



Incorporating Big Data in an Activity-Based Travel Model: The Chattanooga Case Study

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Traditional vs Passive Data

	Household travel survey	LEHD	CTPP/ ACS	Passive Data
Sample Size	Small	Large	Large	Very Large
Socio-demographic	Yes	No	Yes	No
Trip Purpose	All purposes	Work Only	Work Only	All purposed but combined
Mode	Yes	No	Yes	No
Geographic resolution	Long/Lat	Block	County/TAZ (?)	TAZ
Time Period	Yes	No	No	Yes



Passive Data for Calibration

- No mode
- No purpose
- Very large sample
- Trips by TAZ OD
- No socio-demographic



Destination Choice
Calibration

DaySim Destination Choice Calibration

- Usual Work Location Choice (long term choice)
- School Location Choice (long term choice)
- Tour Destination Choice
 - Work to non-usual location (repair, meeting, etc.)
 - Escort
 - Personal business
 - Social
 - Shopping
 - Meal
 - Work-based



DaySim Destination Choice Calibration

Model to Calibrate	Data Used	Method
Usual Work Location Choice	LEHD	Compare Model Commute Flow to LEHD Commute Flow
Tour Destination Choice (All purposes)	Expanded Passive Data	Compare Model Non-work Flow to (Passive OD - LEHD OD)



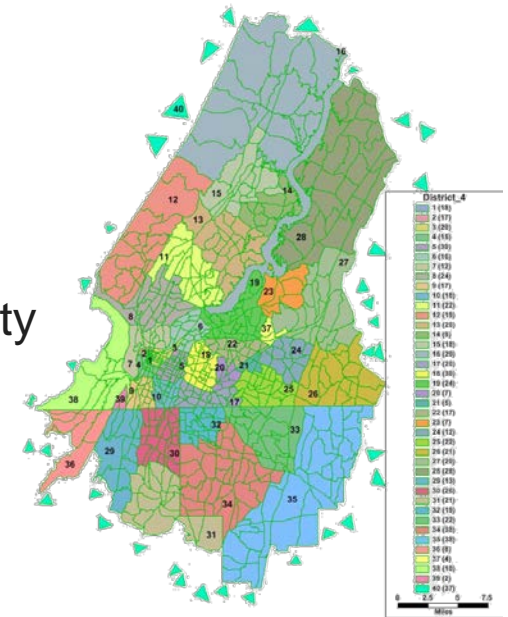
More about Calibration

Passive Data Expansion

1. AirSage's Market Penetration-based Expansion
2. Trip-Generation-based filling of "holes" (ATRI)
3. Single-factor Scaling
4. Matrix Partitioning / Iterative Screenline Fitting

Shadow-pricing

1. 40 district scheme
2. Only pair with significant flow
3. Capped shadow-pricing to maintain sensitivity



Total Daysim Trip Table vs. AirSage

- Daysim vs. AirSage
 - Very good agreement – **10.5% RMSE**
 - All cells within +/- 1%
 - All residence/work Super Districts within +/-2.5%

Origin SuperDistrict	Destination Super District												Grand Total
	1	2	3	4	5	6	7	8	9	10	11	12	
1	0.5%	0.2%	-0.1%	0.0%	0.0%	-0.1%	-0.2%	-0.1%	0.0%	0.0%	-0.1%	-0.2%	0.0%
2	0.3%	0.0%	0.2%	0.0%	0.1%	0.0%	0.0%	0.1%	0.1%	0.0%	0.0%	-0.1%	0.7%
3	-0.1%	0.1%	0.0%	-0.1%	-0.2%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%	-0.1%	-0.1%
4	0.0%	0.1%	-0.1%	0.0%	0.0%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.4%
5	0.1%	0.1%	-0.1%	0.0%	0.2%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%
6	-0.1%	-0.1%	0.1%	-0.1%	0.1%	0.0%	0.1%	-0.1%	0.1%	0.0%	0.0%	0.0%	0.0%
7	0.0%	0.0%	0.2%	0.1%	0.1%	0.0%	0.2%	0.0%	0.1%	0.0%	0.0%	0.1%	0.7%
8	0.0%	0.1%	0.1%	0.1%	0.0%	-0.1%	0.1%	0.0%	-0.2%	0.0%	0.0%	0.0%	0.2%
9	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.3%	0.0%	0.0%	0.0%	0.2%
10	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.0%	0.3%
11	0.0%	0.0%	0.0%	-0.1%	0.0%	0.0%	-0.1%	0.0%	0.0%	0.1%	-0.1%	-0.3%	-0.5%
12	-0.2%	-0.3%	-0.1%	-0.2%	0.0%	-0.1%	-0.2%	-0.1%	-0.1%	0.0%	-0.3%	-0.7%	-2.4%
Grand Total	0.5%	0.2%	0.2%	-0.2%	0.4%	-0.3%	0.4%	0.1%	0.3%	0.3%	-0.5%	-1.3%	0.0%



Assignment Validation

- Great fit!
 - Better than old model
 - Far exceeds TDOT standards

VOLUME RANGE	RMSE	TDOT MAXIMUM
< 5,000	62.13%	100%
5,000 to 10,000	37.91%	45%
10,000 to 15,000	28.00%	35%
15,000 to 20,000	22.73%	30%
20,000 to 30,000	15.73%	27%
30,000 to 50,000	14.05%	25%
50,000 to 60,000	9.93%	20%
All	28.97%	45%

