



Yuxiang Zhao

# Ground Mobility: Travel Mode Analytics

## *Main Research Goals*

Introduction

Background  
& Motivation

Methodology

Case Study

Concluding  
Remarks

Understand disadvantages of each transportation mode and whether they have an impact on future transportation trends

Perform spatial clustering to analyze where are the potential locations of vertiports



Yuxiang Zhao

# Ground Mobility: Travel Mode Analytics

Introduction



Background & Motivation

## Activity Based Model [ABM]

Activity-Based Models predict where and when people go, and for how long, based on a on people's daily activity patterns. These models are used in travel demand management (TDM) work.



DataSource: **ARC\_Activity-Based Modeling\_tripdata**

ARC Model Traffic Analysis Zones 2020. Shapefile  
Atlanta Census Tract. Shapefile

Methodology

Case Study

Concluding Remarks

Table 70: CT-RAMP Trips Data Output File Fields

Field	Description
hh_id	Unique HH ID
person_id	Unique Person ID
person_num	Person number within household
tour_id	Non-unique tour ID given person_id and tour_category
stop_id	Trip stop ID on the tour (1 = no stop, else 0-3)
inbound	Inbound half tour (1=Trip, 0=False)
tour_category	Tour type such as INDIVIDUAL_NON_MANDATORY
tour_purpose	Tour purpose such as social
orig_purpose	Activity at trip origin
dest_purpose	Activity at trip destination
orig_taz	Trip origin taz
dest_taz	Trip destination taz
orig_walk_segment	Trip origin taz walk subzone type
dest_walk_segment	Trip destination taz walk subzone type
parking_taz	Destination parking taz (0=does not apply)
depart_period	Trip departure time period
trip_mode	Trip mode code
tour_mode	Tour mode code
num_participants	Number of persons on the trip
tour_participants	Space concatenated person_num(s) on the tour
tour_start_period	Tour start time period
tour_id_uniq	Unique tour ID (tour_category + " " + tour_id + " " + tour_purpose) given person_id
trip_id	Trip ID within each full tour (1 to N)
orig_purpose_start_period	Origin activity start time period (if first trip, then equal to first half-hour of the simulation day)
home_taz	Home taz
hh_income	Household income
hh_autos	Household autos

Table 70 (Cont'd): CT-RAMP Trips Data Output File Fields

Field	Description
hh_fp_choice	Household free parking choice model result (1 =free, 2=pay)
hh_inc_bin	Household income bin
hh_size	Household size
hh_wkrs	Household workers (person types "Full-time worker" and "Part-time worker")
hh_auto_suff	Household Auto sufficiency (carsowkrs, carspwkrs, nocars)
age	Person age
gender	Person gender
person_type	Person type such as non-worker
activity_pattern	Person activity pattern
tour_mode_name	Tour mode name
trip_mode_name	Trip mode name
travel_time	Trip travel time
distance	Trip distance
cost	Trip auto toll or transit fare
first_wait_time	Transit trip first wait time
trftr_wait_time	Transit trip transfer wait time
walk_aux_time	Transit trip walk access and egress time
auto_aux_time	Transit trip auto access and egress time
boardings	Transit boardings
lvt_local_bus	Transit trip in-vehicle time on local bus
lvt_premium_modes	Transit trip in-vehicle time on premium modes



Yuxiang Zhao

# Ground Mobility: Travel Mode Analytics

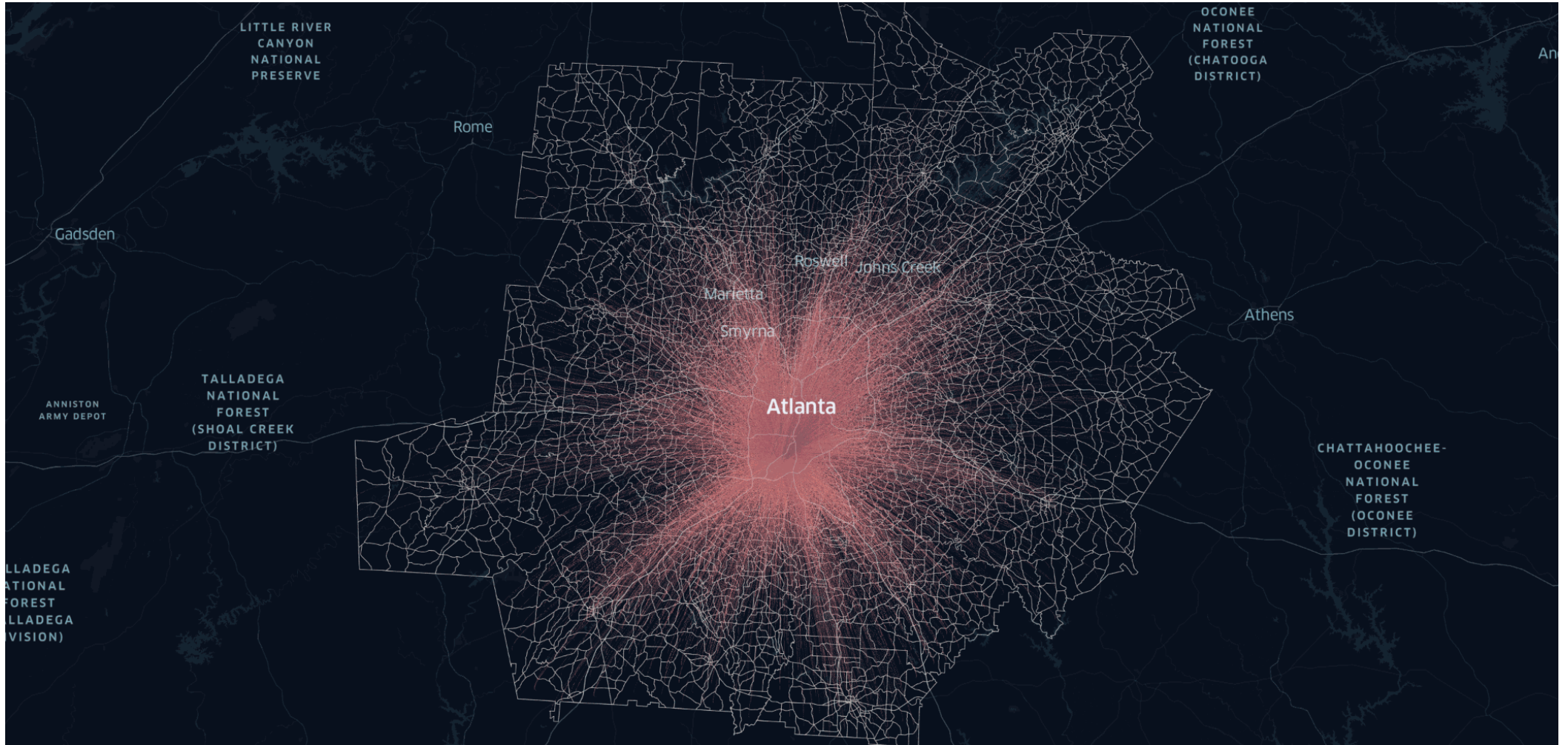
Introduction

Background  
& Motivation

Methodology

Case Study

Concluding  
Remarks



OD-Map visualization of Atlanta airport as destination in the dataset **(130,934 data points)**



Yuxiang Zhao

# Ground Mobility: Travel Mode Analytics

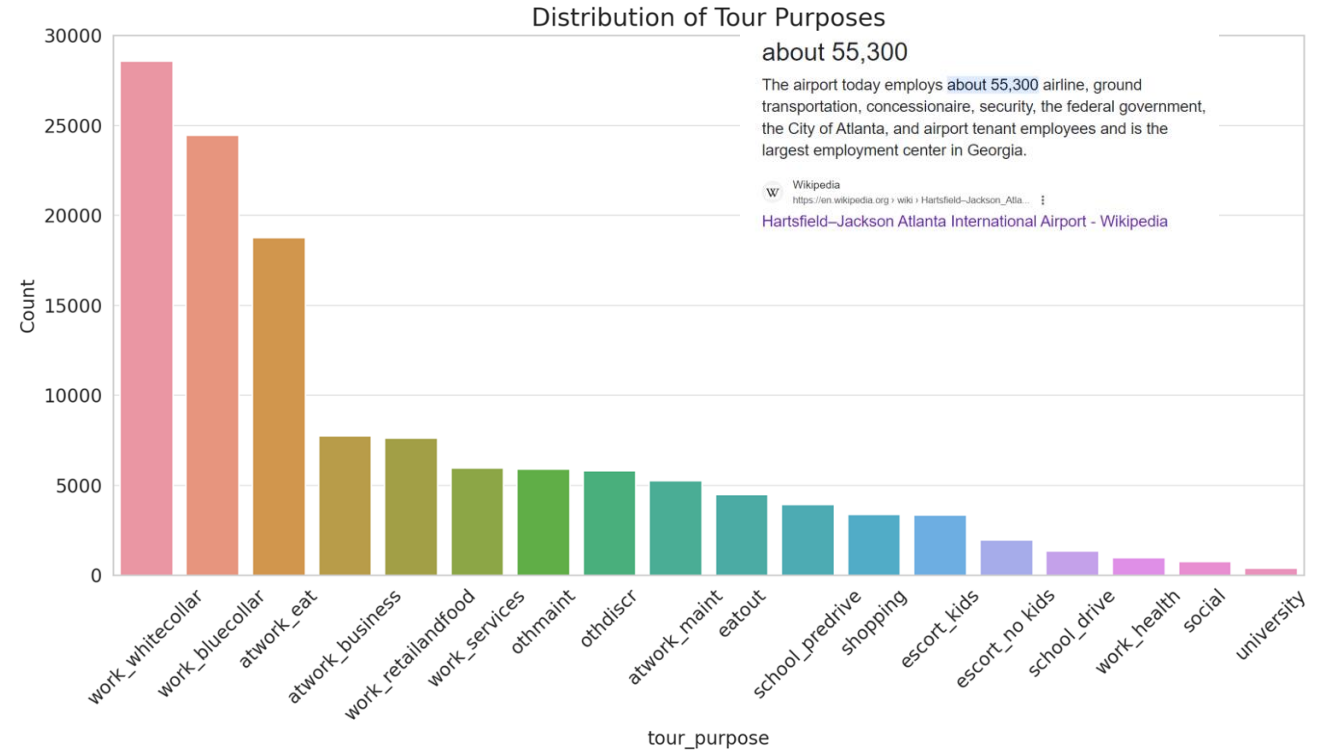
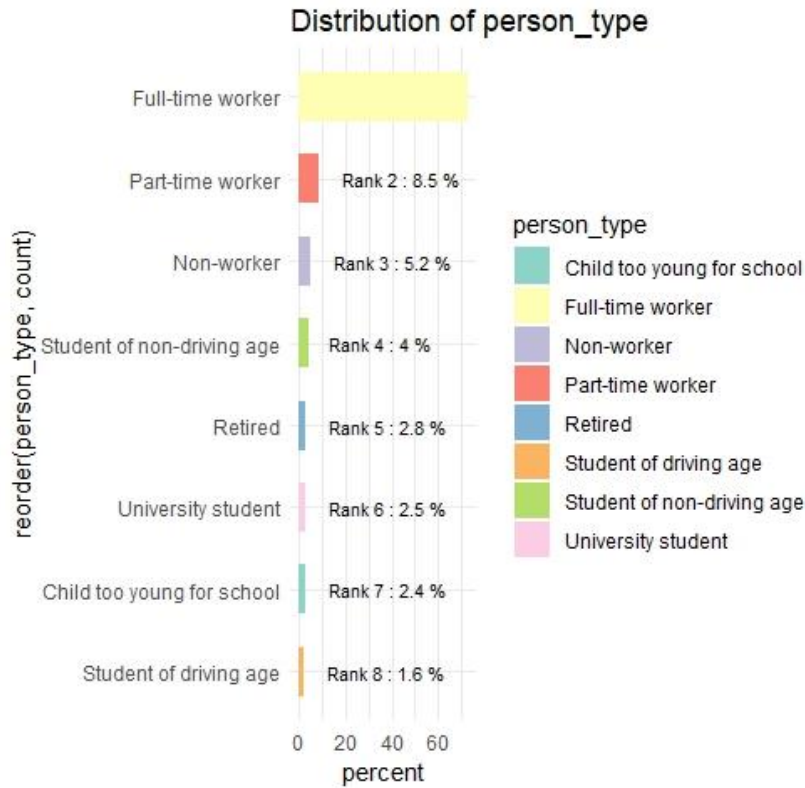
Introduction

Background & Motivation

Methodology

Case Study

Concluding Remarks



From this, we can conclude that the traffic situation leading to the airport is continuous because work is required every day. This traffic situation occurs daily and is not accidental.



Yuxiang Zhao

# Ground Mobility: Travel Mode Analytics

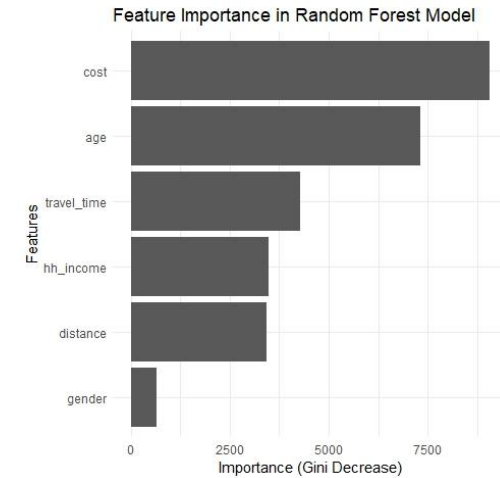
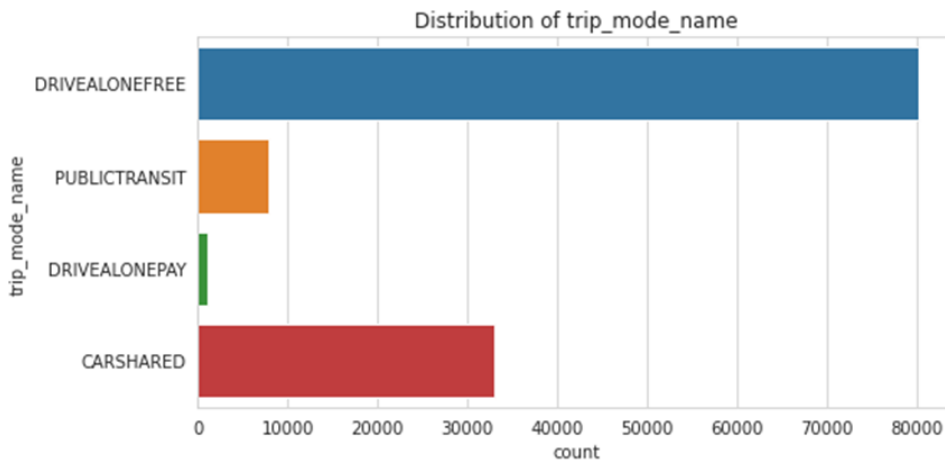
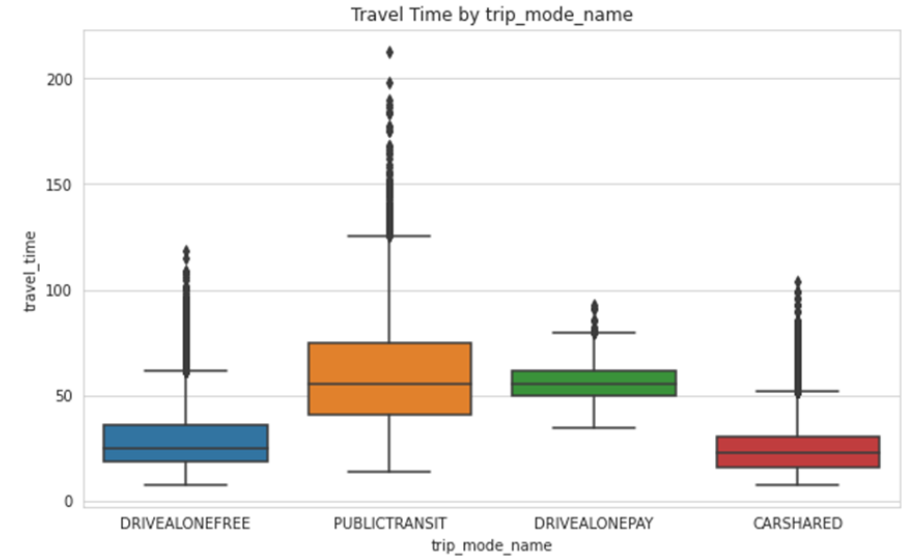
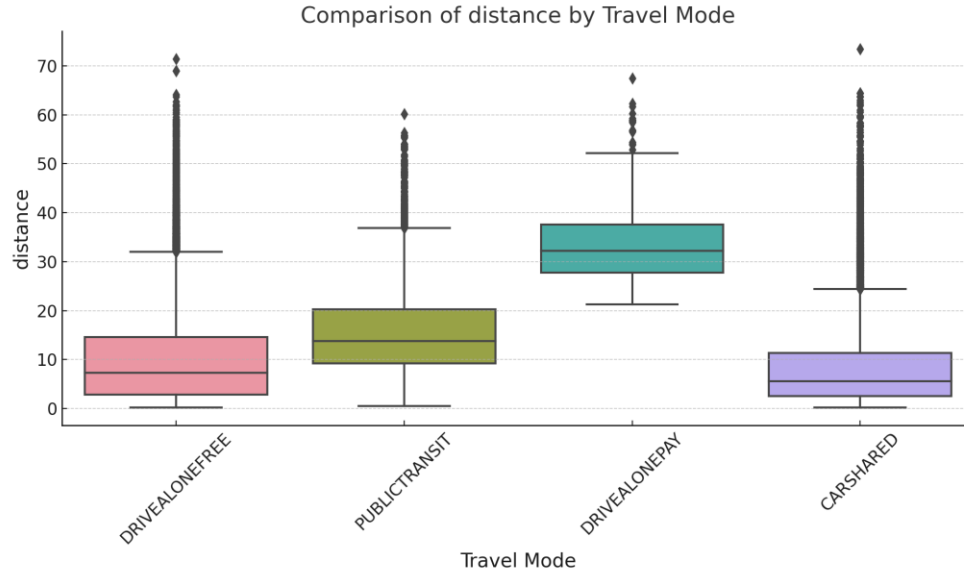
Introduction

Background & Motivation

Methodology

Case Study

Concluding Remarks



Continued analysis of the distribution of trip counts across modes and influencing travel choices.



Yuxiang Zhao

# Ground Mobility: Travel Mode Analytics

Introduction

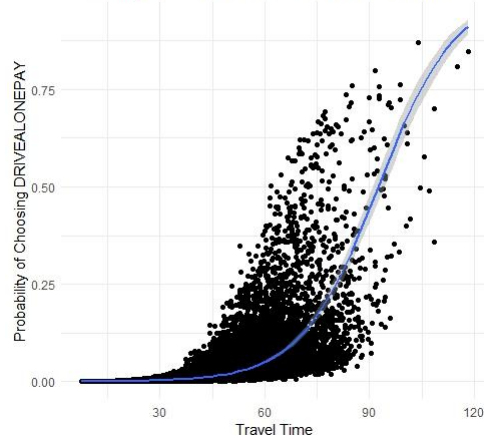
Background & Motivation

Methodology

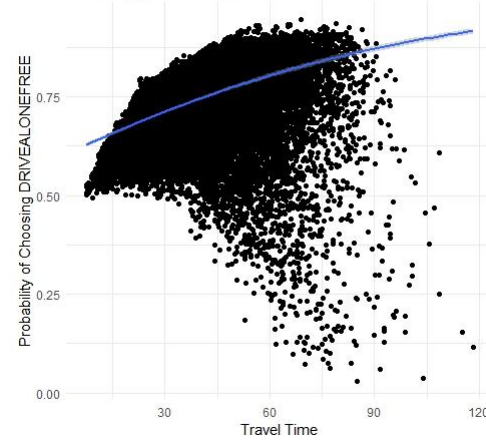
Case Study

Concluding Remarks

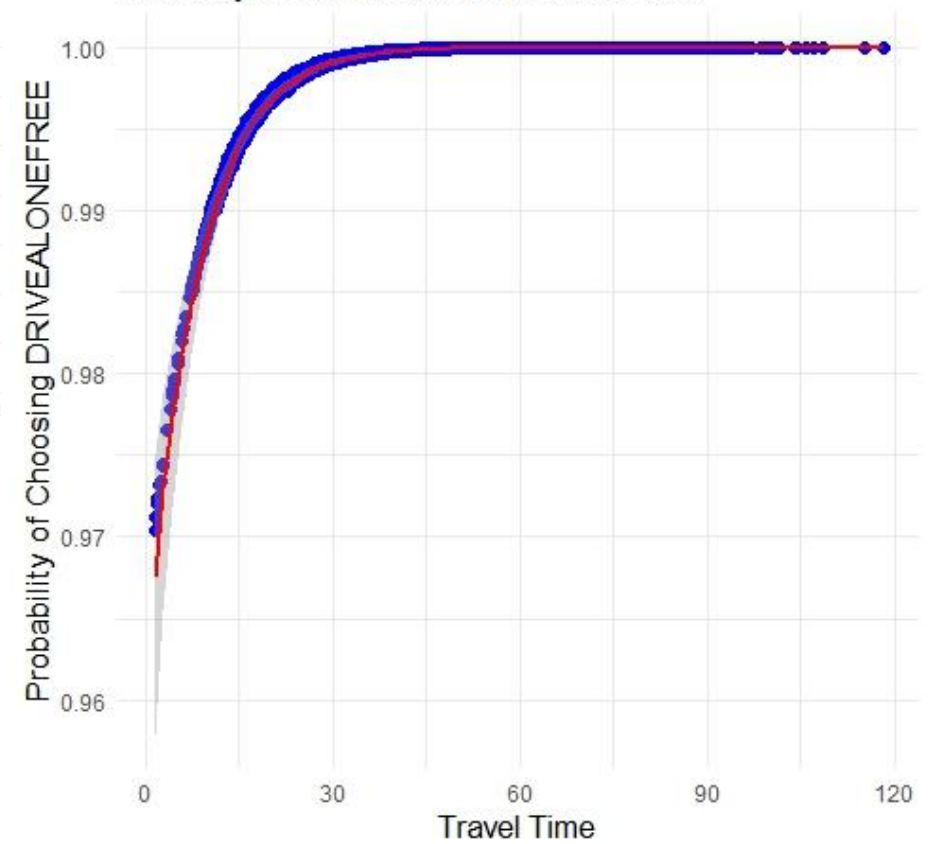
Probability of DRIVEALONEPAY vs. Travel Time



Probability of DRIVEALONEFREE vs. Travel Time

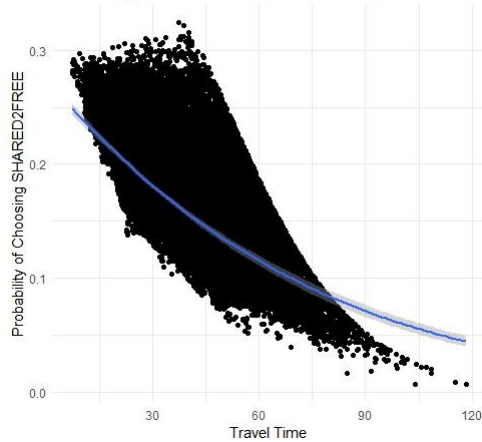


Probability of DRIVEALONEFREE vs. Travel Time

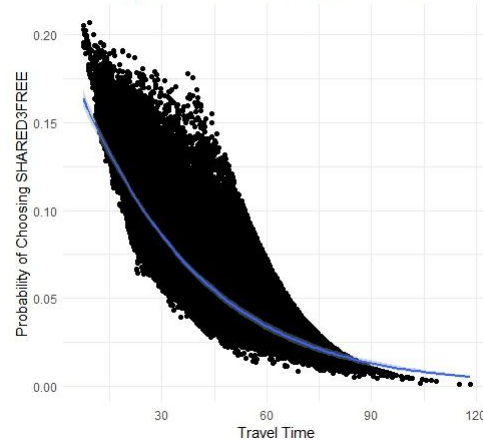


## Multinomial Logistic Regression model

Probability of SHARED2FREE vs. Travel Time



Probability of SHARED3FREE vs. Travel Time



## Fitting Generalized Linear Models

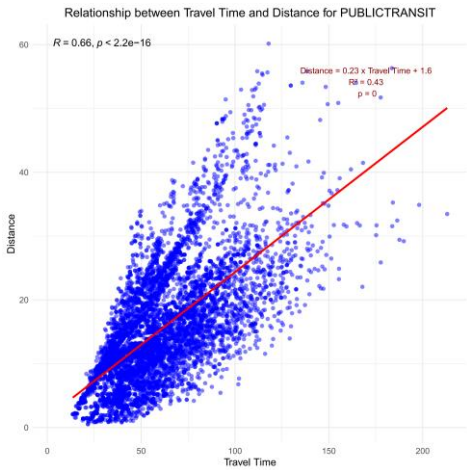
As travel time increases, the likelihood of people choosing to drive alone increases and the likelihood of people carpooling decreases. We can conclude that carpooling does not relieve traffic congestion caused by long distances.



Yuxiang Zhao

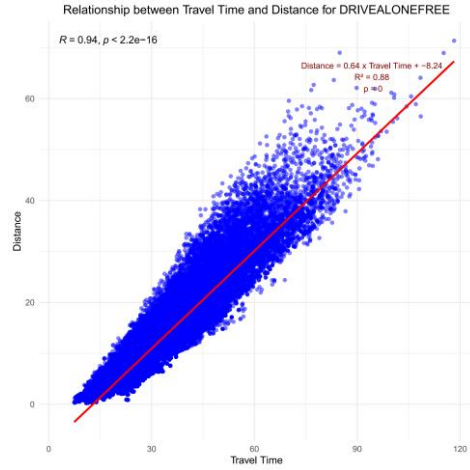
# Ground Mobility: Travel Mode Analytics

## Public transit



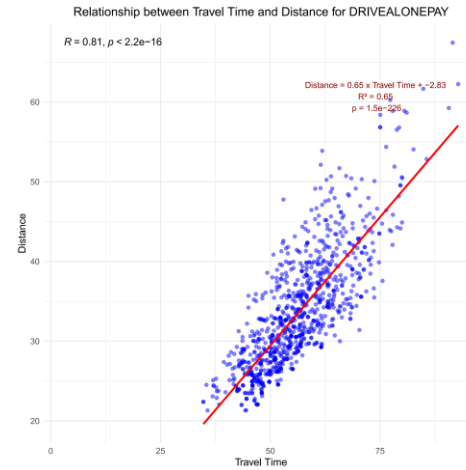
$$\text{Distance} = 0.23 \times \text{TravelTime} + 1.6$$

## Drivealonefree



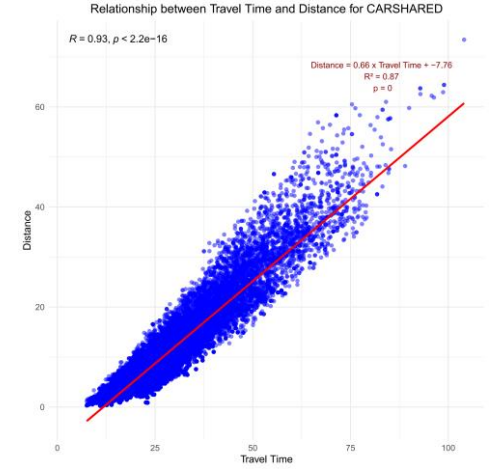
$$\text{Distance} = 0.64 \times \text{TravelTime} - 8.24$$

## Drivealonepay(toll road)



$$\text{Distance} = 0.65 \times \text{TravelTime} - 2.83$$

## Carshared



$$\text{Distance} = 0.66 \times \text{TravelTime} - 7.66$$

The four main modes of travel for ground transportation are shown in relation to time and distance can be compared to UAM later.

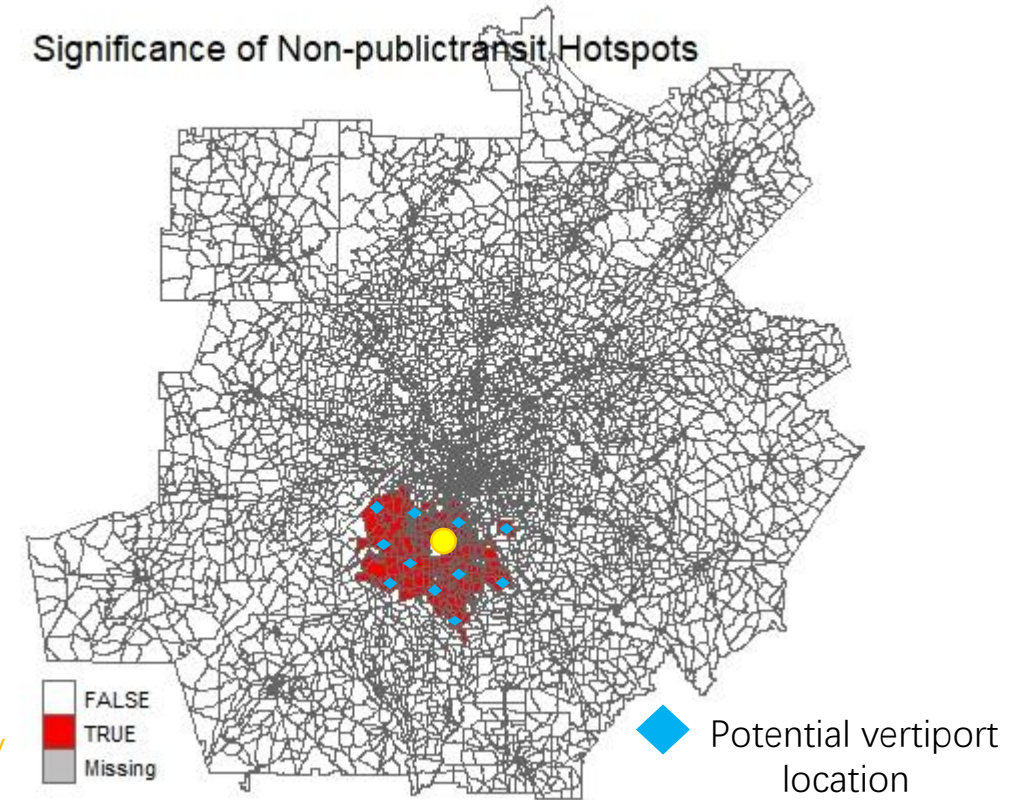
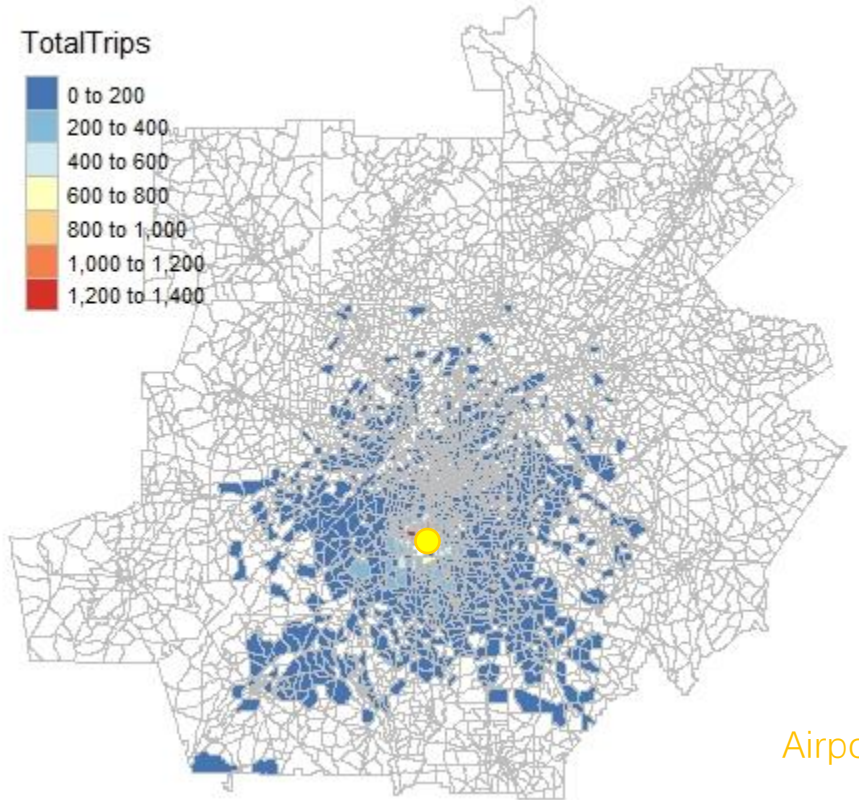


Yuxiang Zhao

# Ground Mobility: Travel Mode Analytics

## Top 25% Total Trips

## Significant LISA P-Values (< 0.05)



Introduction

Background & Motivation

Methodology

Case Study

Concluding Remarks

