# Passive Data Collection and Its Application to Tour-based Modeling

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# Outline

1. **Background**

    - Literature Review and the Region of Waterloo's LRT project

2. **Application Example**

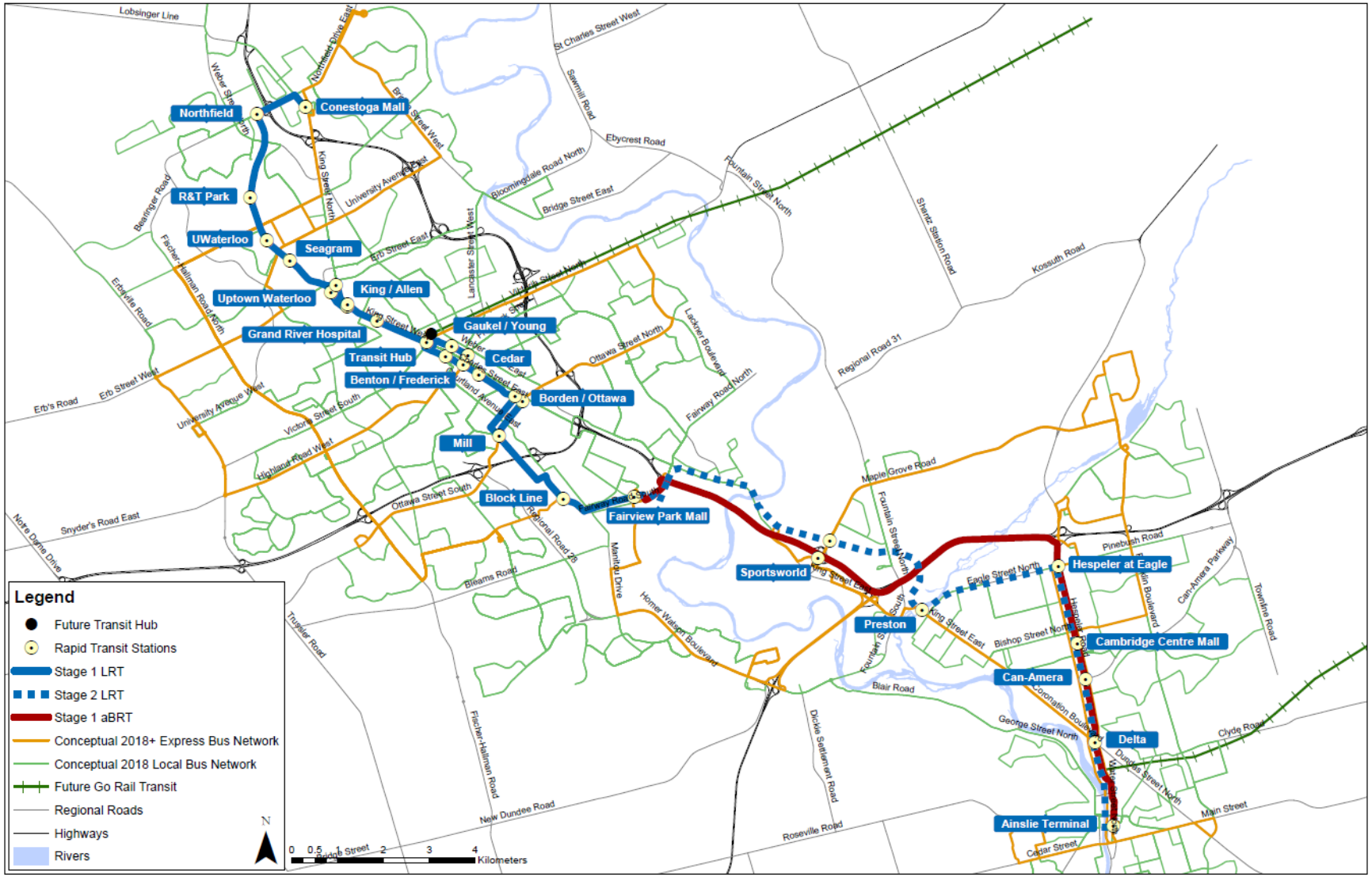
    -Assessment of GPS and Self-reported Data in the City of Edmonton

3. **Current Work**

    **-**Passive data collection in the Region of Waterloo

4. **Future Work**

# Background: LRT in the Region of Waterloo



# Background: Literature Review

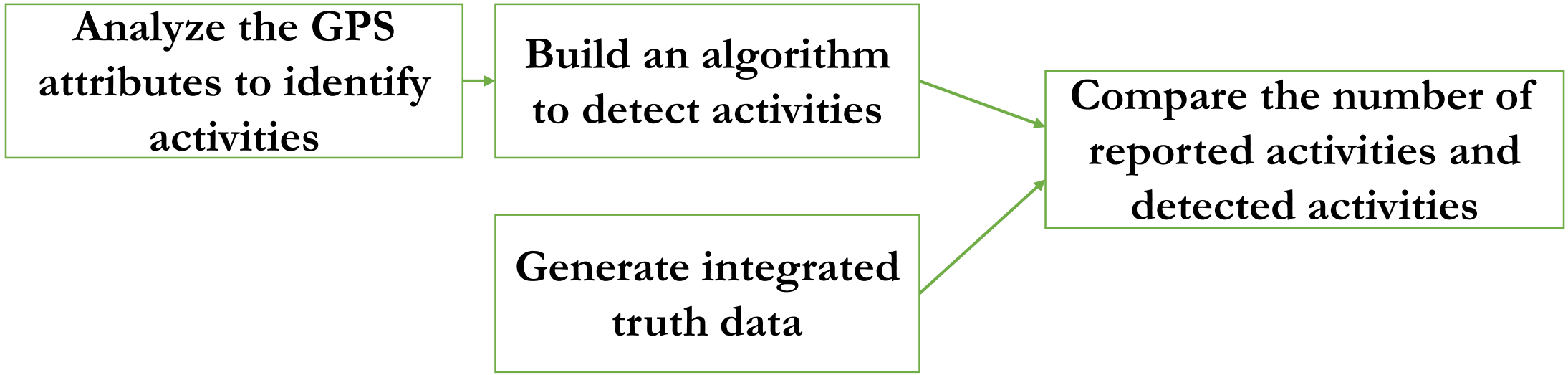
- **Urban sprawl and its impacts** (Ewing, 2008)
- **Benefits of urban core area with high density and high diversity** (Talen, & Koschinsky, 2014; Cervero, & Kockelman, 1997)
- **Approaches to measuring sprawl** (Malpezzi, 1999; Galster et al., 2000)
- **Tour-based activity model as a transportation modeling approach** (Gunn, van der Hoorn, & Daly, 1987)
- **Importance of the new data collection methods for tour-based modeling** (Casello & Usyukov, 2014; Nour, Hellinga, Casello, 2016; )

# Background: iCity-ORF: First Annual Presentation

- **Transportation Data Collection**
  - Traditional survey-based methods
  - New passive methods exit for multiple modes (video and loop detection, AVL/APC data, WiFi and Bluetooth detection, smartphone app)
- **Smartphone App**
  - Collected Data (GPS coordinate, bearing, speed, acceleration, battery, network info)
  - Characteristics (iOS, Android, battery efficient, minimum interaction from users)

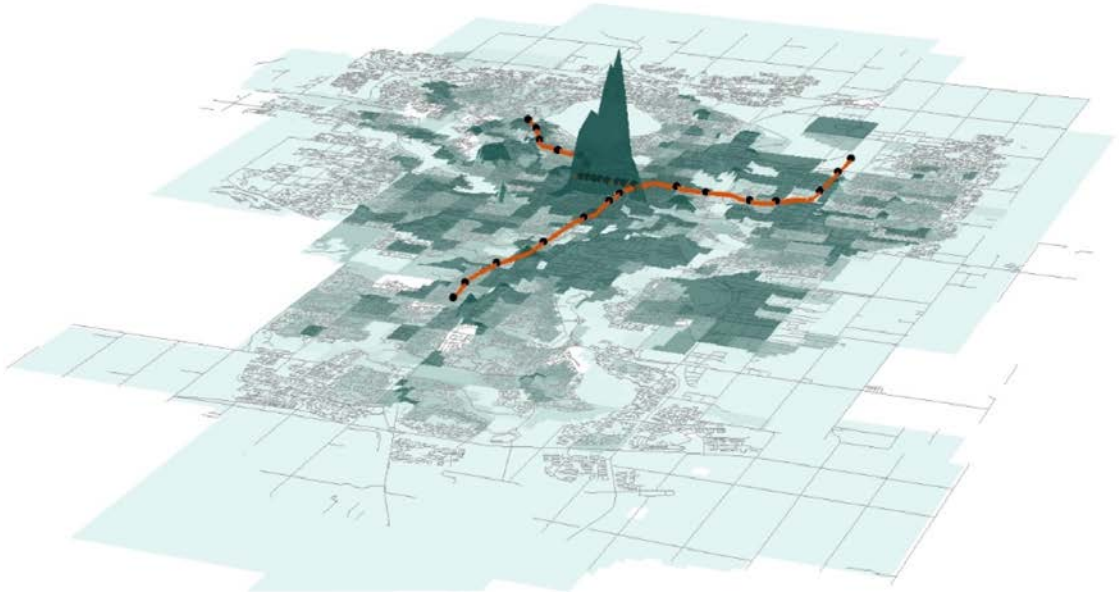
# Application Example: Assessment of Travel Data in the City of Edmonton

**Can GPS data collected by smartphone be an effective supplement to traditional travel survey?**

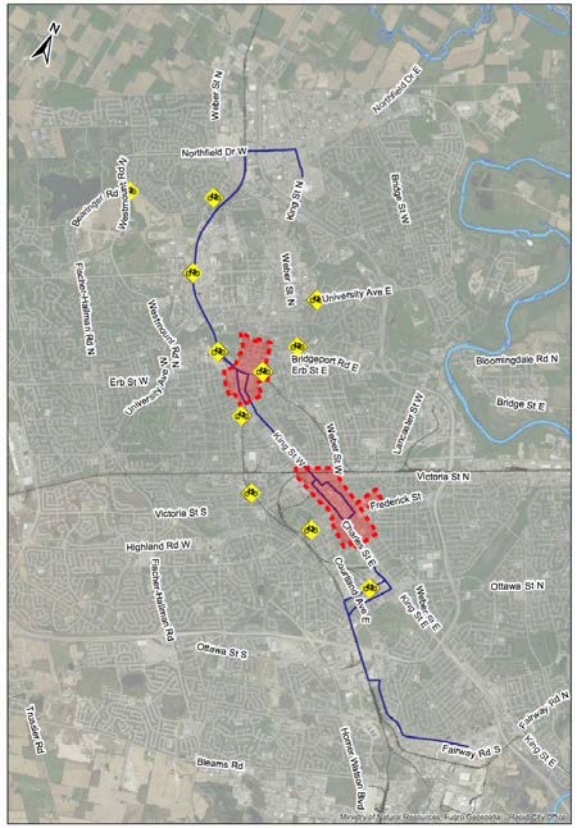


# Current Work: Goals

## Urban core intensification



## Building vibrant urban places

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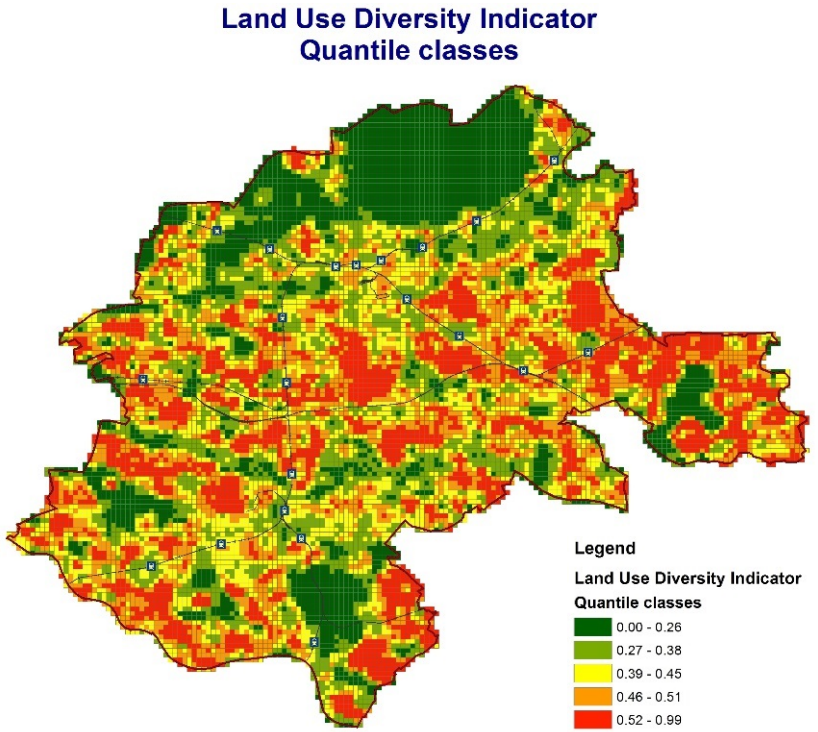
# Current Work: Measurement of Land Use Diversity

**Measuring spatial indicators of land use diversity:**

- Entropy index
- Land use mix index

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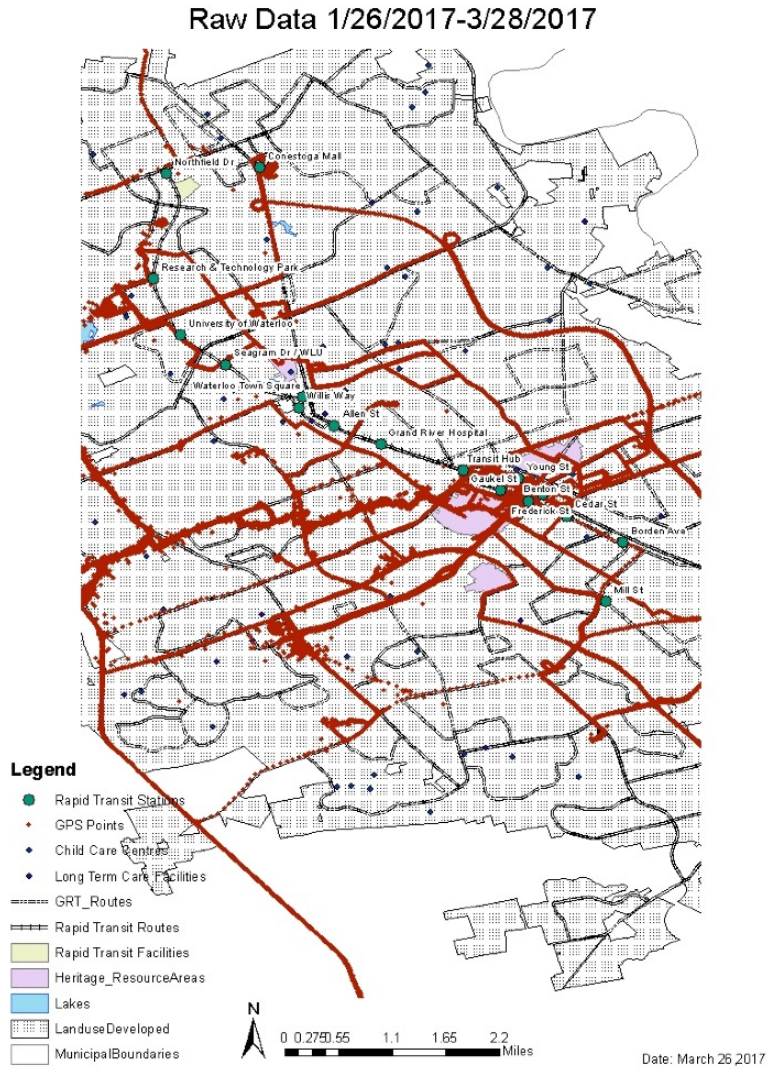
# Current Work: Passive Data Collection in the Core Area

- **Passive Data Collection – Smartphone collected GPS data**
  - Access mode from origin to activity center
  - Duration of pedestrian tour in study area
  - Distance traveled for pedestrian tour
  - Number of activities completed on tour

- **Web-based Demography Survey**
  - Demographics /household composition of participants

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# Future Work: Data Analysis

- LRT operation: January 2018
- 12 months data collection after the introduction of LRT
- Record pedestrian tours as a function of access mode + attraction locations + land use

# References


Casello, J., & Usyukov, V. (2014). Modeling Cyclists Route Choice Based on GPS Data. Transportation Research Record: Journal of the Transportation Research Board,2430, 155-161. doi:10.3141/2430-16

Cervero, R., & Kockelman, K. (1997). Travel demand and the 3Ds: Density, diversity, and design. Transportation Research Part D: Transport and Environment,2(3), 199-219. doi:10.1016/s1361-9209(97)00009-6

Ewing, R., Schmid, T., Killingsworth, R., Zlot, A., & Raudenbush, S. (n.d.). Relationship Between Urban Sprawl and Physical Activity, Obesity, and Morbidity. Urban Ecology, 567-582. doi:10.1007/978-0-387-73412-5_37

Galster, G., R. Hanson, H. Wolman, S. Coleman, and J. Freihage. 2000. Wrestlng sprawl to the ground: defining and measuring an elusive concept. Fannie Mae Foundation, Washington DC. URL=www.fanniemaefoundation.org/research/Galster.pdf.

Gunn, H. F., van der Hoorn, A. I. J. M., and Daly, A. J. (1987) Long range country-wide travel demand forecasts from models of individual choice, Proceedings of the 5th International Conference on Travel Behaviour, Aix-en Provence, France.

Malpezzi, S. 1999 Estimates of the measurement and determinants of Urban Sprawl in US Metropolitan Areas. Center for Urban Land Economics, University of Wisconsin, Madison WI. URL1= http://wiscinfo.doit.wisc.edu/realestate/pdf/9906a.pdf.

Nour, A., Hellinga, B., & Casello, J. (2016). Classification of automobile and transit trips from Smartphone data: Enhancing accuracy using spatial statistics and GIS. Journal of Transport Geography,51, 36-44. doi:10.1016/j.jtrangeo.2015.11.005

Talen, E., & Koschinsky, J. (2014). Compact, Walkable, Diverse Neighborhoods: Assessing Effects on Residents. Housing Policy Debate, 24(4), 717–750. https://doi.org/10.1080/10511482.2014.900102

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