

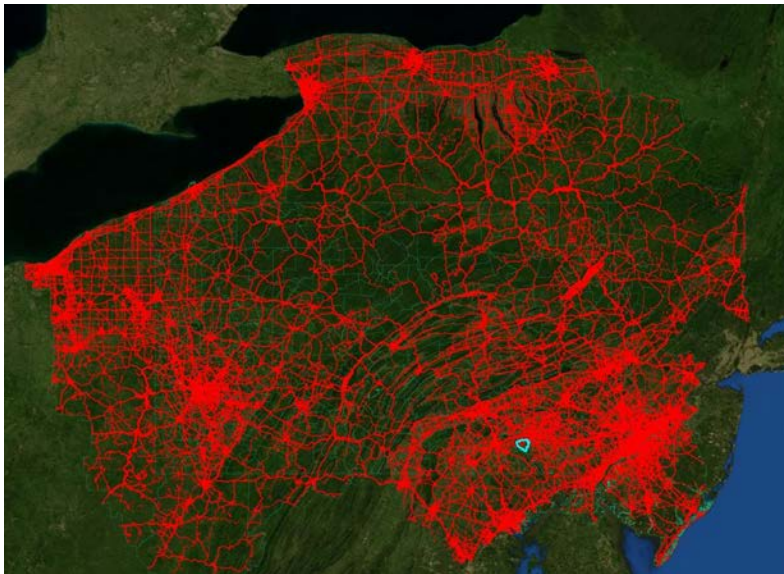


Development of an Agile & Data-Driven Model Framework

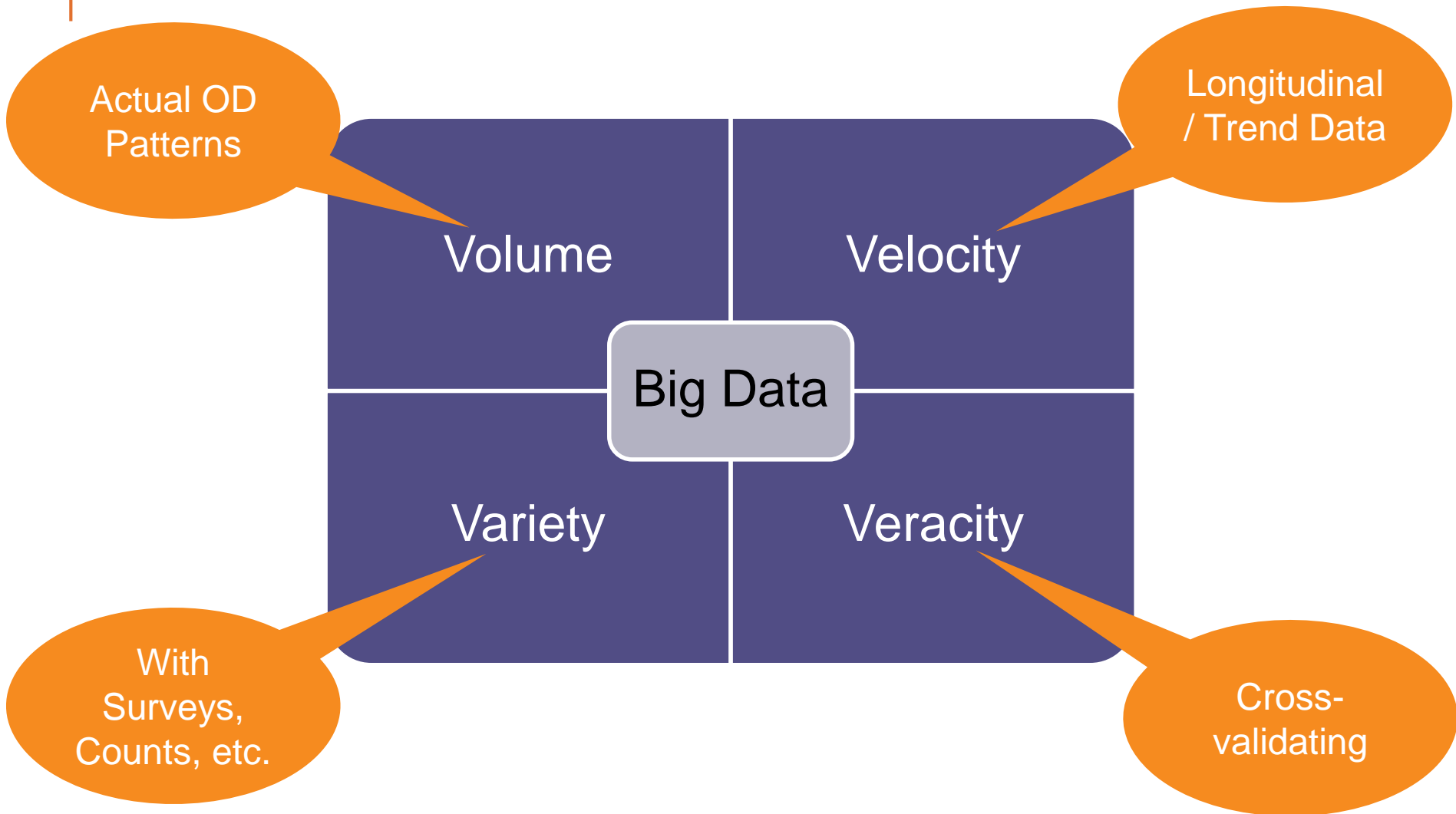
Steven Trevino
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The Challenge

- How can modeling keep up?
 - constant stream of passive data
 - transformative changes in travel



Key 1: Embrace the Data



Key 2: Ensemble Modeling

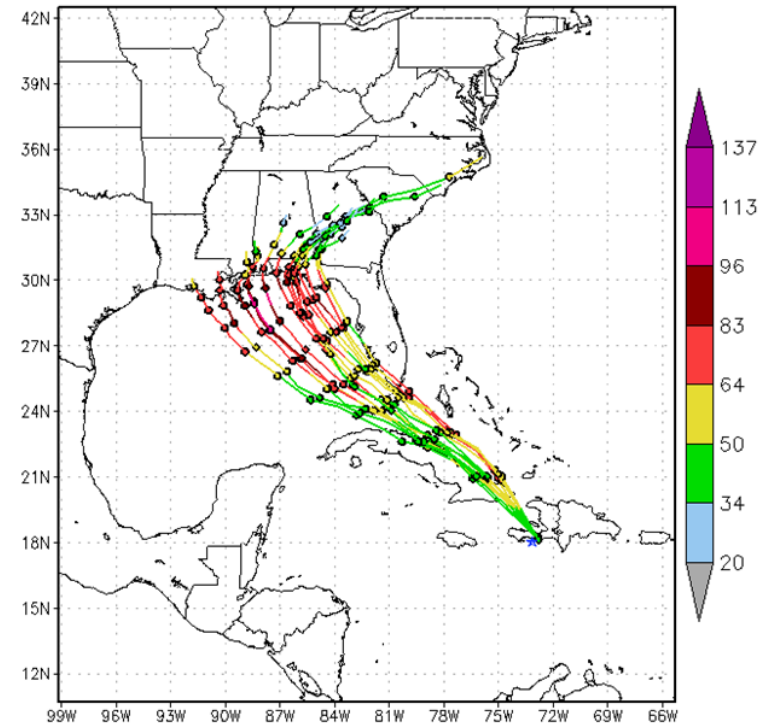
Key insight from machine learning:



Multiple models are better than one

Ensemble Modeling & Forecasting

- Combine multiple forecasts into a “consensus” forecast via binding function
- Works best with different (uncorrelated) models
- Can also “boost” with models in series
- Has led to greater predictive validity (e.g., in meteorology)



Ensemble Forecast of Hurricane Isaac - noaa.gov

Deep Thoughts...

*“All models are wrong; some models are useful.”
– George Box*

- Different models are wrong in different ways
- Being wrong in multiple ways allows you to better understand how you are wrong
- Multiple models will be more useful

An Old Lesson

“There is no single approach to travel forecasting or set of procedures that is ‘correct’ for all applications.”

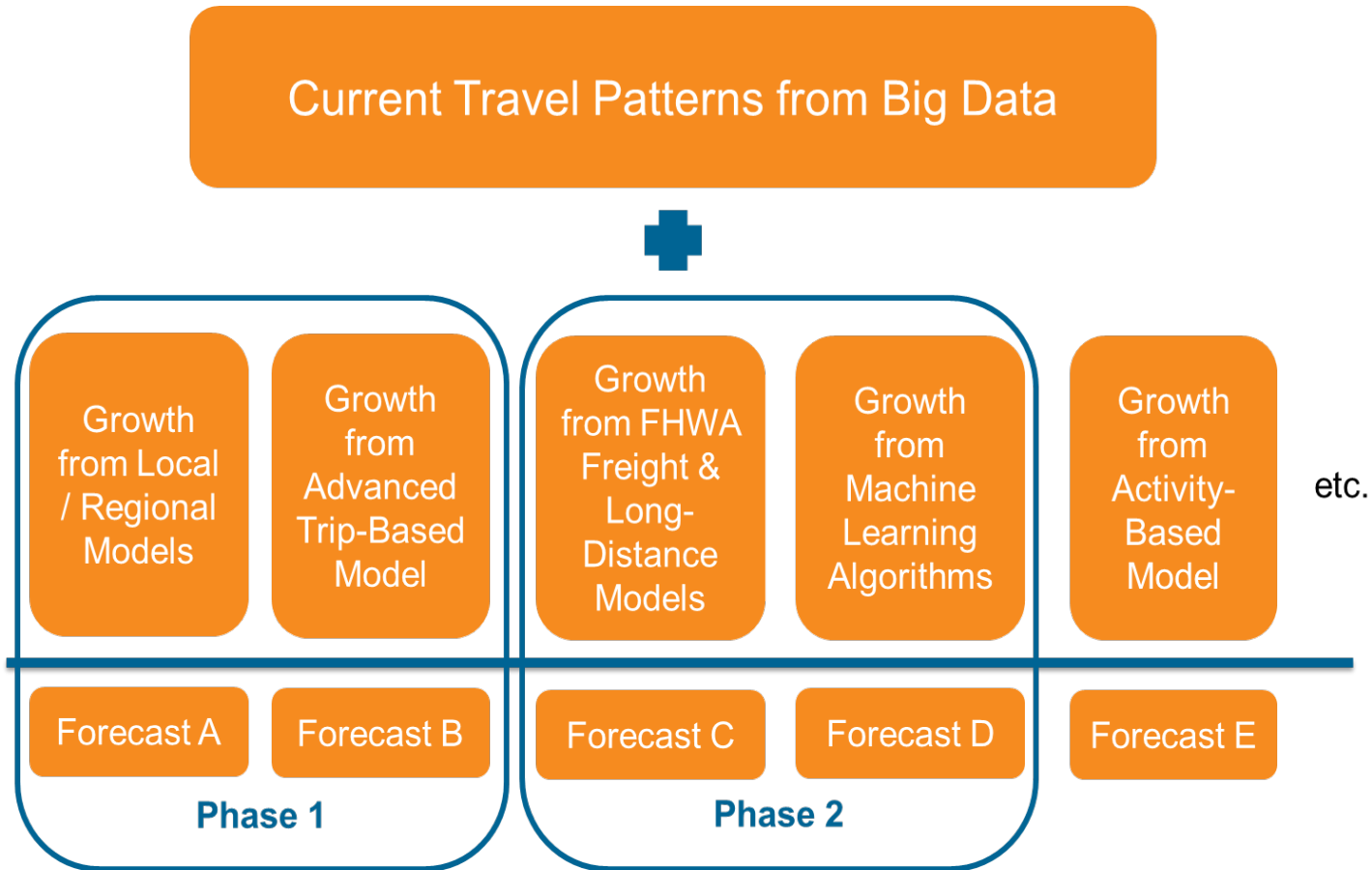
– TRB Special Report 288



Top 25 MSAs – Using Multiple Models Already

| Rank | Region (MSA) | 2010 Population | Agencies | AB Model? | Trip-Based? |
|------|--|-----------------|-------------|-----------|-------------|
| 1 | New York-Northern New Jersey-Long Island, NY-NJ-PA | 19,006,798 | NYMTC | x | |
| 2 | Los Angeles-Long Beach-Santa Ana, CA | 12,872,808 | SCAG | x | x |
| 3 | Chicago-Joliet-Naperville, IL-IN-WI | 9,569,624 | CMAP | x | x |
| 4 | Dallas-Fort Worth-Arlington, TX | 6,300,006 | NCTCOG | | x |
| 5 | Philadelphia-Camden-Wilmington, PA-NJ-DE-MD | 5,838,471 | DVRPC | x | x |
| 6 | Houston-Sugar Land-Baytown, TX | 5,728,143 | H-GAC | x | x |
| 7 | Miami-Fort Lauderdale-Pompano Beach, FL | 5,414,772 | FDOT 4 | x | |
| 8 | Atlanta-Sandy Springs-Marietta, GA | 5,376,285 | ARC | x | x |
| 9 | Washington-Arlington-Alexandria, DC-VA-MD-WV | 5,358,130 | MWCOG | | x |
| 10 | Boston-Cambridge-Quincy, MA-NH | 4,522,858 | CTPS | plan | x |
| 11 | Detroit-Warren-Livonia, MI | 4,425,110 | SEMCOG | plan | x |
| 12 | Phoenix-Mesa-Glendale, AZ | 4,281,899 | MAG | x | x |
| 13 | San Francisco-Oakland-Fremont, CA (SF county only) | 4,274,531 | SFCTA | x | |
| 14 | Riverside-San Bernardino-Ontario, CA | 4,115,871 | SCAG | x | x |
| 15 | Seattle-Tacoma-Bellevue, WA | 3,344,813 | PSRC | x | |
| 16 | Minneapolis-St. Paul-Bloomington, MN-WI | 3,229,878 | Met Council | x | |
| 17 | San Diego-Carlsbad-San Marcos, CA | 3,001,072 | SANDAG | x | |
| 18 | St. Louis, MO-IL | 2,816,710 | EWGW | | x |
| 19 | Tampa-St. Petersburg-Clearwater, FL | 2,733,761 | FDOT 7 | x | x |
| 20 | Baltimore-Towson, MD | 2,667,117 | Met Council | x | |
| 21 | Denver-Aurora-Broomfield, CO | 2,506,626 | DRCOG | x | |
| 22 | Pittsburgh, PA | 2,351,192 | SPC | | x |
| 23 | Portland-Vancouver-Hillsboro, OR-WA | 2,207,462 | METRO,ODOT | x | x |
| 24 | Cincinnati-Middletown, OH-KY-IN | 2,155,137 | OKI | x | x |
| 25 | Sacramento--Arden-Arcade--Roseville, CA | 2,109,832 | SACOG | x | |

New Framework



Proposed Framework for Illinois Statewide Model



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