# Trip Purpose Classification:

*Summary of research:*

A study looking into the predictability of trip purpose from anonymous labelled GPS data. Trip purpose inference can offer insight into the motivation behind *why* people move around a city and provides those who plan transport a better understanding of how to account for fluctuations of transport demand at a given time and location. This study will evaluate the importance of a spatial and temporal consideration when trying to improve classification results by discussing uncertainty found both spatially and temporally in the model’s error terms.

***Key Words:*** *Travel purpose classification, Mobility, Random Forest, Spatial and Temporal Error, Volunteered Geographic Information.*

## Structure of Research:

*Guidelines from Transport Research part C:*

1. Introduction
   * 1. State the objectives of research
     2. Provide adequate literature review not too extensive
2. Literature review
   * 1. Extend the literature review in the introduction
     2. Lay the foundation for further work
3. Methodology
   * 1. Provide detail allowing research to be reproduced
4. Results
   * 1. Should be clear and concise
5. Discussion
   * 1. Explore the significance of the results
     2. Do not repeat results, perhaps even combine with results
     3. Avoid extensive citations
6. Conclusions
   * 1. Conclusions of the study, short and concise
     2. Can be combined as a sub-section of discussion
7. Appendices:
   * 1. If more than one appendix, then use A, B, C
     2. A.1 refers to a figure; Table A.1 a table, in appendix A

*Main components of each section of the actual report:*

1. Introduction
2. Literature review
   * 1. Trip purpose classification review
     2. Table comparison of predictor variables and accuracy used in research (extension of Ermugan *et al.*, 2017 with new perspective on modelling)
     3. VGI & its uses in mobility research
     4. Spatial & temporal evaluation of error terms OR space & time in transport research
3. Data
   * 1. Data source and description
4. Methodology
   * 1. Data preparation & extraction
     2. Model specification
     3. Table with all variables used
5. Results
   * 1. RF model
     2. Spatial signatures of the model error terms
     3. Temporal signatures of the model error terms
6. Discussion
   * 1. Review results
7. Conclusions & further research
   * 1. Applications of research
     2. Brief conclusions from research
8. Appendices:
   * 1. If more than one appendix, then use A, B, C
     2. A.1 refers to a figure; Table A.1 a table, in appendix A

## Key Ideas:

*Why trip purpose?*

* Provides a valuable piece of information about transport that is currently not widely utilised in transport research
* The insight into which activities occur on which times and locations may have some structure which can be studied.
* Relating to smart cities theory: can be used to better manage how people use resources and where within urban areas

*Why anonymous data?:*

* One pathway of future trip purpose research is towards collating large amount of anonymous data which can be made available online. Data which can support theory around our understanding of transport/population mobility in a city.

*Key research topics unique to this study:*

- Away from an a-spatial model evaluation and towards spatial and temporal (see below)

- Reduction of data down to spatial or temporal sub-sections e.g. down town v.s out-skirts or morning vs midday vs ...

- Evaluation of data imputation using a SMOTE (NC) oversampling technique

- No personal information about respondents is used as the data contains only purpose & mode labels with a GPS trace -> this form of anonymous data is less sensitive therefore could be repeated

*Away from an a-spatial model evaluation and towards spatial and temporal:*

- Often trip purpose research focuses on the a-spatial breakdown of classification statistics, but we look to a spatial and temporal analysis of error terms. This will show us where the model fails across the city and can form the foundations of a discussion into what this means for past and future research.

## Requirements:

*What Transport Research part C wants:*

From the guideline: “The interest is not in the individual technologies or methodologies per se, but in their ultimate implications for the planning, design, operation, control, management, maintenance and rehabilitation of transportation systems, services and components”.

*TR part C requirements:*

- Subdivision - numbered sections

- Highlights (4-5 85-character bullet points of research findings)

- Abstract can be visual or text

- maximum 6 key words

- use DOI

- for data see: <https://www.elsevier.com/authors/author-resources/research-data/data-base-linking>

## Limitations of this research:

*Data limitations:*

* Is it representative of the whole city of Montreal?
* VGI is problematic (even talked about by the curators of the data)

*Methodological limitations:*

* Ecological Fallacy, MAUP, MTUP, Change of support problem