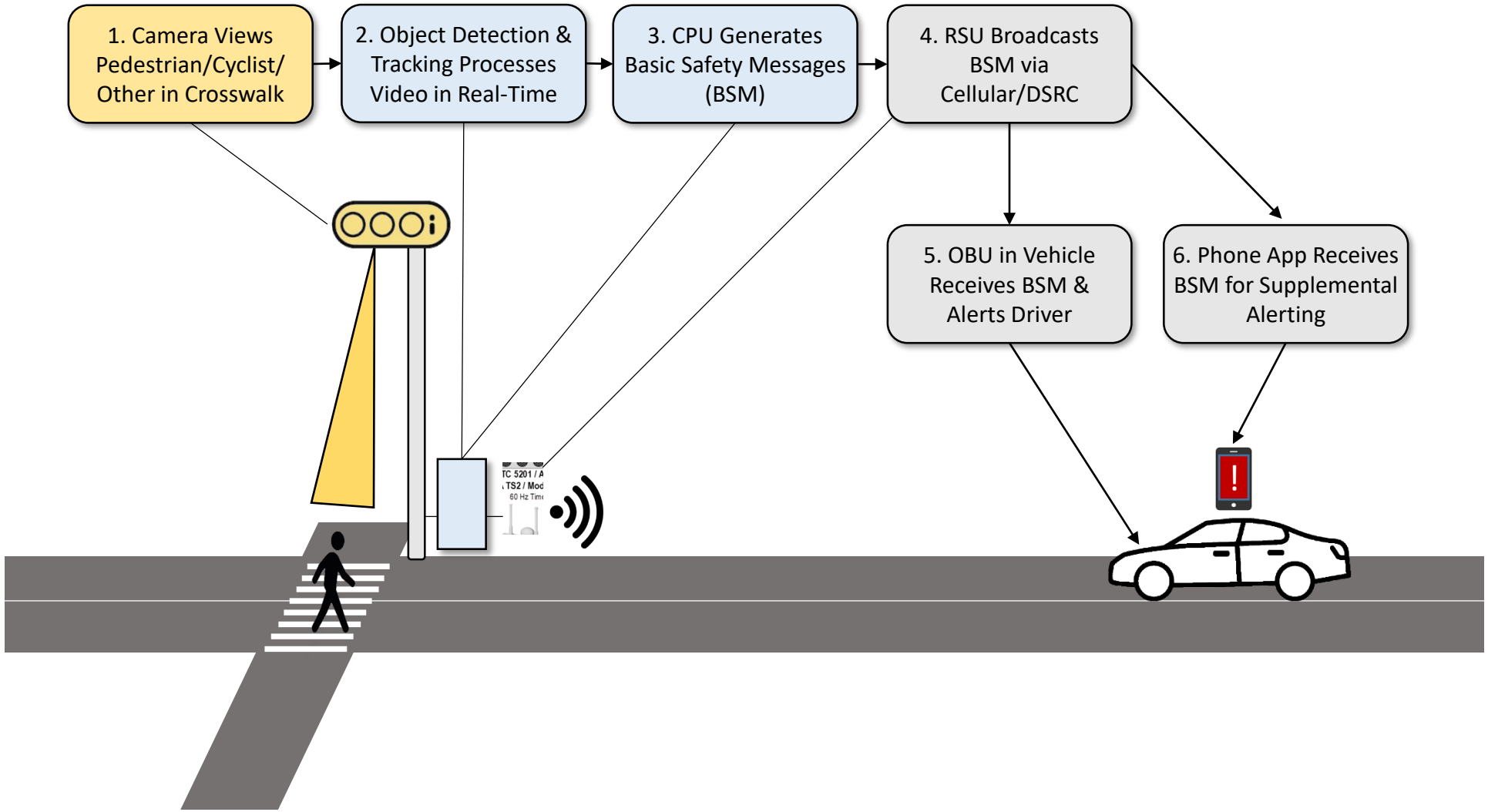
- Intersection Object Detection
- Intersection Object Tracking
- Work Zone Identification
- Dilemma Zone Identification
- DSRC/Cellular Safety Message (BSM/PSM) Transmission

Vehicle Operation Guidance

- DSRC/Cellular Safety Message (BSM/PSM) Receipt
- Work zone messaging (Speed, Merging, etc.)
- Variable speed limits

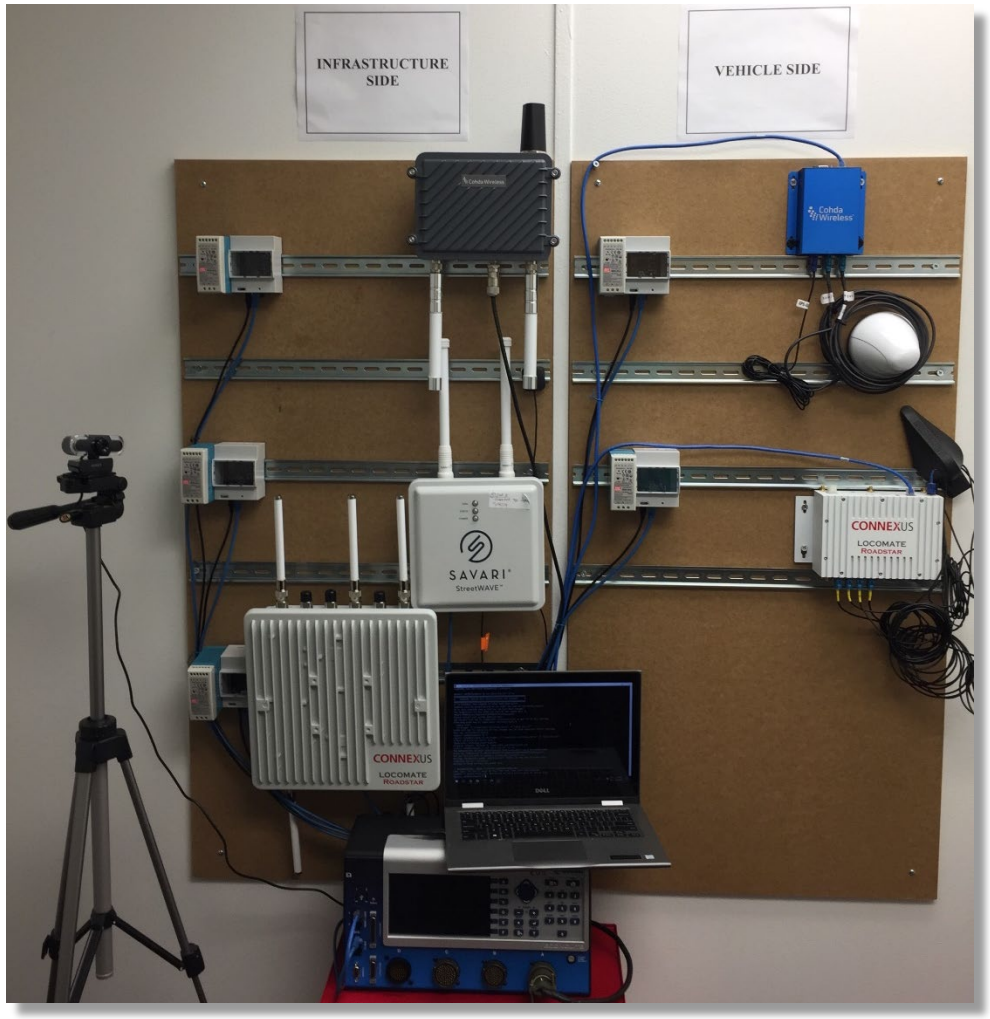
# Route 1 & Knox Road

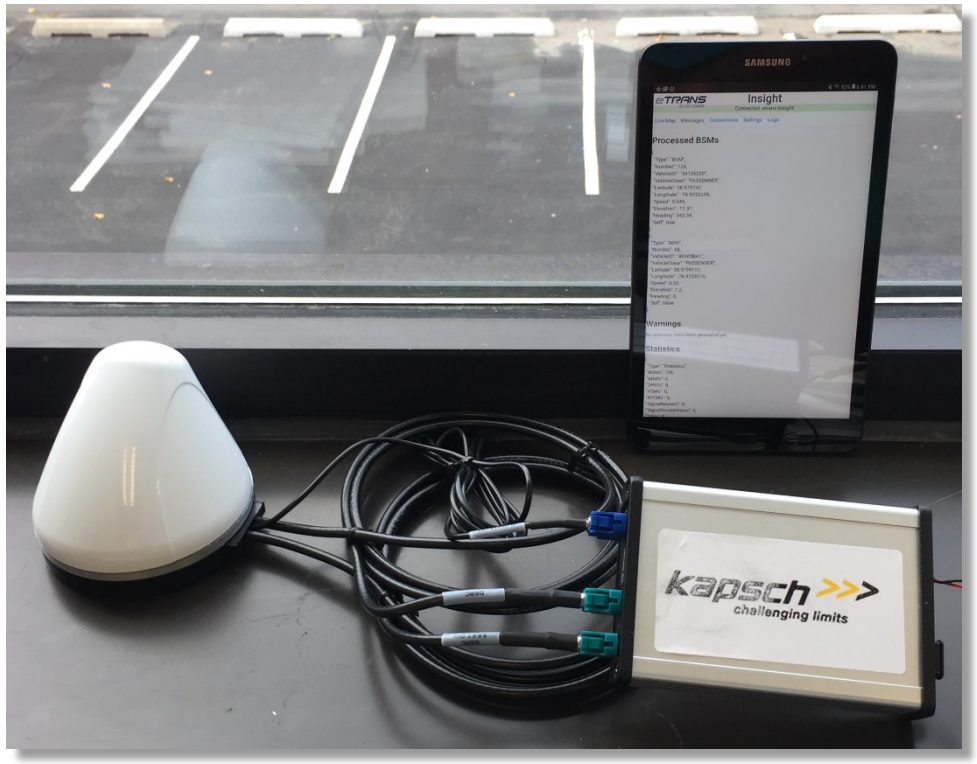
# *Object Detection & Tracking and BSM Alert Generation & Receipt*



# Lab

***RSU (infrastructure side) and OBUs (vehicle side)***
Camera, Comms, PC, etc., & Cobalt Controller (loaner)



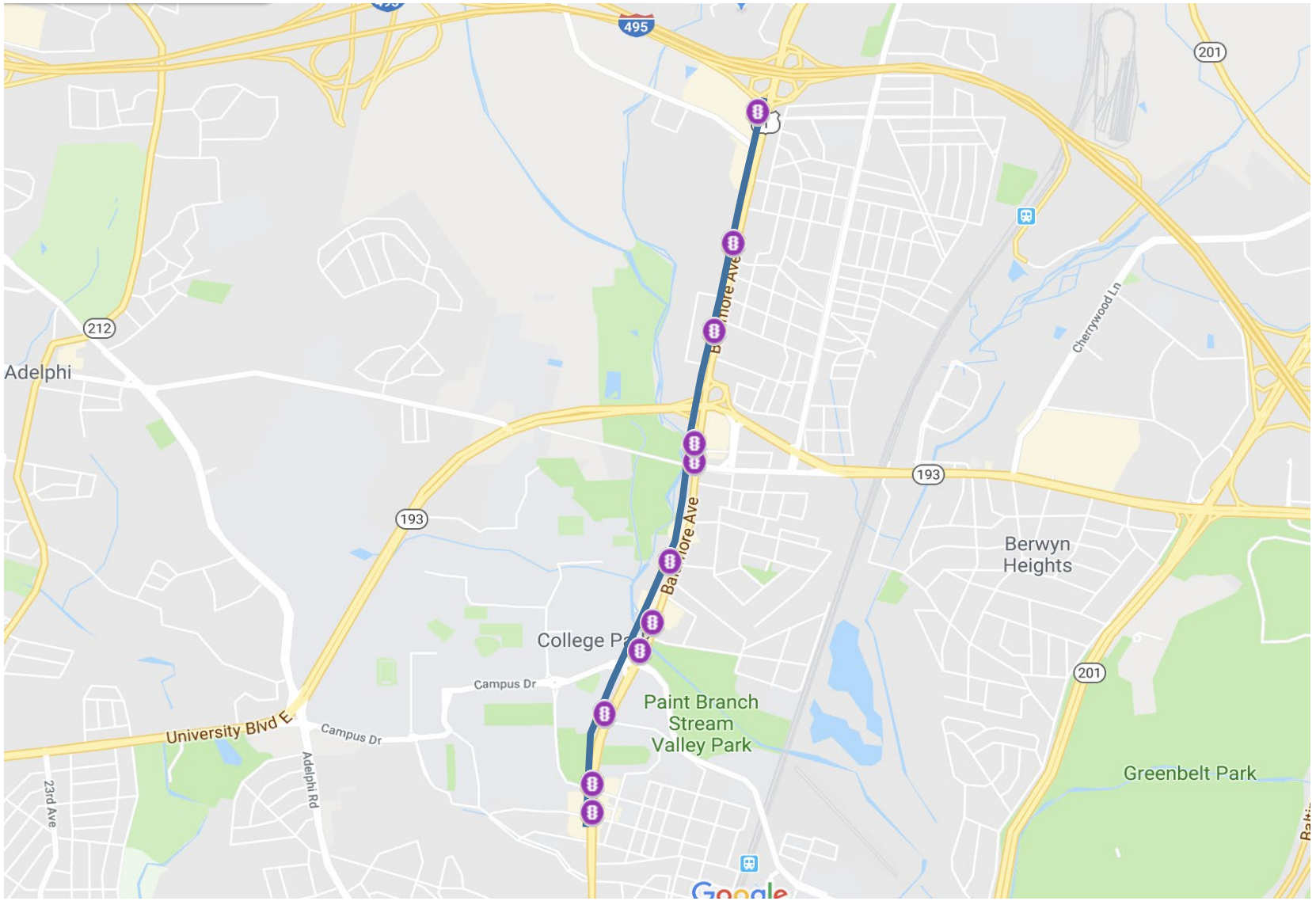




***Kapsch sniffer (Danlaw OBU + eTrans Insight app)***
Used to independently verify the type, content, and quality of messages that are being broadcast

# Current Work

- Continue Prototyping of Object/Pedestrian Detection Algorithms
- Continue Development of BSM/PSM Broadcast and Receipt Messaging, Including Leveraging DSRC & Cellular Technologies
- Prototype In-Vehicle and On-Infrastructure Alerting Solutions, Including Phone App Development
- Test Integration with Third-Party Commercial Technologies
- Coordinate Prototyping and Testing with State and Local Jurisdictions on and Around UMD College Park Campus – Includes Access to Control Signal Cabinet (Cobalt Preferred) & Iteris Camera Mount

# Possible Smart Cities Route 1 Demo Corridor



# Why a Demo Corridor?

I-STREET

TRANSPORTATION INSTITUTE
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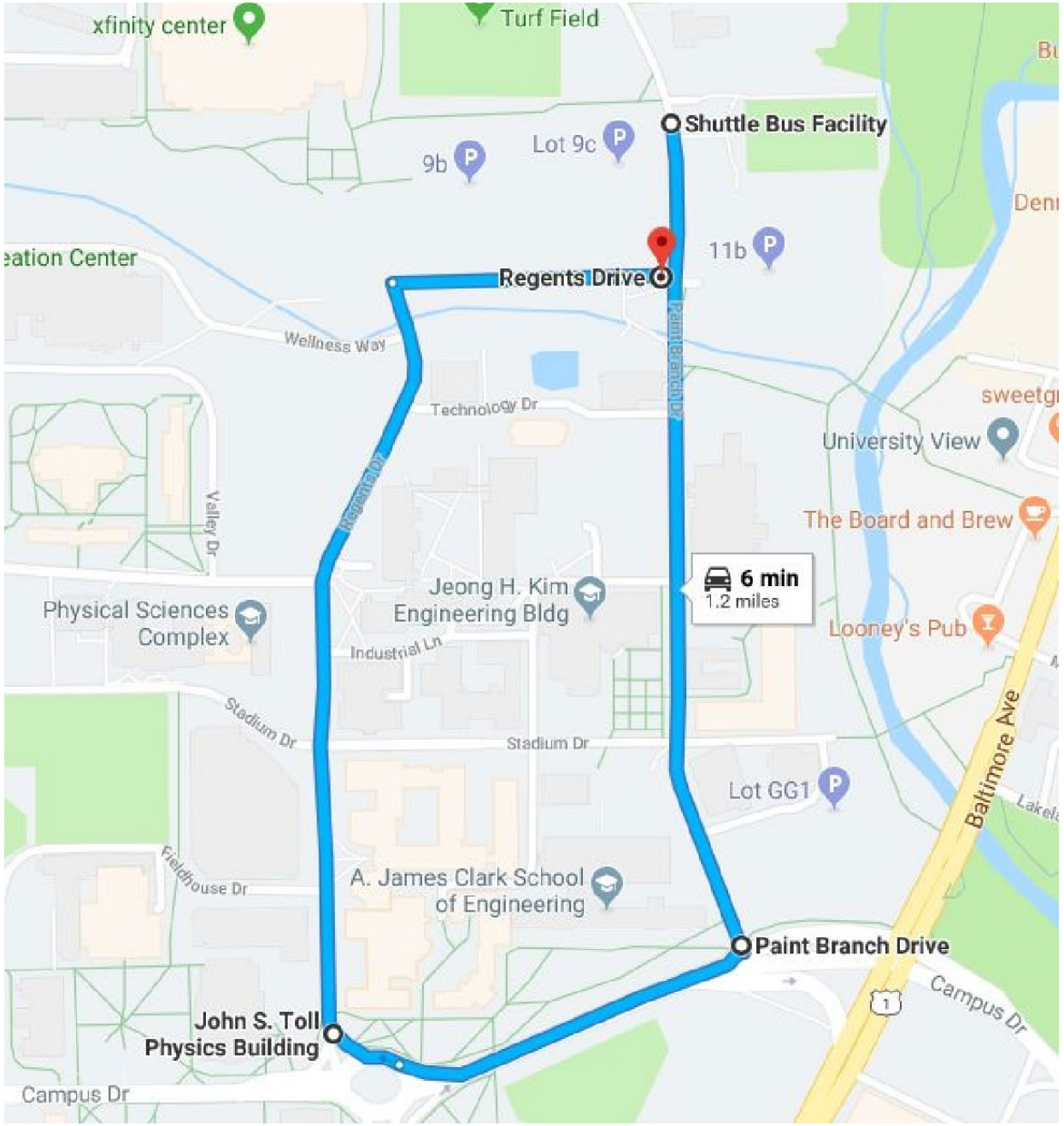
The main goals of the testbed are to:

- Facilitate the development and implementation of advanced technologies
- Foster collaboration with industry wishing to test and further enhance their own technologies
- Improve mobility and safety on campus and around Gainesville
- Quantify the minimum criteria for operators to safely engage with automated vehicles
- To become a model nationally and internationally for the use of advanced technologies to enhance transportation.

# Other related CAV Pilot - Olli

- Level 4 Automated Transit Vehicle
- Local Motors (MD Company in National Harbor)
- 3 month pilot funded by Clark School & MTI
- Currently negotiating agreement


xfinity center
Turf Field
Shuttle Bus Facility
9b
Lot 9c
11b
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Regents Drive
Wellness Way
Technology Dr
Paint Branch Dr
University View
sweetgr
The Board and Brew
Valley Dr
Regents Dr
6 min
1.2 miles
Jeong H. Kim
Engineering Bldg
Physical Sciences
Complex
Industrial Ln
Looney's Pub
Stadium Dr
Stadium Dr
Lot GG1
Baltimore Ave
Fieldhouse Dr
A. James Clark School
of Engineering
Paint Branch Drive
John S. Toll
Physics Building
Campus Dr
Campus Dr
1

# Questions?