

# Data Analytics - Measuring Habit Variations to Identify Drivers

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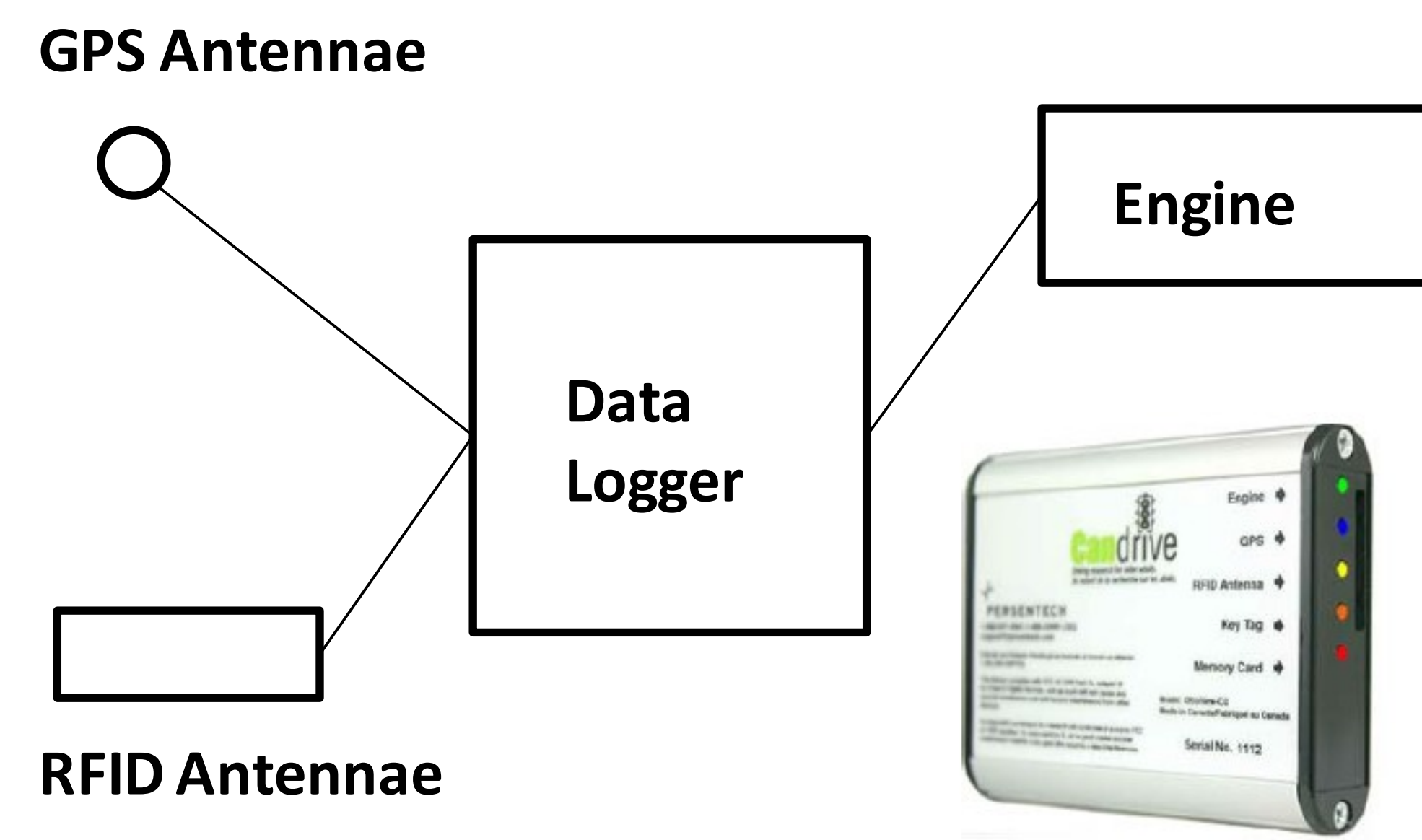
Canada's Capital University

## Objective and Background

- Chronic illness is increasing and impacts driving.
- Clinicians must report driving concerns
- No agreed standardized tests for driving risk.
- In-car "black box" data provides new data source
- Vehicles are typically shared by multiple drivers
- This project explores the identification of a driving signature to distinguish between drivers and to provide a foundation for future analysis of driving signature change as a predictive tool of driving ability.

## Methodology

- Collaboration with Candrive project at OHRI:
  - Candrive is in the 5th year of collecting GPS and Engine Computer data
- Analyze for attributes that distinguish drivers
  - Trip measures: Time of day, Distance, Duration
  - Driver Choices: Road types (city, highway)
  - Driving Habits: Velocity, Acceleration, Throttle use, Speeding
- Techniques and goal
  - Use signal processing and data analysis
  - Identify features that distinguish drivers
  - Build towards a driving signature tool



Block diagram of the data collection architecture along with an image of the Persentech OttoView-CD data collection device.

## The Data Set

- Over 1000 drivers enrolled in program in Canada, Australia and New Zealand.
- For Ottawa drivers – now collecting the 5<sup>th</sup> year data. On average ~1000 hours of driving collected for each enrolled vehicle
- Global data set ~1TB**

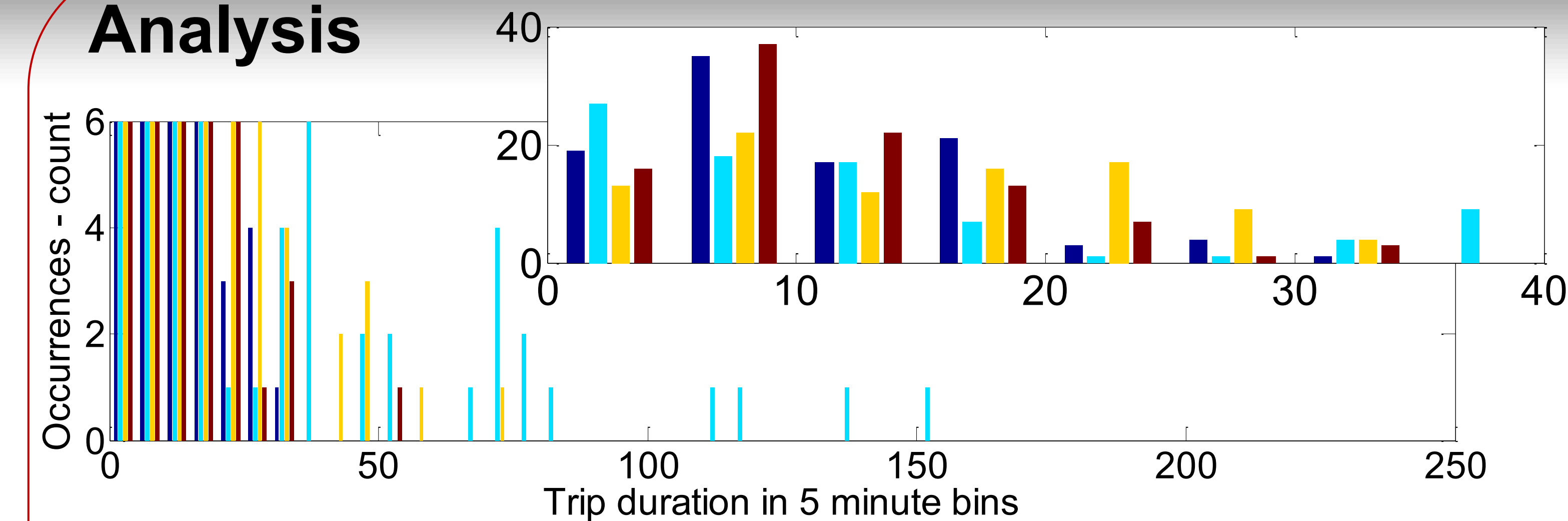
Number of participants	256
Participant age at entry	
Mean	76.3
Std Deviation	4.5
Range	70 - 92
70-74	106
75-79	90
80-84	47
85-89	12
90+	1
Gender	
F	36%
M	64%

Summary demographic information for the Ottawa Candrive participants at entry to the project.

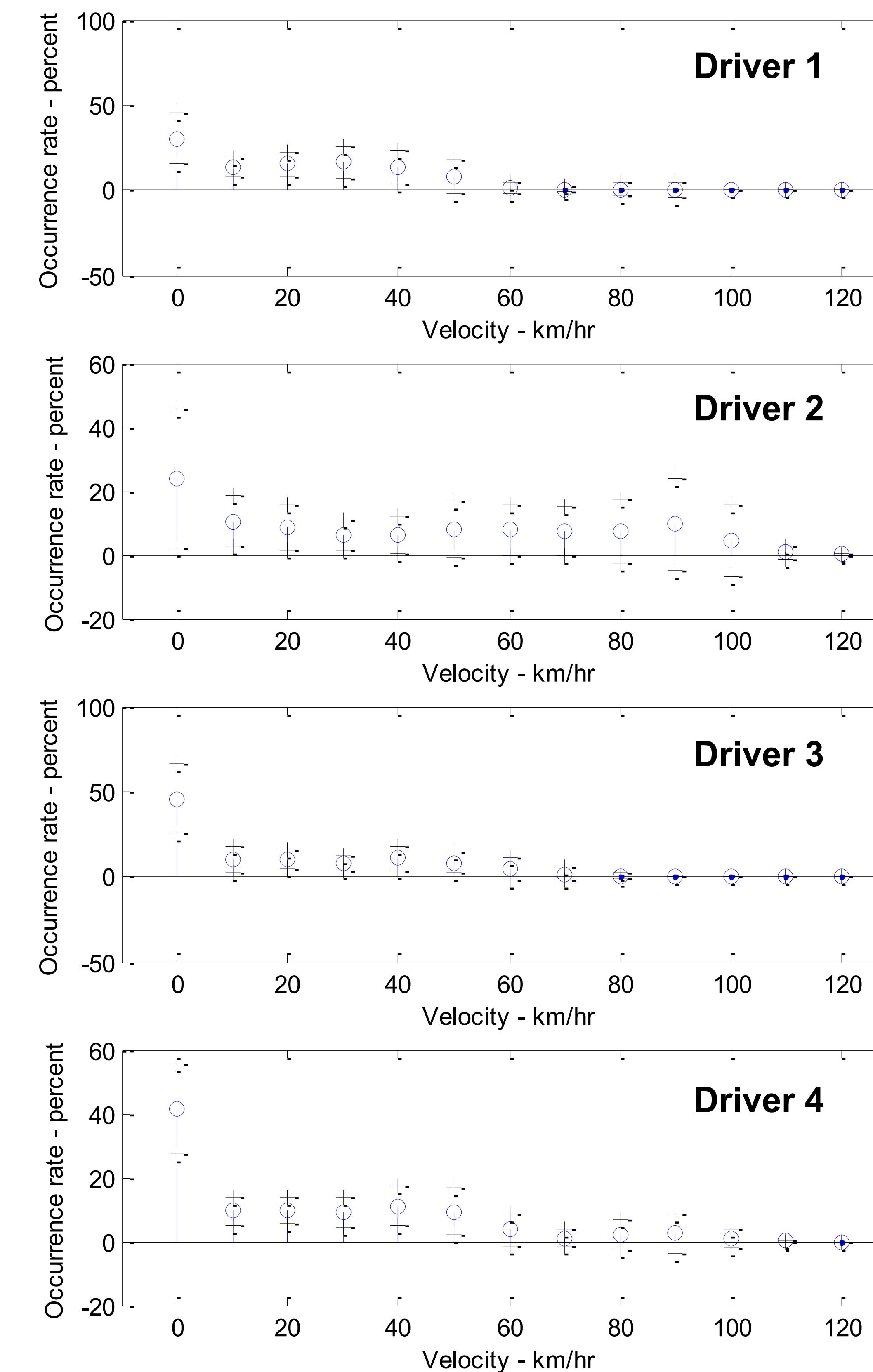
Parameter	Measure Value	Sensor
Time	Date/time (second)	GPS
Location	Latitude/Longitude Fix accuracy	GPS
Velocity	km/hr	GPS
Speed Limit	km/hr	GPS/GIS mapping
Alerts	text (e.g., school zone)	GPS
Trip Data	Trip counter RFID tag #	OBDII recorder
Engine data	Engine RPM Absolute throttle position	OBDII recorder
Speed	Vehicle speed sensor (dashboard)	OBDII recorder

Information captured by Candrive sensor system. All data captured at a 1Hz sampling rate.

## Analysis



Histogram of trip durations for the 100 trips for each of the participants shown on two different scales. Driver 1 - dark blue, 2 - light blue, 3 - yellow, 4 - red.



Histogram showing the velocity habits for each of the drivers for the GPS report velocity showing mean value for 10km/hr hour wide bins + shows one standard deviation.

Road Type	Driver 1	Driver 2	Driver 3	Driver 4
city	99.2	71.6	95.5	86.4
highway	0.8	28.4	4.5	13.6

Summary information for 100 trips for each of 4 drivers showing percent of time each driver traveled on each road choice based on posted limit where posted limit known

	Driver 1	Driver 2	Driver 3	Driver 4
<b>Trip length (km)</b>				
Mean	5.21	26.24	6.44	5.48
Std Dev	5.07	41.76	6.23	4.73
Min	0.50	0.35	0.02	0.02
Max	27.33	207.87	29.31	24.85
<b>Trip duration (minutes)</b>				
Mean	11.00	23.67	16.12	11.39
Std Dev	6.50	30.11	12.10	8.04
Min	3.62	2.10	3.43	2.02
Max	32.12	154.38	73.87	52.97

Summary information for 100 trips for each of 4 drivers showing trip statistics for travel distance and time.

## Results

- Preliminary results show how the various analysis techniques create features that distinguish the differing driving habits and tendencies of drivers.
- Specifically the analysis shows differentiation potential of:
  - road choice (highway avoidance)
  - time of day of travel (night/high traffic times)
  - velocity and acceleration (driver habits)
  - velocity/posted limits (speed limit compliance)

## Acknowledgements

Natural Sciences and Engineering Research Council (NSERC) and industrial and government partners, through the Healthcare Support through Information Technology Enhancements (hSITE) Strategic Research Network. Candrive prospective study ([www.candrive.ca](http://www.candrive.ca)) funded by the Canadian Institutes of Health Research (CIHR) Bruyère Academic Medical Organization (Innovation Funding).