

Data-Driven Modeling Engine for Short-Term Forecasting

*MetLife Stadium (MLS) Transit Ridership
Forecasting Approach*

presented to

Model Task Force, Fall 2023

presented by

Cambridge Systematics, Inc.

Nikhil Puri

TEAM: Moby Khan, Jason Lemp, Daniel Patterson, and Xuenan Ni



CAMBRIDGE
SYSTEMATICS

Think  Forward

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Data-Driven Models in Response to Demand Model Pain Points

CHALLENGES

Long model development & run times

Constrained by model limitations

Difficulty explaining results

Poor reporting and visuals

APPROACH

Data-driven models*

Scalable and short run times

Improved visuals and reporting

Rooted in modeling best practices
for short-term forecasts

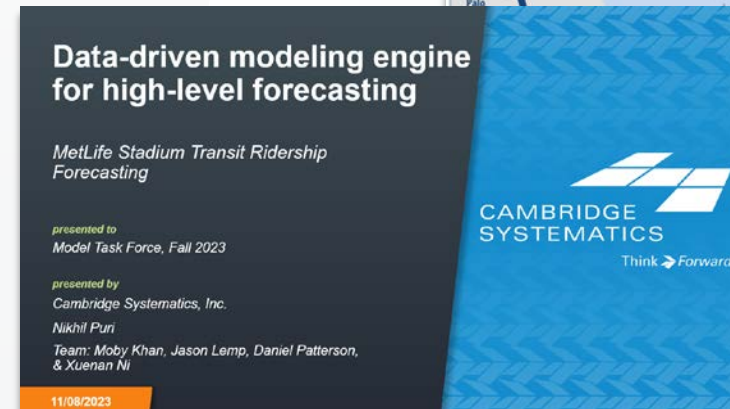
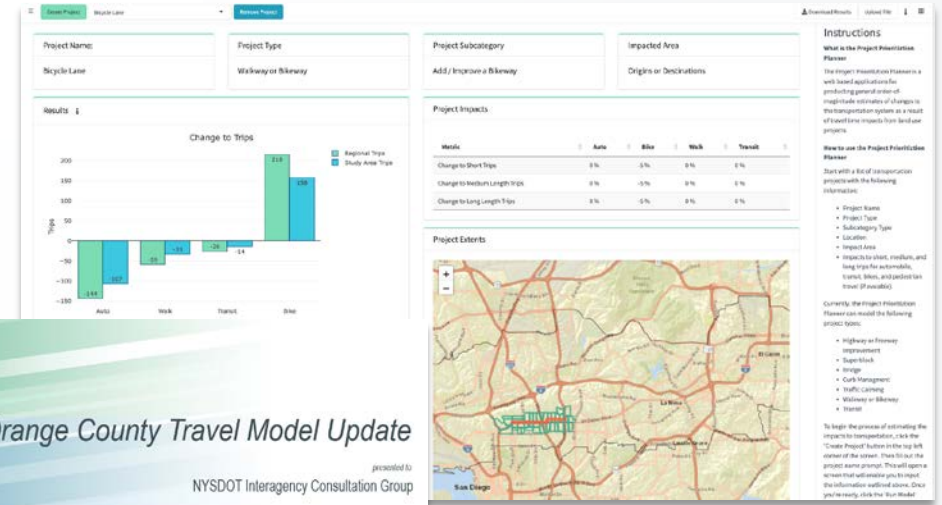
Ability to blend data sources and model input

* Data-driven models are data agnostic

Big Data-Driven Model Examples



- » **ORANGE COUNTY, NY** – Model development from scratch in the absence of a household travel survey
- » **SAN DIEGO** – Multimodal sketch planning tool – walking, biking, transit mode shares
- » **METLIFE STADIUM DATA-DRIVEN MODEL**
- » **ONEIDA COUNTY, NY** – Highway corridor sketch planning model (underway)
- » **SAN FRANCISCO BAY** – Mode share and transit competitiveness sketch planning tool



MetLife Project Description

Secaucus Junction –
Meadowlands Complex

Secaucus Junction

10 rail lines | Gameday rail to MLS

Meadowlands Complex

MetLife Stadium

American Dream Mall

Racetrack

Key Events

Football and soccer games

Concerts

Weekends



Modeling Approach Rationale

CREATIVE SOLUTION TO A NONTRADITIONAL CHALLENGE

CHALLENGE

Predominantly weekend travel

Flexibility to expand service market

Ability to consider markets beyond model region

Limited data availability

Short deadline

APPROACH

Leveraged LOCUS – allows scalability
add tailored solutions

Developed a sketch planning tool
using best practices

Leveraged regional models

Short-term forecasts

* LOCUS – Big data platform developed by Cambridge Systematics

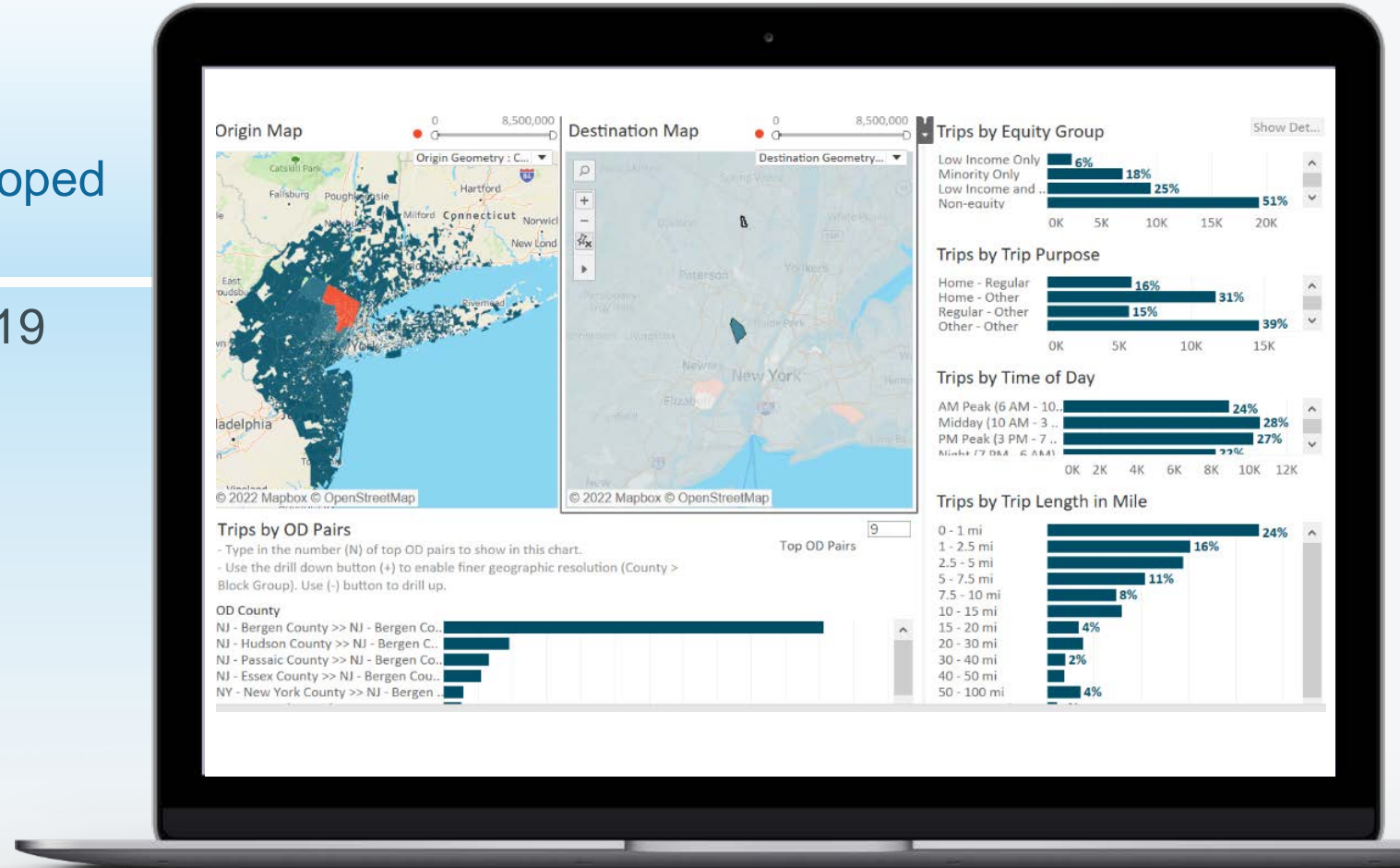
Establishing a Baseline – LOCUS



LOCUS

BIG DATA PLATFORM developed
by Cambridge Systematics

- ✓ Anonymized cell phone data – 2019
- ✓ Travel patterns
 - » origin-destination
 - » time of day
 - » equity tagging
 - » trip purpose
- ✓ Dashboarding
- ✓ Ability to analyze raw data to answer unanticipated questions



Trip Generation

Trip Generation is an input into the model

For example, the user specifies the following:

- **Number of MLS attendees** for a particular event
- **Number of visitors to the mall**

Event type is an input

- **For stadium** – sports event, concert, and other
- **For mall** – weekday, Saturday or Sunday

Trip Distribution

Relied on LOCUS data for trip distribution

- Census block group level

Tailored approach to account for lower than anticipated sample size

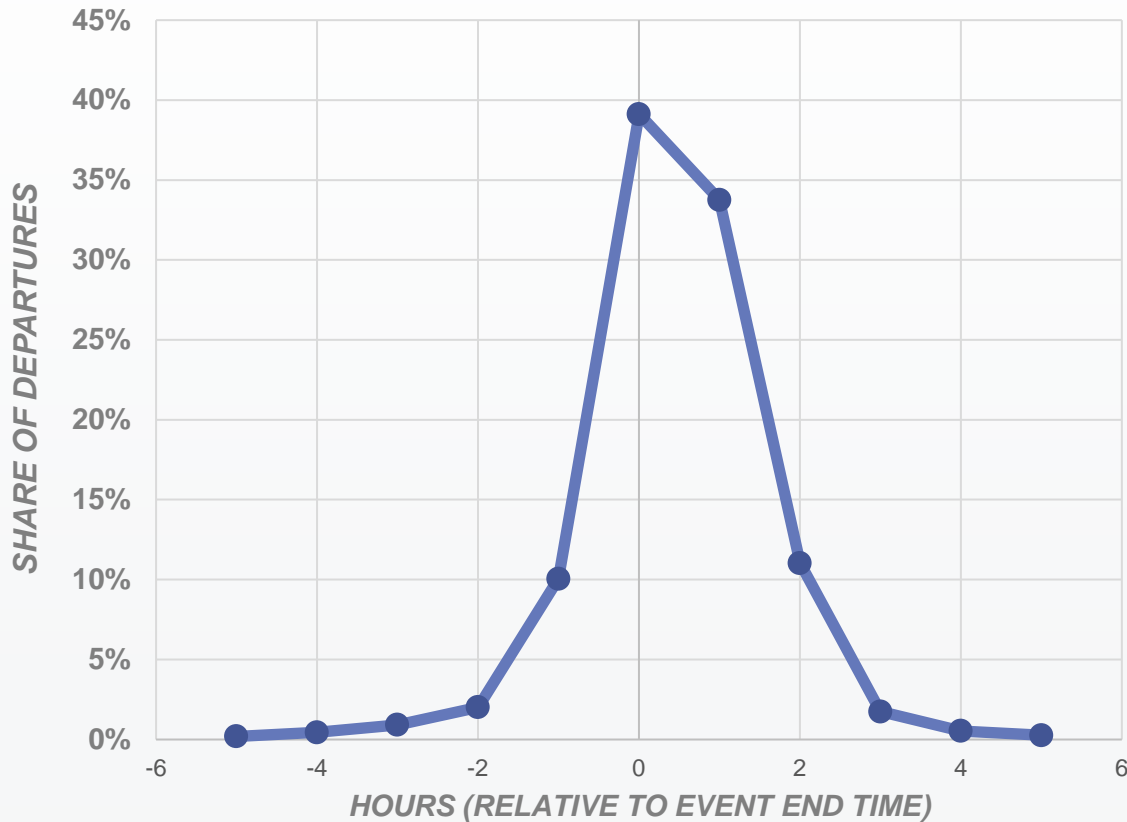
- Used trip (origin-destination) and home location information

Ability to leverage raw data

- Analyzed data to understand visits to the **stadium** and the **rail line**
- Identify calendar date of event
- Distributions by geography, time of day, etc.

Alternative Scenario Results (Typical NFL Game) – Hourly Distribution

HOURLY DISTRIBUTION OF DEPARTURES
AFTER A NFL GAME



73% DEPARTURES within
2 HOURS of event ending

Hour before
game end

10%

Hour 0-1
after game

39%




Hour 1-2
after game

34%

TRANSIT DEPARTURE BY HOUR

Hourly Departure Splits	Hour	Outbound
39%	Hour 0-1	4,075
34%	Hour 1-2	3,543

Baseline Results

Mode		Daily Inbound		Daily Outbound		Total
	Bus	2,099	3%	2,359	3%	4,457
	Rail	7,357	10%	8,299	11%	15,656
	Auto	65,574	87%	64,372	86%	129,946
TOTAL		75,030	100%	75,030	100%	150,060

Assumed ~ 75K attendees

Sensitivity Testing

Types of sensitivity tests conducted

- **Doubled the fare** – decreased ridership by approximately 30 percent
- **Increased travel times** – resulted in a 12 percent reduction in ridership
- **Reduce rail headways** – increased ridership by approximately 11 percent

Validation and sensitivity test results vetted by agency staff and thought to be reasonable

Alternatives/Scenario Planning

TYPICAL NFL GAME WITH INCREASED TRANSIT SERVICE

Meadowlands Rail + New Transit Mode

Secaucus Junction – Meadowlands





- **Rail** –15 min IVT & 15 min headway (4/hour)
- **New Transit Mode** ~ 13 min IVT & ~ 90 second headways (38 per hour)

Modeled

- Combined “rail” mode
- ~ 90 sec headways
- ~ 12.8 min travel time (weighted average)







Alternative Scenario Results (+ New Transit Mode) – Typical NFL Game

Mode	Daily Inbound		Daily Outbound		Total
 Bus	1,958	3%	2,151	3%	4,109
 Rail	3,965	5%	4,390	6%	8,355
 New Transit Mode	5,446	7%	6,031	8%	11,477
 Auto	63,660	85%	62,458	83%	126,118
Total	75,030	100%	75,030	100%	150,060

- New Transit Mode modeled as rail – similar attributes
- Approx. **16 % transit share**, including buses
- **27% increase in daily Rail + New Transit Mode ridership** between Secaucus & MLS, compared to baseline
- **~ 46 % shift from Rail** to New Transit Mode attributable to high frequency New Transit Mode service

Large Sporting Event

(Rail + New Transit + Additional Visitors from NYC , Hudson, Essex+ Reduced Parking)

Mode	Daily Inbound		Daily Outbound		Total
 Bus	2,500	3%	2,800	3%	5,300
 Rail	12,500	15%	13,000	16%	25,500
 New Transit Mode	17,400	21%	18,100	22%	35,500
 Auto	50,100	61%	48,600	59%	98,700
Total	82,500	100%	82,500	100%	165,000

Assumption – 1.5 X baseline share of visitors from New York, Essex, Hudson, Queens, and Kings counties

- *Reduced outside counties by delta*
- *Reduced parking by 65% (28K to 9.8K)*
- Approximately **40% transit share**, including buses

In Summary

Alternate approach to travel demand models that offers:

- **Geographic flexibility and scalability**
- **Quick run times**
- **Scenario testing**
- **Data fusion**
- **A variety of applications –** transit mode choice, highway corridor studies, multimodal planning, and a framework to develop a simpler travel demand model

Ability to run models in the cloud

Caveats

- **Not a replacement for long-term forecasting models**
- **Ideal for short-term forecasting and sketch-planning**

Contact Information

Thank You for Listening !

Nikhil Puri

Cambridge Systematics

email: npuri@camsys.com

Tel: 201-926-0425