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Incorporating Long-Distance, Visitor, and Summer Travel into the new Michigan Statewide Model

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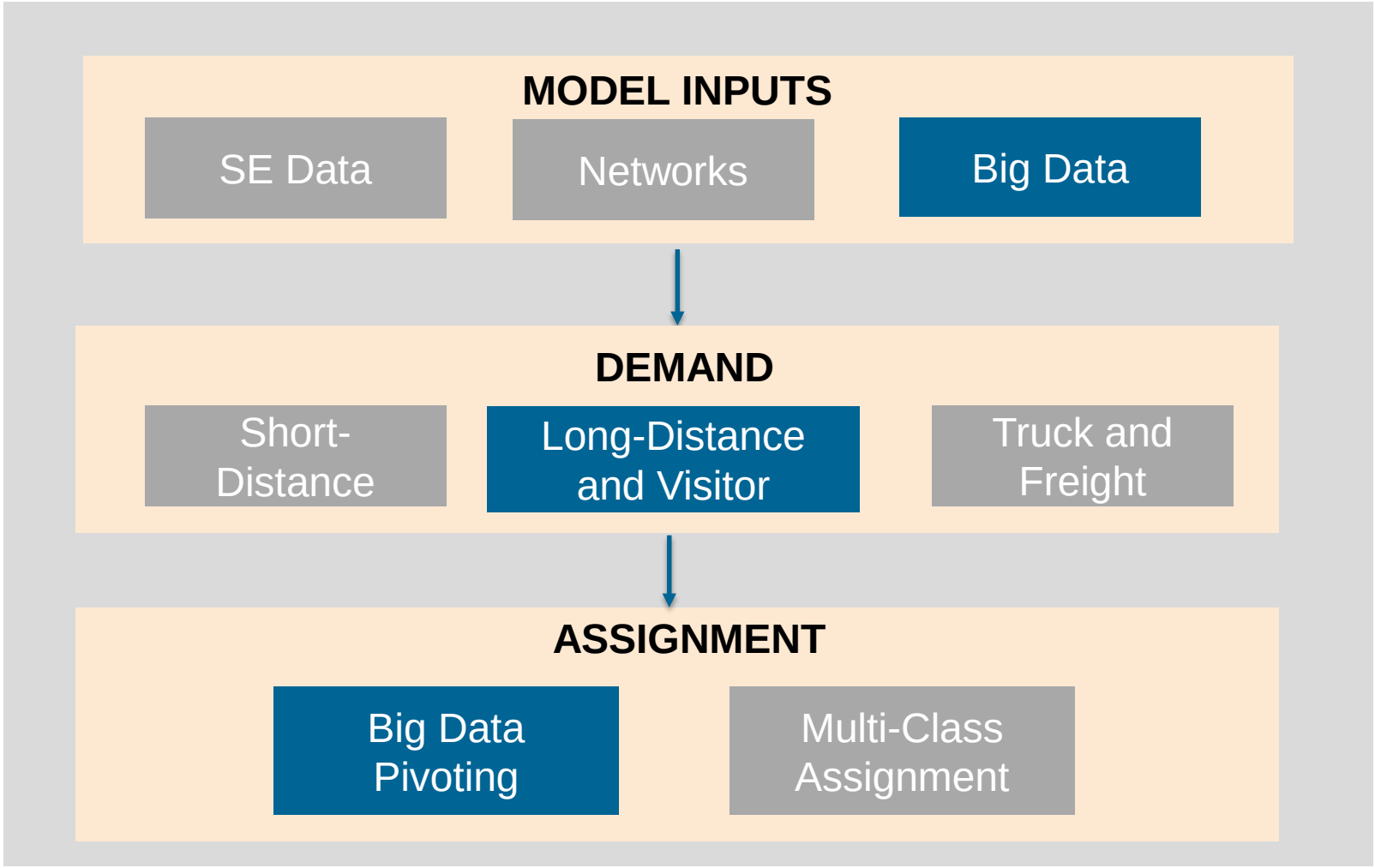
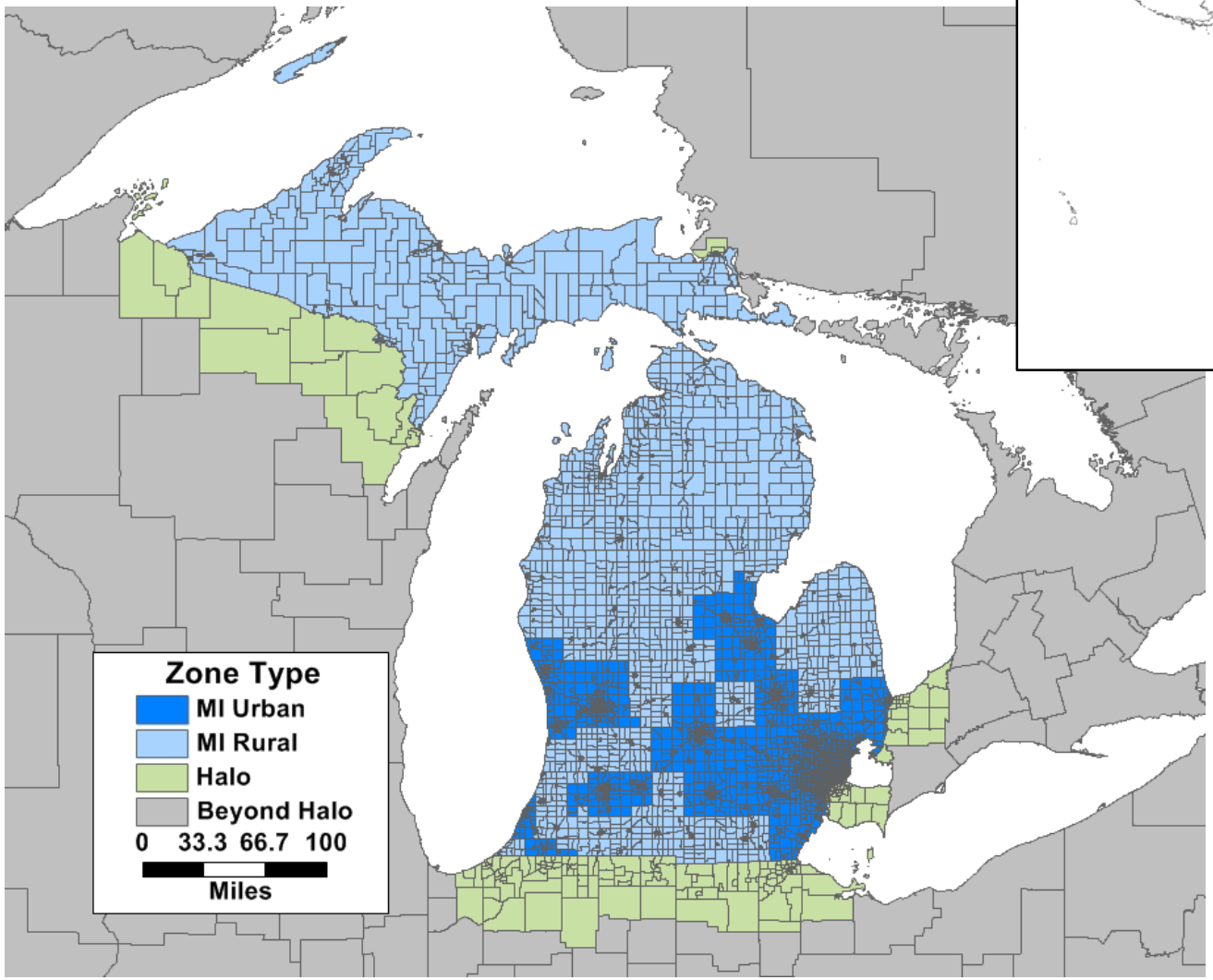
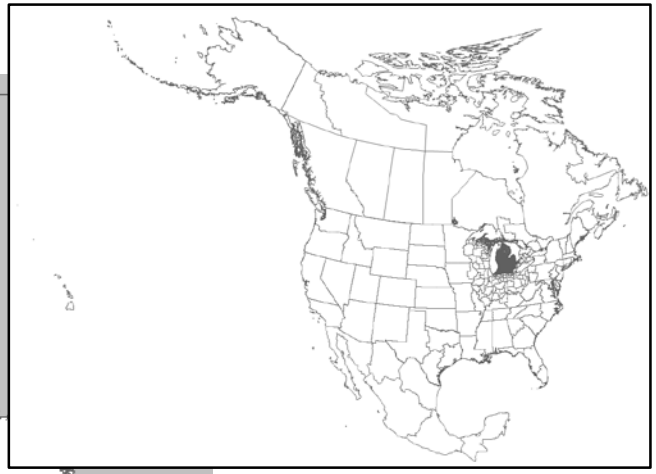
Model Structure and Data-Driven Approach

Model Components and Presentation Topics



Model Area

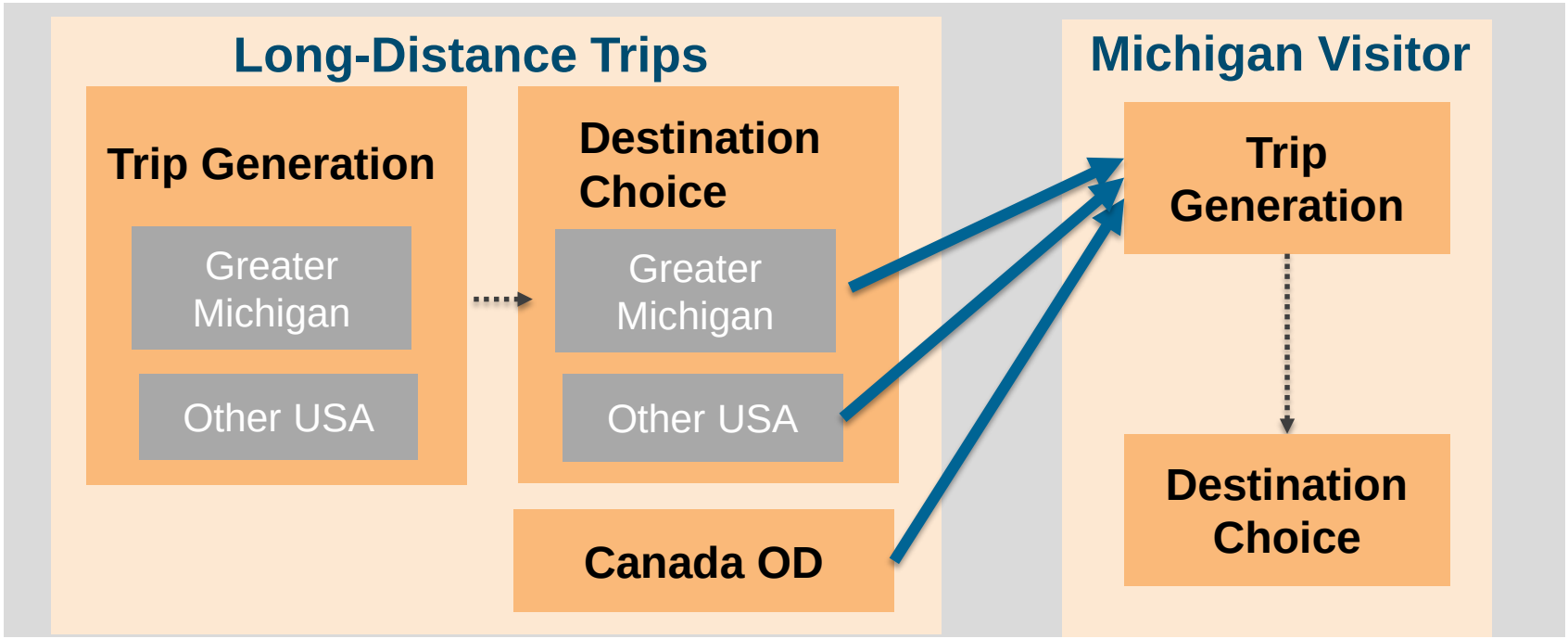

Zone Type
MI Urban
MI Rural
Halo
Beyond Halo
0 33.3 66.7 100
Miles



Advanced Trip-Based Framework

Not ABM, but captures some "low-hanging fruit"

- Trip/Tour Purposes
- Household Synthesis
- Model linkages (HB -> NHB & Long-Distance -> Visitor)

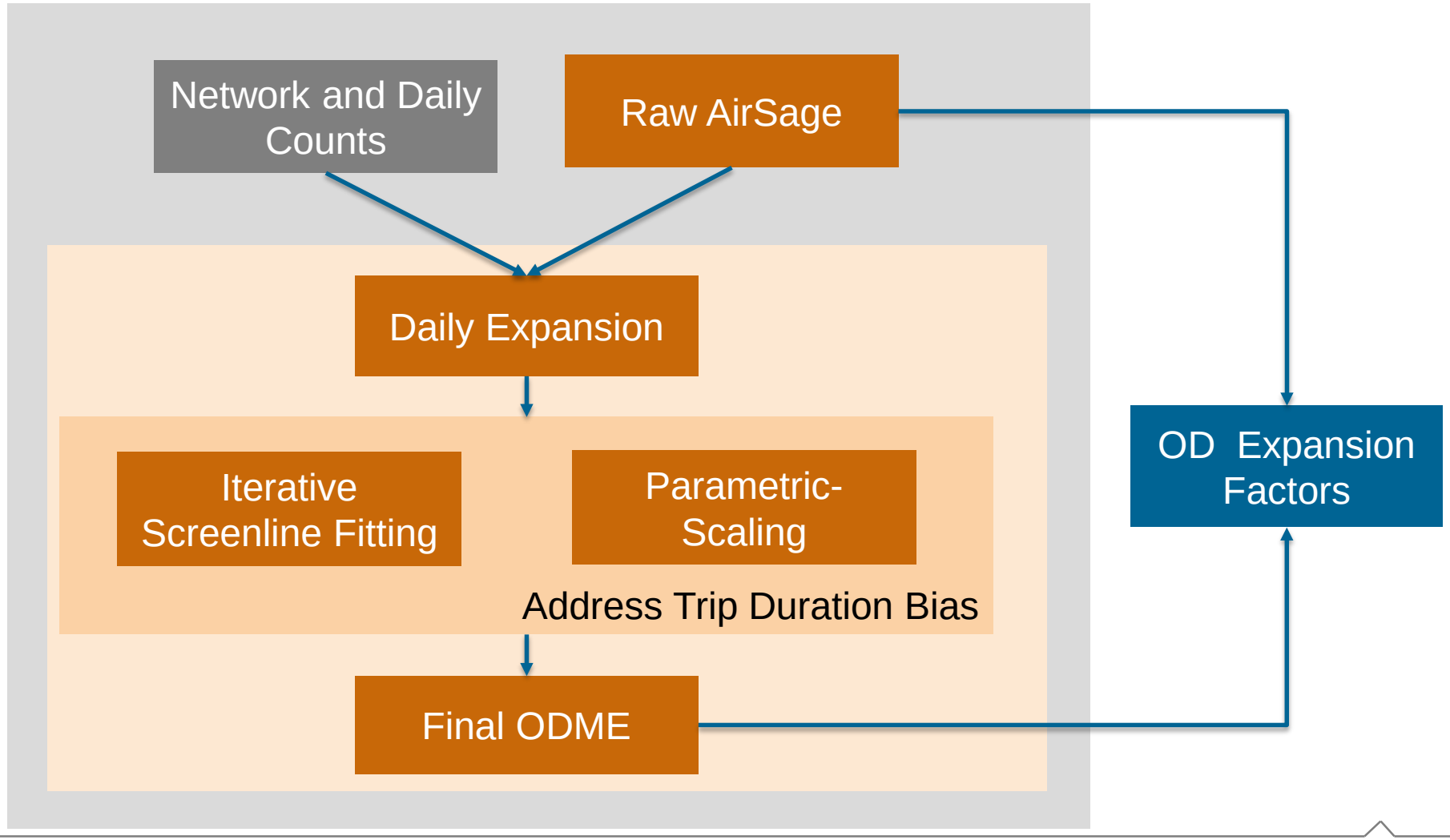


Data Sources

Data Sources and Model Estimation

Source (2015)	Long-Distance Travel			Visitor Travel	Summer
	MI	Other USA	Canada		
Daily HH Survey -227K Records	**Main**			2nd	2nd
Long-Distance Recall -17K Records	2nd				2nd
AirSage -July, Oct. Weekday/end 20M unique (I,J,type)	2nd	**Main**		**Main**	**Main**
Canada Border Crossing -13K Records			**Main**		

AirSage Expansion



HH Survey and Expanded AirSage

	Raw AirSage**	Expanded AirSage	Household Survey
Daily Trips*	18.7 M	21.5 M	21.4 M
Trip Distance*	14.6 miles	8.2 miles	7.1 miles

*Resident, Internal, Non-Intrazonal Vehicle Trips

**Raw data scaled to have zero daily percent error in assignment

Long-Distance Travel

Long-Distance Ground Trips (MI Residents)

50 to 100 miles

	HH Survey	AirSage
Daily Trips	**212K**	**213K**
Distance (mi)	**66**	**66**

> 100 miles

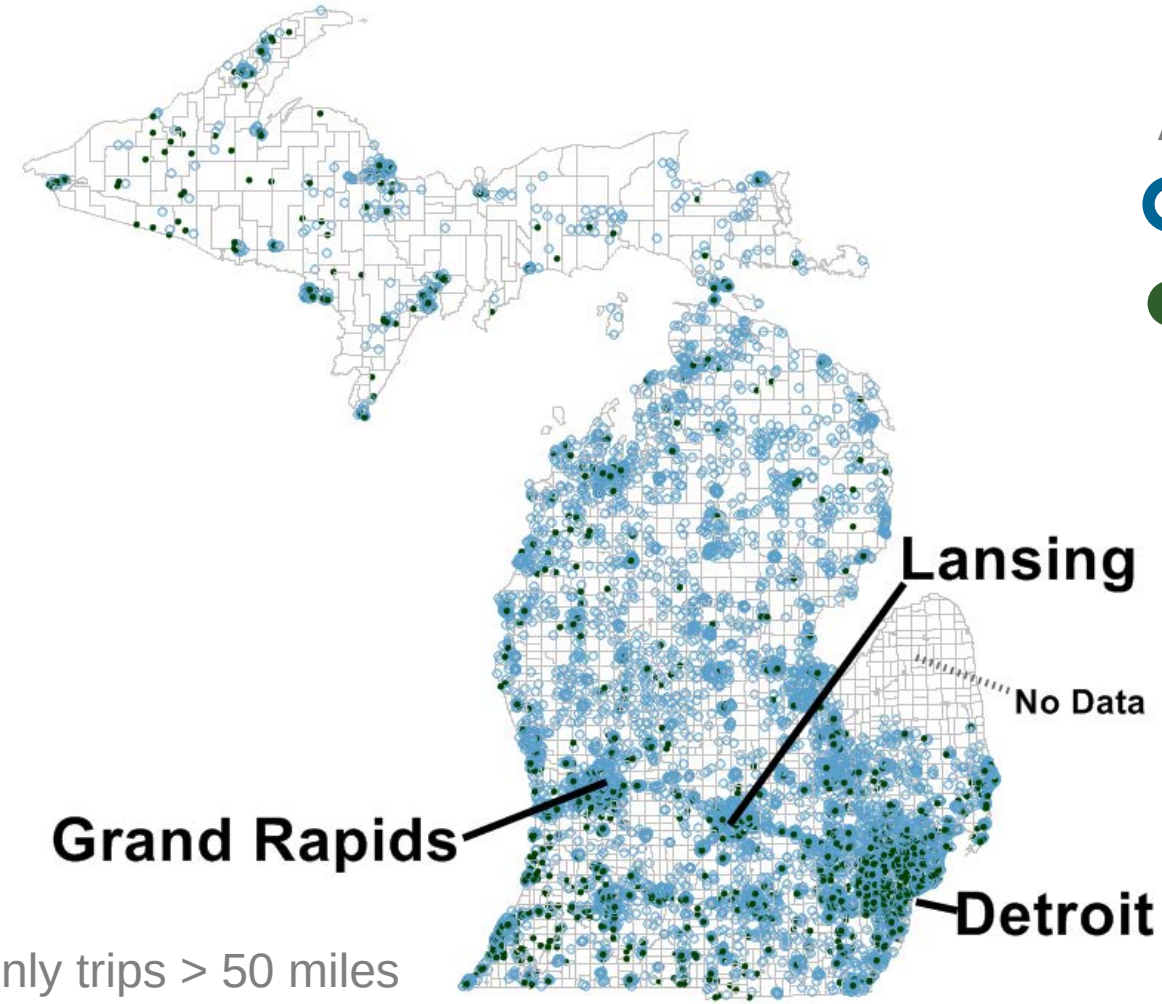
	HH Survey	AirSage	LD Recall
Daily Trips	**131K**	**106K**	**49K**
Distance (mi)	**173**	**157**	**230**

*Figures exclude Air travel in HH surveys and inferred AirSage Air travel

Long-Distance Generation

	Variable	Commute	Business	Main-tenance	Leisure
Agent	**HH Workers**	▲	▲		
	HH Persons			▲	▲
Demographic	**Income**	▲	▲	▲	▲
	Has Children	▼		▼	▼
	Has Senior			▲	▲
Location	**Urban**	▼	▼	▼	▼
	Detroit	▼	▼	▼	▼
	Up Peninsula			▲	▼

AirSage Long-Distance Attractions



Attractions

- 20 **MI** Resident
- 20 **Not MI** Resident

*only trips > 50 miles

Destination Choice: Starting Hypothesis (part 1)

- Genetic Algorithm to estimate models
- Improves fit of starting hypothesis

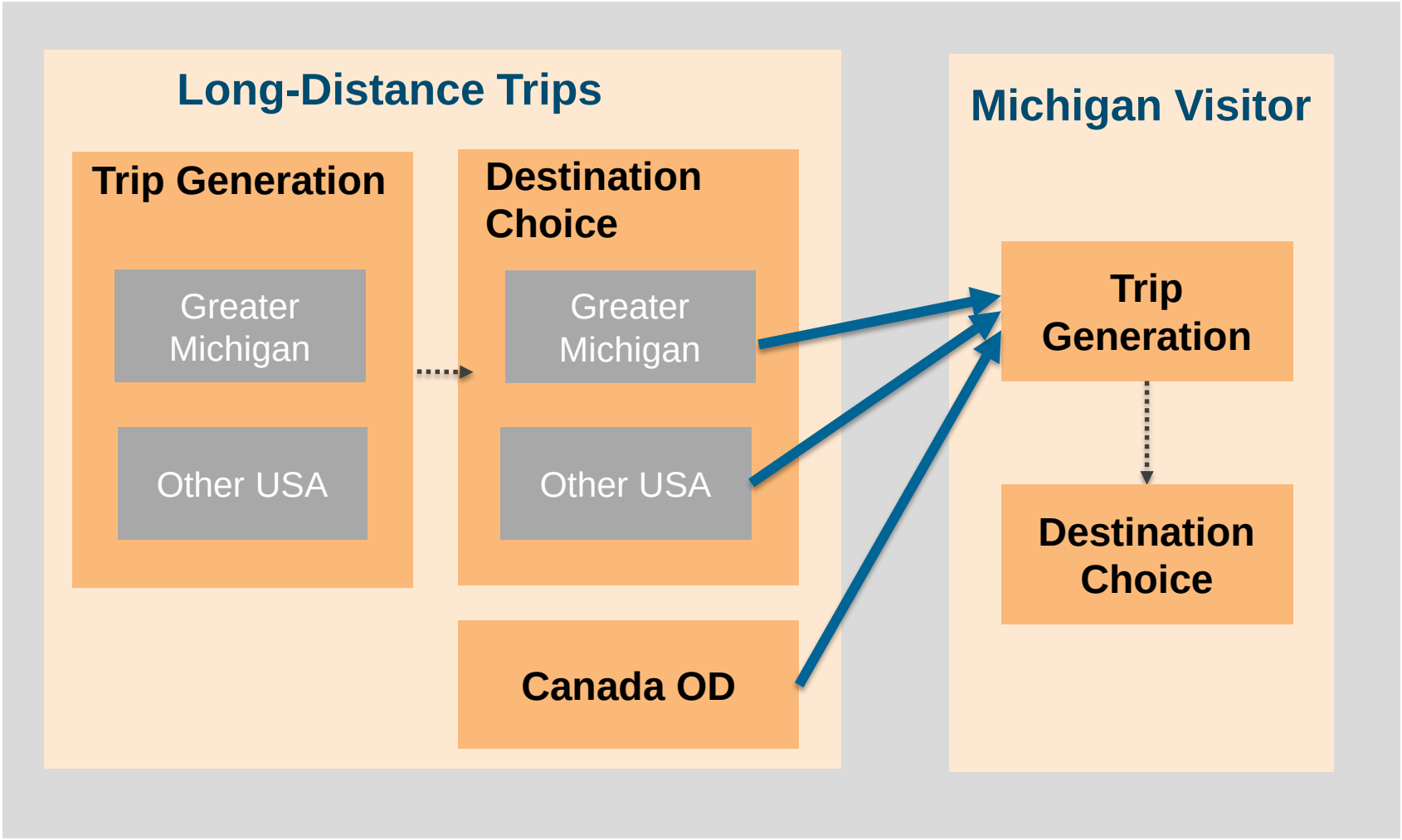
	Variable	Business	Commute	Main-tenance	Leisure
Employment	Accommodations	**3.0**		**2.0**	**1.0**
	Arts, Entertain…	**0.5**	**0.1**		**2.5**
	Retail & Dining	**0.5**	**0.1**	**1.2**	**0.5**
	Health & Social	**1.0**	**0.9**	**2.0**	
	Government	**1.5**	**1.2**	**1.2**	
	Other Emp	**1.0**	**0.9**	**1.2**	

Destination Choice Hypothesis (part 2)

	Variable	Business	Commute	Main-tenance	Leisure
Misc. Attr	University Enroll	**1.0**	**1.0**	**1.0**	
	Households	**0.1**	**0.1**	**0.1**	**0.1**
	GenAccess	**0.1**		**0.3**	**-0.15**
Location	Park Area				**0.5**
	Great Lakes (mi)				**0.1**
	Interior Lake (mi)				**0.5**
Impedance	Time	**-0.014**	**-0.016**	**-0.015**	**-0.015**
	Distance	**-0.007**	**-0.008**	**-0.008**	**-0.008**
	Log Distance	**-0.350**	**-0.400**	**-0.375**	**-0.375**
	US Border X'ing	**-0.560**	**-0.200**	**-0.200**	**-0.200**
	River Crossing	**-0.280**	**-0.100**	**-0.100**	**-0.100**

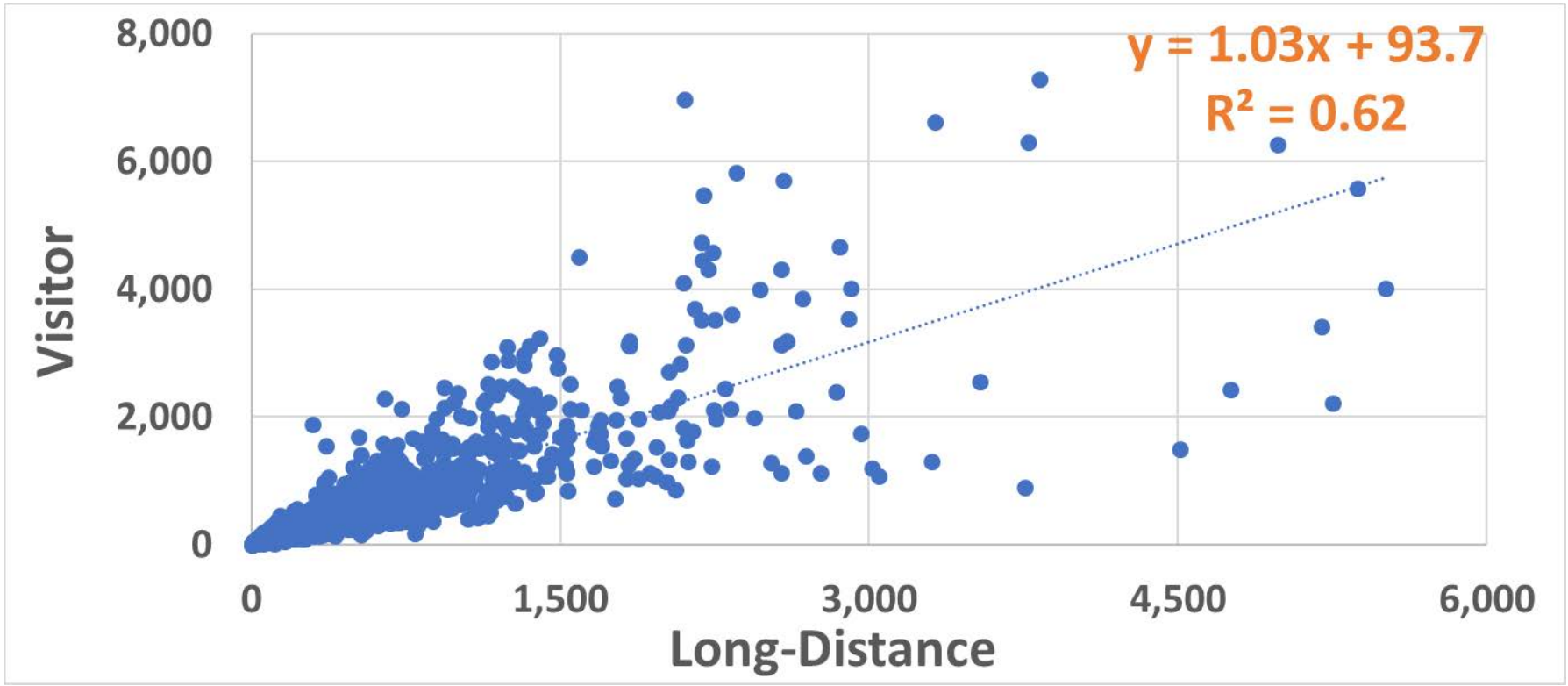
Visitor Travel

Long-Distance and Visitor Linkage



Visitor vs. Long-Distance Trips

- Good Correlation
- Not all visitor travel linked to long-distance

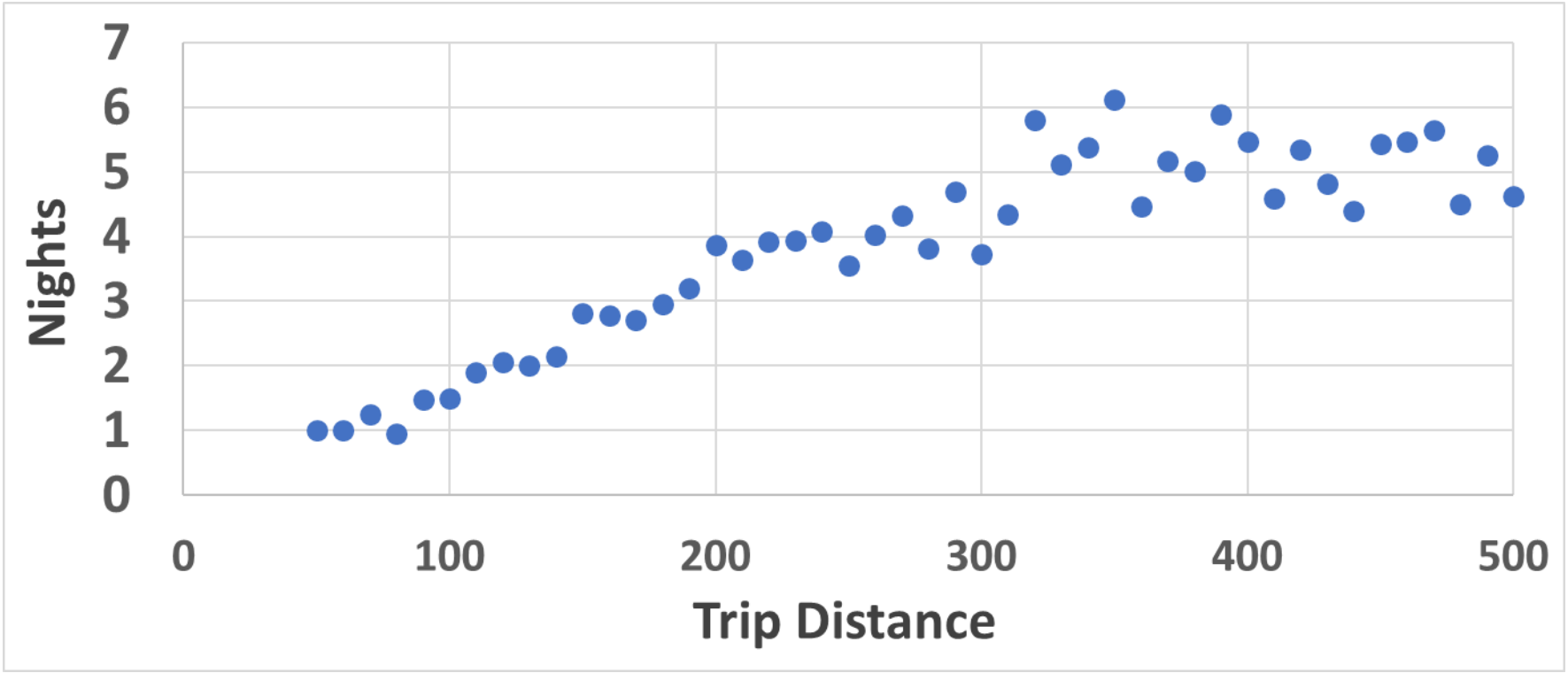


*AirSage Zones in MI excluding DTW

Average Trip Duration vs. Distance

Longer Distance >>> Longer Duration

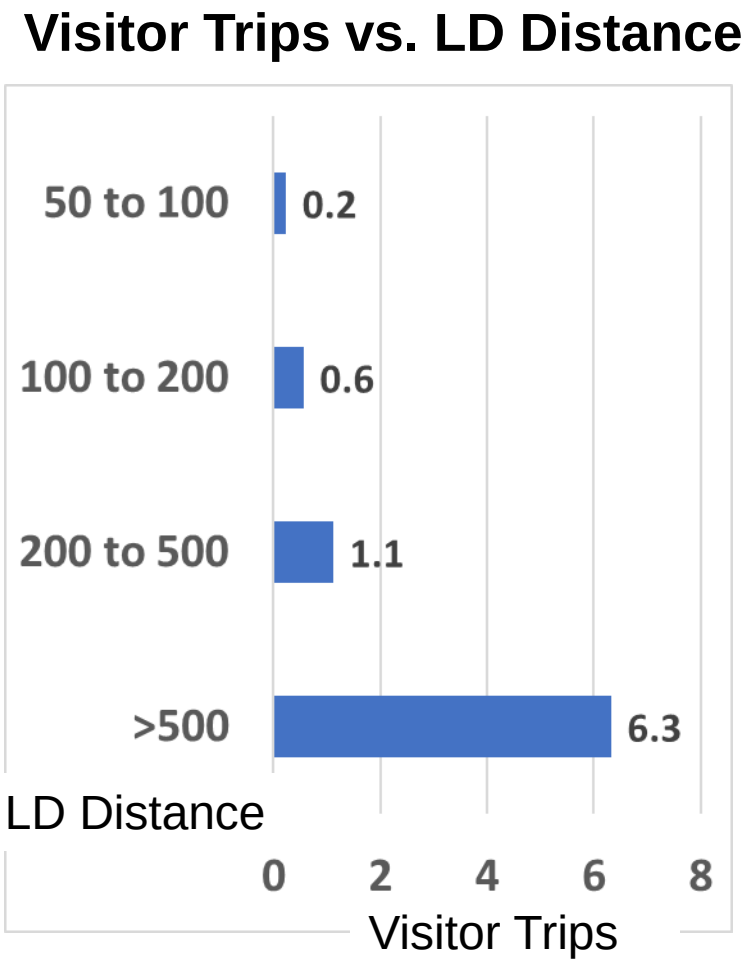
Longer Duration >>> More Visitor Trips (per LD)



From Recall Survey (which may favor longer trips); Network distance

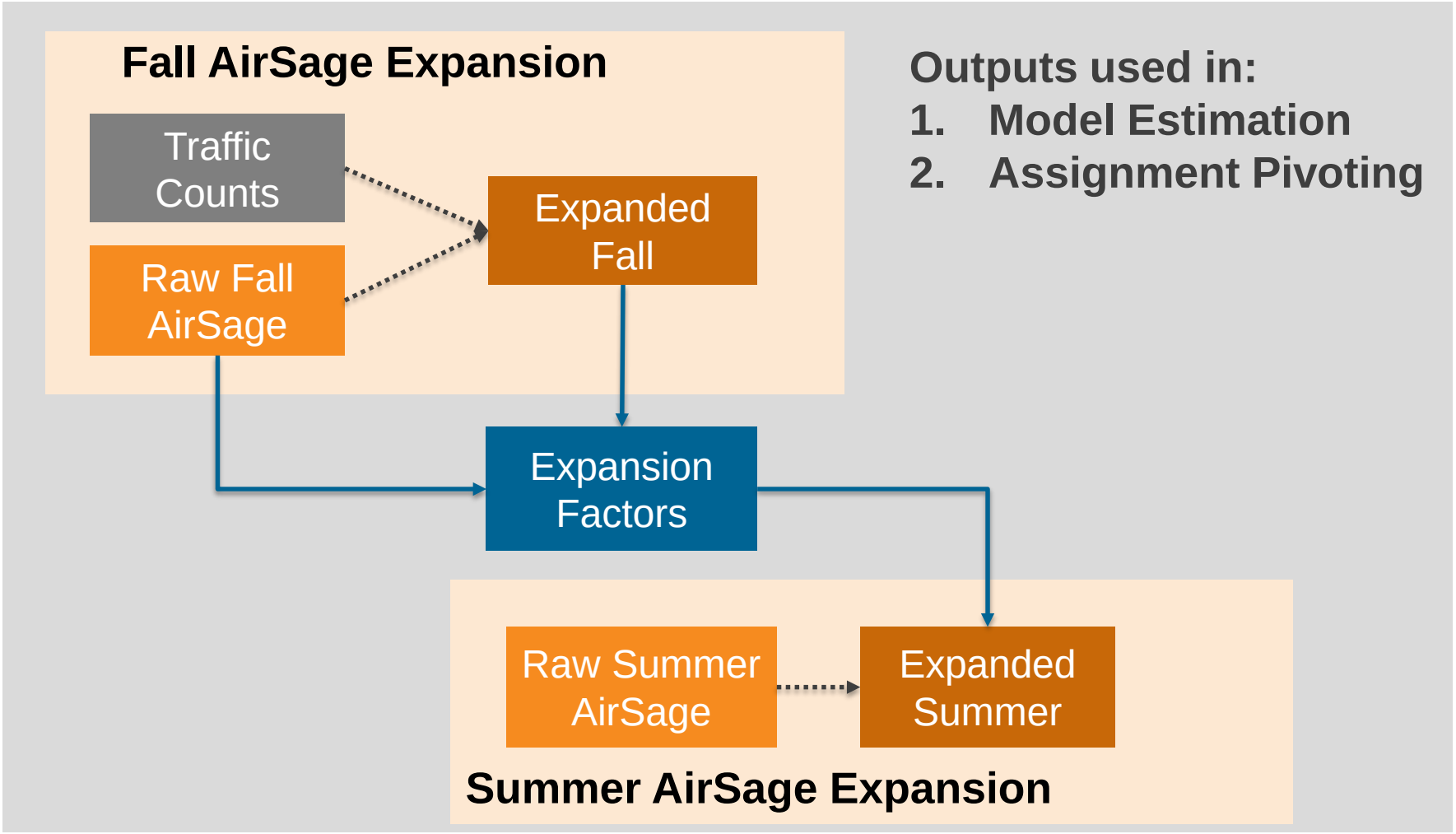
Draft Visitor Model

Variable	Coef.
LD Trips (<100 mi)	0.24
LD Trips (100 to 200 mi)	0.57
LD Trips (200 to 500 mi)	1.12
LD Trips (>500 mi)	6.32
Retail Employment	0.063
Hotel Employment	0.207
Service Employment	0.0089



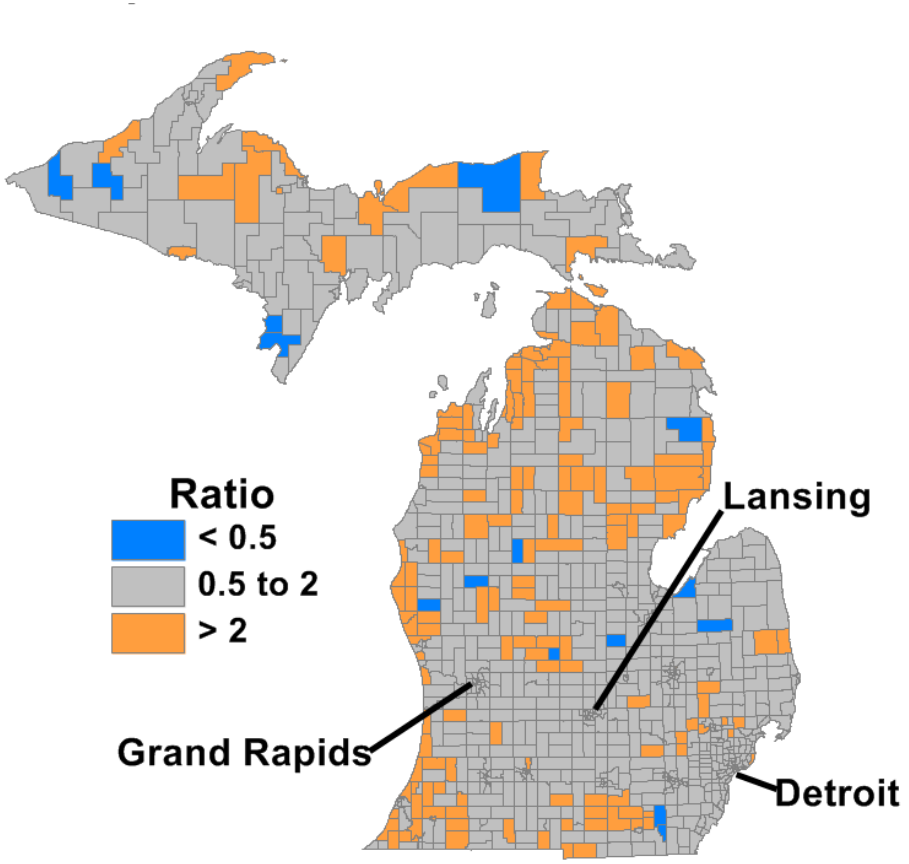
Seasonal Travel

Seasonal “Big Data” Trip Matrices

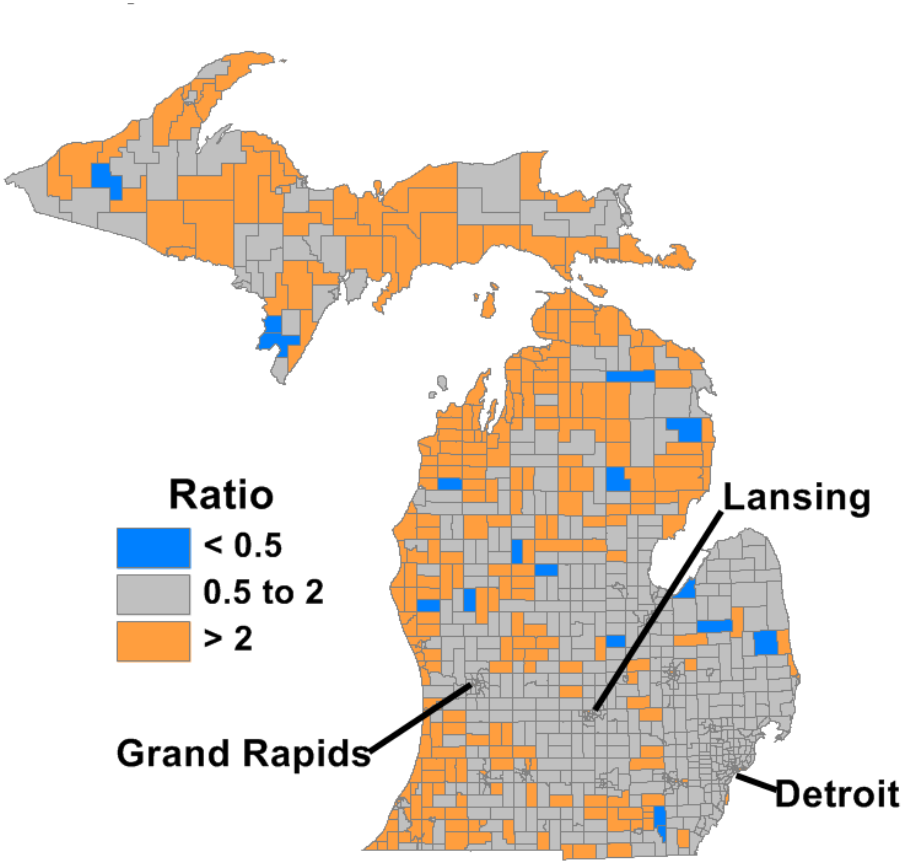


Observed Summer to Fall Ratio: LD and Visitor Trips

Long-Distance Destinations



Visitor Origins



Conclusions

Conclusions/Innovations

- Long-Distance and Visitor linkage in an “advanced” trip-based framework
- Combine Big Data and Traditional data sources
- Initial support for using passive data to develop seasonal models

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