



# Utilizing GPS Data to Determine Truck Parking Needs

## FMRI Webinar Series

### Presenters

Mihalis Golias & Dimitris Giampouranis

### Research Team:

Mihalis Golias, Sabyasachee Mishra, Dimitris Giampouranis, Vasilis Liatsos (University of Memphis)

Chris Cherry, Airton G. Kohls (University of Tennessee Knoxville)

Dan Murray (American Transportation Research Institute)

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# Presentation Objectives

- Discuss advantages, limitations, & complexity of GPS data in truck transport applications
- Data analytics and mining tools to assist decision makers & inform the public



# Study objectives

- TDOT and FMRI (USDOT) funded study
- Identity existing parking areas with over-utilization (candidates for expansion)
- Identify locations for new truck parking facilities
- Survey trucking industry to identify specific issues in TN

# Data

- i. Truck GPS data first aggregated and anonymized (ATRI)

<b>Month Year: 2018</b>	<b># of ping (in millions)</b>	<b># of unique trucks</b>	<b>% of unique trucks</b>
<b>March</b>	~123.6	~152K	~0.12%
<b>May</b>	~124.6	~146K	~0.12%
<b>July</b>	~133.5	~145K	~0.11%
<b>October</b>	~113.7	~136K	~0.12%
<b>October No Speed Limit</b>	~171.4	~140K	~0.08%

- ii. ETRIMS network with AADT
- iii. Traffic Counts (hourly volumes)
- iv. Public and Private rest area polygons & amenities
- v. Software used: PostgreSQL, Matlab, PowerBi, ArcGIS Desktop & Online



# Expansion Factors

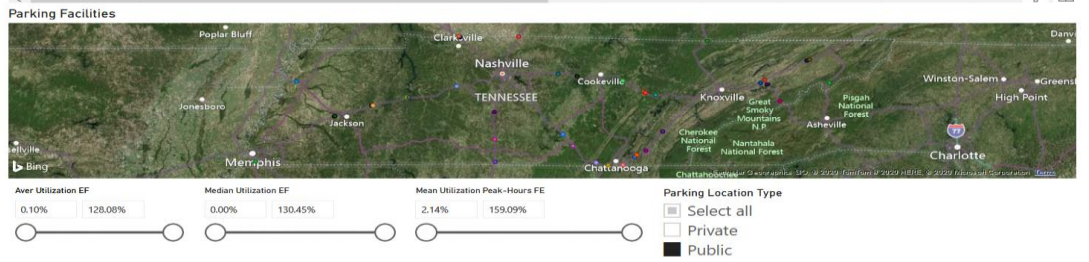
1. Select any link within a 1-mile radius of a parking location
2. Estimate based GPS truck flows (hourly and daily)
3. Estimate count-based truck flows
4. Fit best probability distribution (in our case it was log-normal)
5. Mean: 2.104, STD: 0.924

# Analytics/Mining Tools

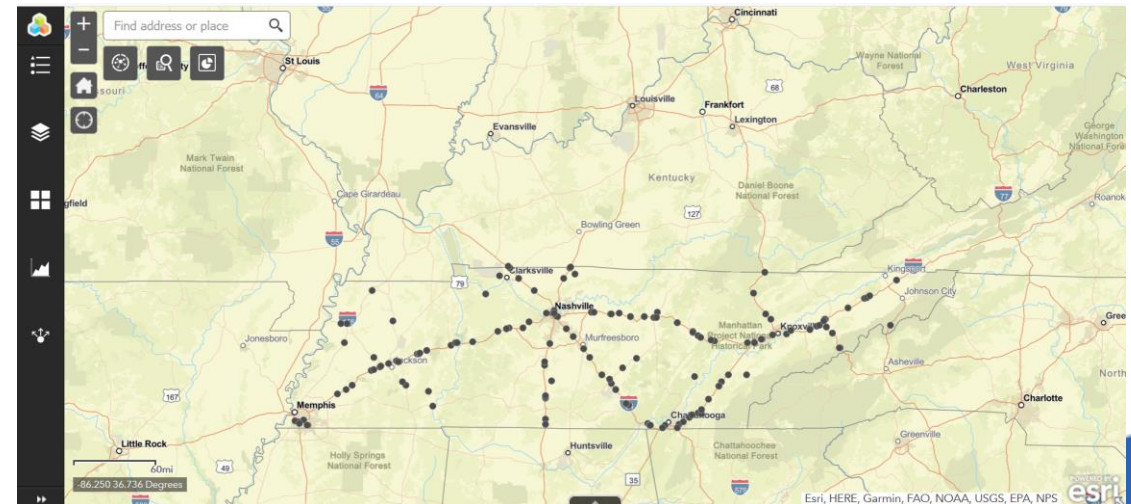
- Utilization/Violations
- Increase Capacity
- New Locations

Utilization/Violations

designation	Location	Description	Capacity	Ave Util	AveUtI_MeanEF	AveUtI_2STD_EF	Median Util	MedUtI_MeanEF	MedUtI_2stdEF	Ave UtI PH	AveUtI
Public	3	REST AREA EB I-40 MM73	10	29.69%	62.47%	117.36%	30.00%	63.12%	118.58%	37.78%	
Public	4	REST AREA WB I-40 MM73	10	27.56%	57.99%	108.94%	30.00%	63.12%	118.58%	37.02%	
Public	16	CLOSED-WELCOME CENTER SB I-65 MM121	15	28.80%	60.60%	113.86%	26.67%	56.11%	105.41%	43.48%	
Public	41	REST AREA WB I-40 MM426	19	31.46%	66.18%	124.34%	26.32%	55.37%	104.02%	46.72%	
Public	12	WELCOME CENTER WB I-24 MM 0.5	31	27.11%	57.04%	107.15%	25.81%	54.30%	102.01%	39.91%	
Public	25	WELCOME CENTER WB I-24 MM160	12	23.36%	49.15%	92.33%	25.00%	52.60%	98.82%	32.95%	
Public	17	CLOSED-WELCOME CENTER NB I-65 MM121	21	26.46%	55.67%	104.59%	23.81%	50.10%	94.11%	38.11%	
Public	9	REST AREA EB I-40 MM170	13	25.31%	53.24%	100.03%	23.08%	48.56%	91.22%	35.06%	
Public	10	REST AREA WB I-40 MM170	13	25.95%	54.59%	102.56%	23.08%	48.56%	91.22%	34.87%	
Public	7	REST AREA EB I-40 MM130	10	20.45%	43.03%	80.84%	20.00%	42.08%	79.06%	28.27%	
Public	8	REST AREA WB I-40 MM130	10	19.70%	41.44%	77.86%	20.00%	42.08%	79.06%	27.85%	
Public	37	TURNOUT EB I-40 MM 336	10	24.95%	52.49%	98.61%	20.00%	42.08%	79.06%	40.00%	
Public	29	TURNOUT WB I-40 MM 306	10	27.97%	58.85%	110.56%	20.00%	42.08%	79.06%	47.63%	
Public	47	WELCOME CENTER EB I-40 MM267	15	20.27%	42.65%	80.12%	20.00%	42.08%	79.06%	28.2	



Capacity Increase/New Facilities



# Limitations

- Expansion factors
- Truck parking duration & GPS signal
  - Short trips with multiple visits to the same truck stop
  - Parking duration unit (e.g., 1 min VS 15 min VS 1 hour)

# Future research

- Improve expansion factors (more GPS data)
- Develop data mining model for capacity expansion/new locations that include:
  - Accidents (involving trucks or during presence of illegal parking)
  - Freight facility locations
  - Commodity flows (disaggregate at zip code level-ongoing project)
  - Trip type (long haul, short haul, drayage etc.)





Thank you

Q/A

Mihalis Golias: [mgkolias@memphis.edu](mailto:mgkolias@memphis.edu)