



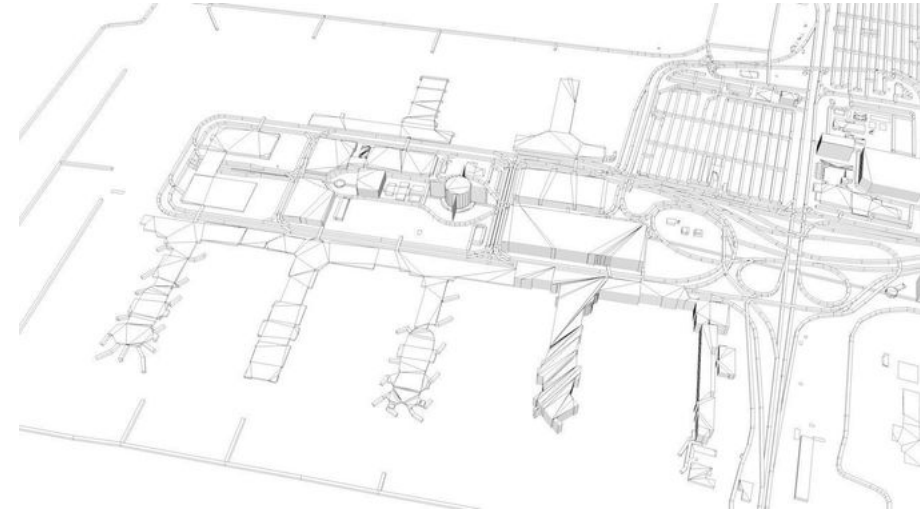
Data Trends: Improving Airport Operations and the Passenger Experience

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LAX Perspective

- LAX Strategic Plan
- Airport Management: business objectives
- 600+ Data Sets in and around airport
- Newly created Data & Analytics Center of Excellence (CoE)



Problems that LAX Needs to Solve

Traffic Congestion:

LAX needs to predict trends on lane closure data due to capital improvements that will reduce the number of car lanes in the CTA placing additional strain on the ~5200 vehicles passing through every hour

Retail Optimization:

LAX needs to establish buy behavior and anticipate potential impacts to concessions to optimize terminal throughput and queue management

Facility Operations:

LAX needs data and trends to better react and implement passenger movement contingencies to reduce downtime and increase availability at restrooms, elevators, escalators and walkways

Security and Surveillance

Enhancement:

To increase TSA/CBP flow and wait times, LAX needs data and predictive trending on passenger count, pattern analysis and event recognition

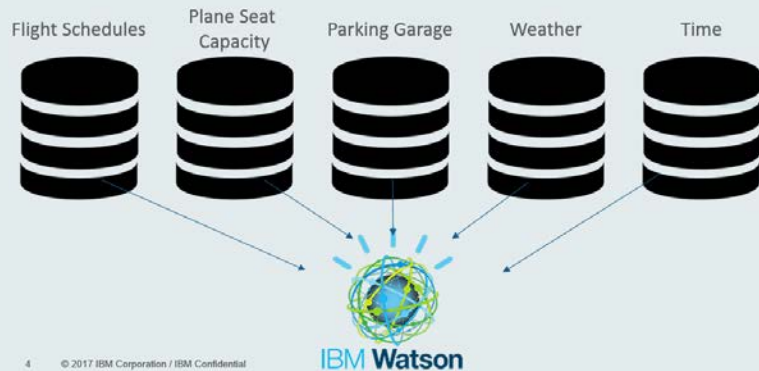
Project Highlight - Traffic Congestion Prediction Model

Using AI/ML to predict when the CTA will reach threshold levels

Actionable Insight: Pre-deploy traffic mitigation resources before thresholds are reached.

Watson Congestion Predictive Modeling – Data Inputs

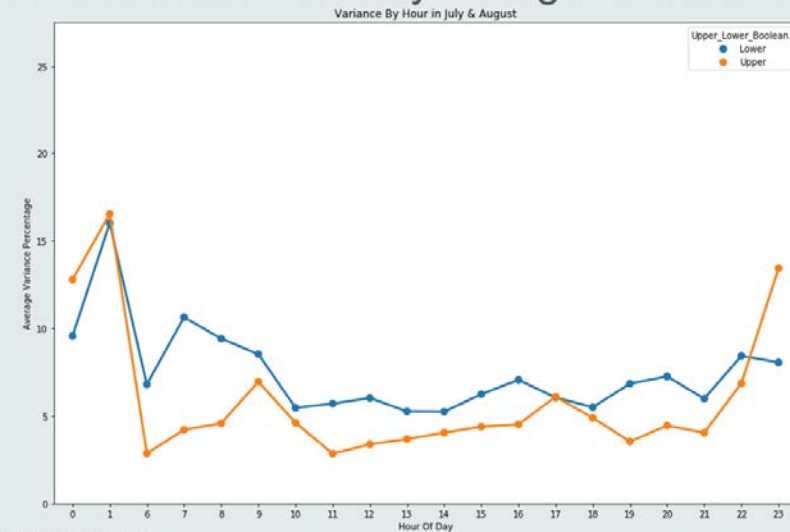
- 62 Independent Variables are currently being fed into new Watson Machine Learning Algorithm
- Same 5 Main Data Sources



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Model Performance on July & August Actual Data



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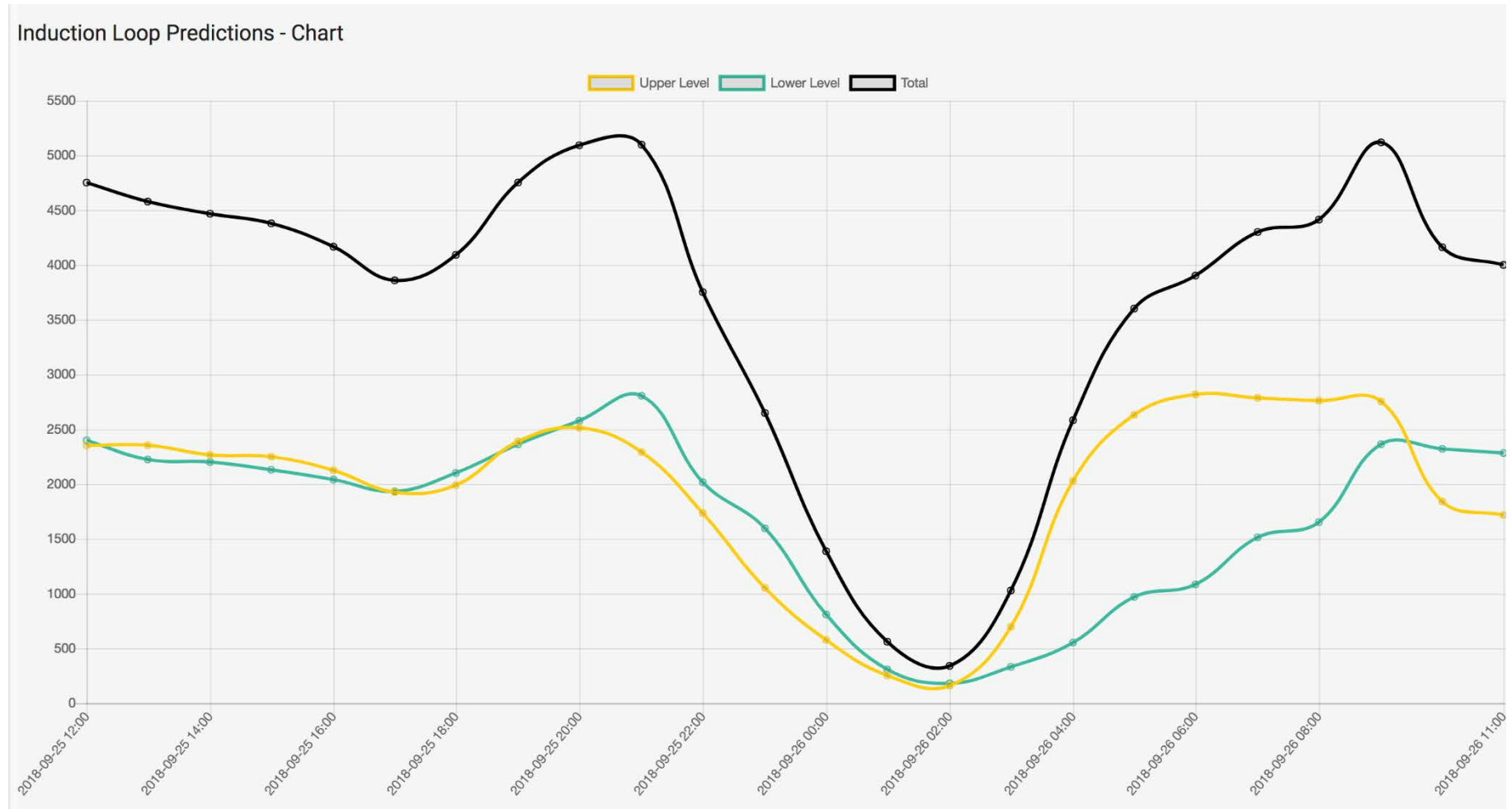
Project Highlight - Traffic Congestion Prediction Model

Using AI/ML to predict when the CTA will reach congestion threshold levels

LAX Central Terminal Area - Vehicle Count Prediction Chart

Peak ~5200 vehicles per hour

Black: Total Count
Yellow: Upper Level
Green: Lower Level

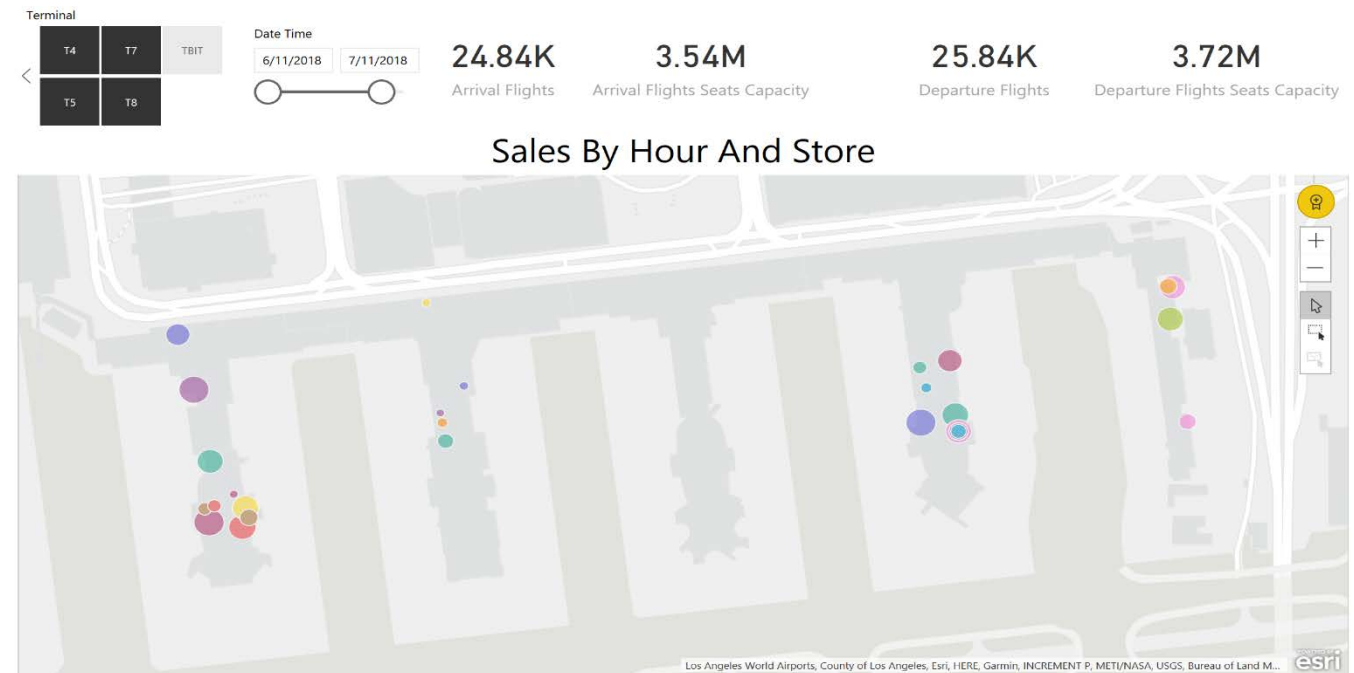


Project Highlight - Concession

Using sales data and flight schedule to establish buyer behavior at the hour level

Actionable Insight:

- Tailor concession offering based on origin/destination profile of the guest. (Example more grab & go vs sit down dining)
- Anticipate potential impacts to concession that are heavily correlated with guest origin/destination.



Project Highlight – Facility Operations

SMART conveyance dashboard monitoring passenger movement.

Last Update: Maximo Sync
2 minutes ago

SMART - Maximo Conveyance Dashboard

Current Time:
09-21-2018, 0932 PDT

ColumnsReset FiltersClick on a cell in the Summary Table to filter for discrepancies in the indicated terminal and/or of t

Terminal	Asset Type	Legacy Name	Indicators	Date Down	Estimated RTS
02	Escalators	T2-ES-12		8/2/2018 7:24:48 AM	10/18/2018 7:08:00 AM
03	Escalators	T3-ES-01	⚠	9/21/2018 9:22:01 AM	
03	Escalators	T3-ES-08		9/21/2018 8:09:18 AM	
4C	Moving Walkways	T4C-MWW-22		7/22/2018 7:54:19 AM	10/24/2018 9:13:00 AM
05	Escalators	T5-ES-17		9/19/2018 1:53:10 PM	10/18/2018 7:00:00 AM
06	Elevators	T6-EL-10	⚠	9/21/2018 8:18:10 AM	
07	Moving Walkways	T7-MWW-15		4/18/2018 8:35:02 AM	11/30/2018 7:09:00 AM
TB	Elevators	C12EL02		9/20/2018 9:16:06 PM	9/25/2018 8:23:00 AM
TB	Escalators	ES2-BC		8/24/2018 7:11:42 AM	10/10/2018 1:03:00 PM
TB	Escalators	C11ES02 (formerly CE-9)	⚠	9/21/2018 8:22:48 AM	9/25/2018 8:11:00 AM
TB	Moving Walkways	MW5-S05		5/21/2018 10:58:47 AM	10/30/2018 9:04:00 AM
TB	Moving Walkways	MW2-S04		9/14/2018 7:37:02 AM	9/30/2018 12:00:00 AM

	Elevators	Escalators	Moving Walkways
Terminal 1			X
Terminal 2		1 / 14	X
Terminal 3		2 / 11 ⚠	X
TBIT	1 / 62	2 / 53	2 / 10
4C			1 / 5
Terminal 4			
Terminal 5		1 / 17	X
Terminal 6	1 / 10 ⚠		X
Terminal 7			1 / 1
Terminal 8			X
Parking / Other	2 / 61	X	X

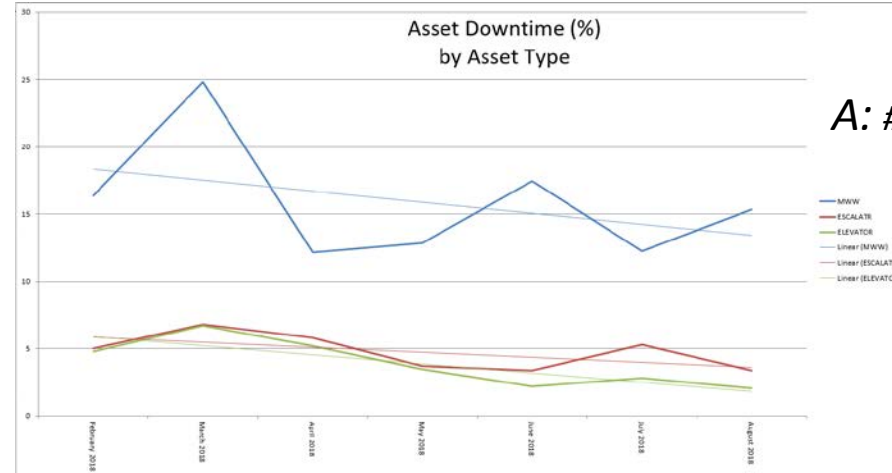
All ClearDown / TotalX = N/A

⚠ = Injury⚠ = Critical Asset

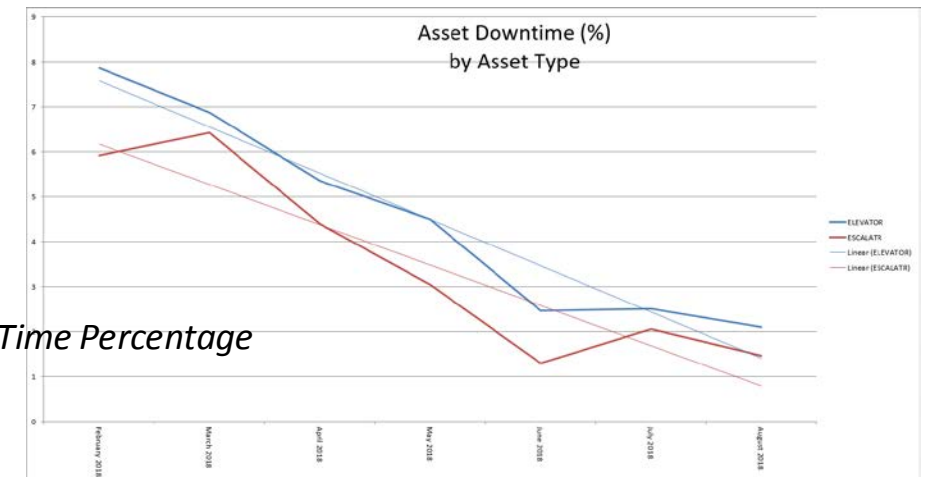
Problems that Airports Need to Solve - Deeper

Conveyance Assets: Down Time Trends

Month	MWW	ESCALATR	ELEVATOR
August 2018	15.34	3.37	2.06
July 2018	12.24	5.28	2.8
June 2018	17.46	3.35	2.18
May 2018	12.86	3.71	3.45
April 2018	12.17	5.79	5.21
March 2018	24.83	6.81	6.72
February 2018	16.36	5.01	4.8



B: Down Time Percentage

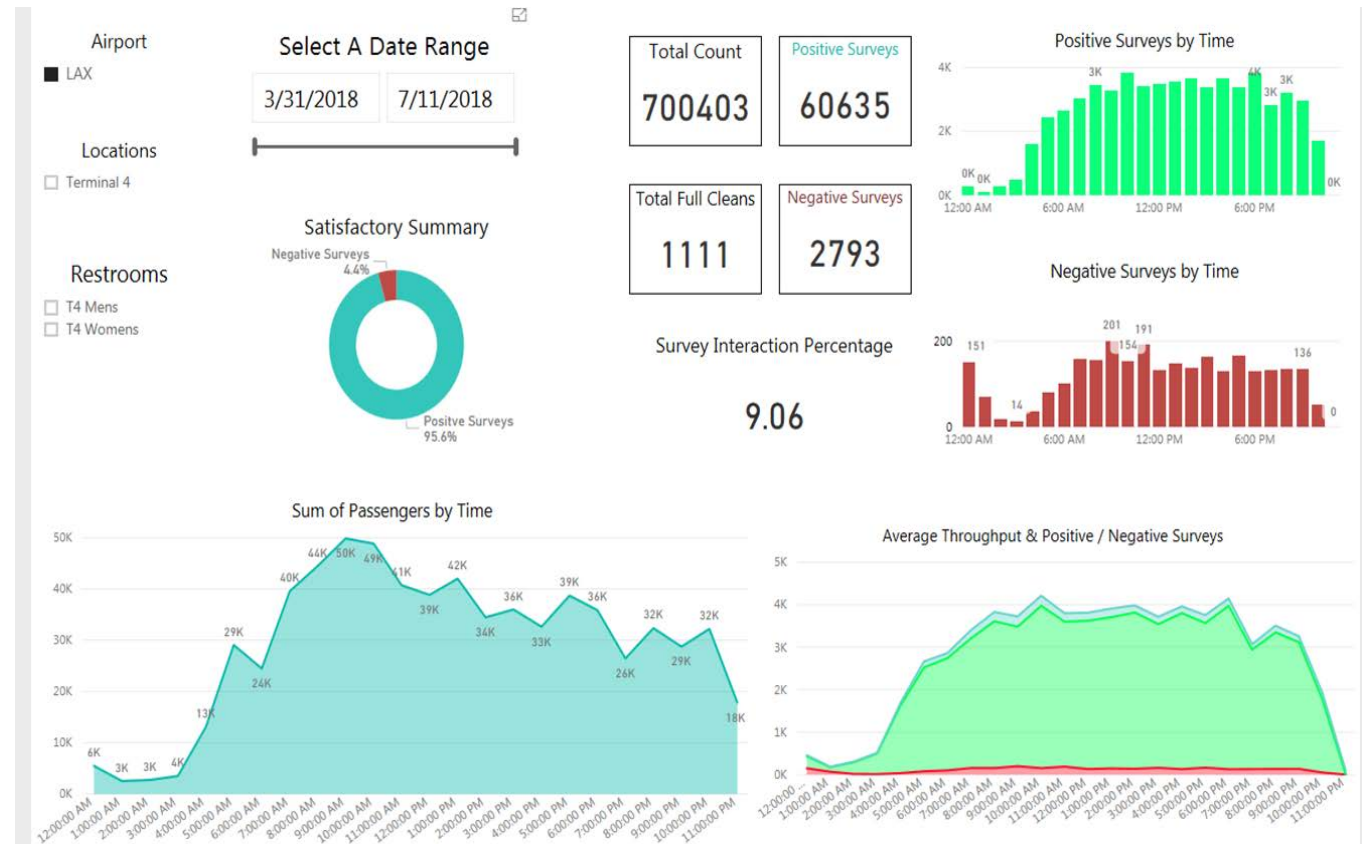


Project Highlight: SMART Restroom

Track passenger feedback and custodial response through a variety of technologies

Actionable Insight:

- Measure Employees' Cleaning Duration
- Benchmark Cleaning Duration vs Guest Feedback
- Use Real-Time Guest Feedback to Improve Restroom Experience

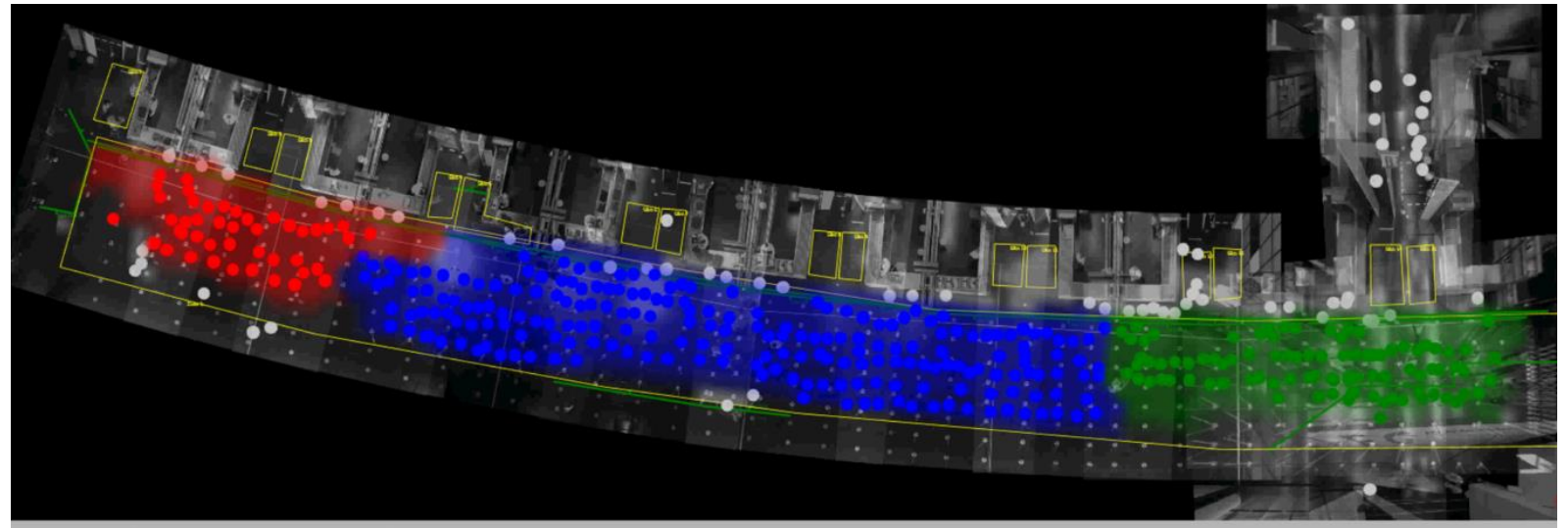


Project Highlight: People Tracking

Track passenger paths and dwell time

Example 1: Waiting times in front of security checkpoints

- Separation of business/economy/transfer queues for managing overflow situations and line changes using advanced queue detection.
- Performance of each individual lane and the complete checkpoint, including throughput, number of PAX, activity at the X-ray belt, and process time.



	Name	Queue Length	Wait. Back.	Wait. Forw.	Out Flow
■	Business	44	3m	3m	674
■	Eco	205	8m	9m	1173
■	Transfer	91	6m	7m	729

What LAX Needs to Provide Additional Data Trends

Intelligent Software Platforms:

Collect multiple video streams and other data from various IoT appliances and sensors:

- Advance Object Detection
- Behavioral Recognition
- Advance Event Detection
- Media Broadcast Analysis
- Conversation Monitoring
- LPR
- Watch List, People / Vehicle Search

People/Pedestrian - Detection, character recognition, tracking, and movement pattern analysis:

- Motion Detection
- Pedestrian Flow & Direction
- Speed/Queuing Anomalies
- Crowd Behavior Anomalies

Objects - Detection, character recognition, tracking, and movement pattern analysis:

- Object Loitering (i.e. Unattended Bag)
- Object Missing

Vehicles - Detection, character recognition, tracking, and movement analysis:

- General Detection Identification & Tagging
- Unique Identification (i.e. ALPR, unique profile)
- Vehicle Speed, Density, Flow & Direction
- Traffic control and management

LAWA Challenges / Lessons Learned

- Procurement strategy
 - Cost—not a traditional CIP
 - Long term lease agreements don't include data sharing T&Cs
 - Getting the organization to operationalize the use of the data
 - Determining the right technology that will have the broadest impact on analytics
 - Going from operational data gathering to analytics data gathering
 - Data scientist skills needed
 - Deliver Data and Analytics at the Optimal Point of Impact
-

Next Phases of our Journey

- Guest Engagement Strategy
- IoT Sensors
- Interactive Kiosks
- Smart Parking
- Internal collection of data sets, overlaying for ML
- Curbside Analytics
- Energy Reduction / Savings
- Enhance PR with Data-Backed Storytelling



Outcomes



- Data and analytics will drive our business operations rather than just reflect them
- Analytics will become increasingly pervasive, spreading to places where it never existed before
- We will learn how to best get information out to the people and processes that will gain value from it



Thank You