Short Term Recovery

Utilizing data analytics cell within the JFO (Irma and Harvey) immediately following the disaster to better inform recovery operations (e.g. innovative approach to SDEs).

Background

- Substantial Damage (SD) determinations are made by Local Building Official
- Substantial Damage: Damage of any origin sustained by a structure whereby the cost of restoring the structure to its pre-damage condition would equal or exceed 50% of the market value of the structure before the damage occurred.

Substantial Damage occurs when:

$$\frac{\text{Cost of Repairs}}{\text{Pre-Damage Market Value}} \geq 50\%$$

- Local officials are supporte EMA's SDE Tool
- Historically, structures to be inspected are identified by local officials or by FEMA
  - Can take considerable amount of time to develop list
  - Delays the inspections and the rebuilding process.

Analytic Cell

– 2017 Hurricane Season: Record flooding and damage: Harvey, Irma and Maria

– FEMA sought data driven approach to SD process to reduce the number of inspections

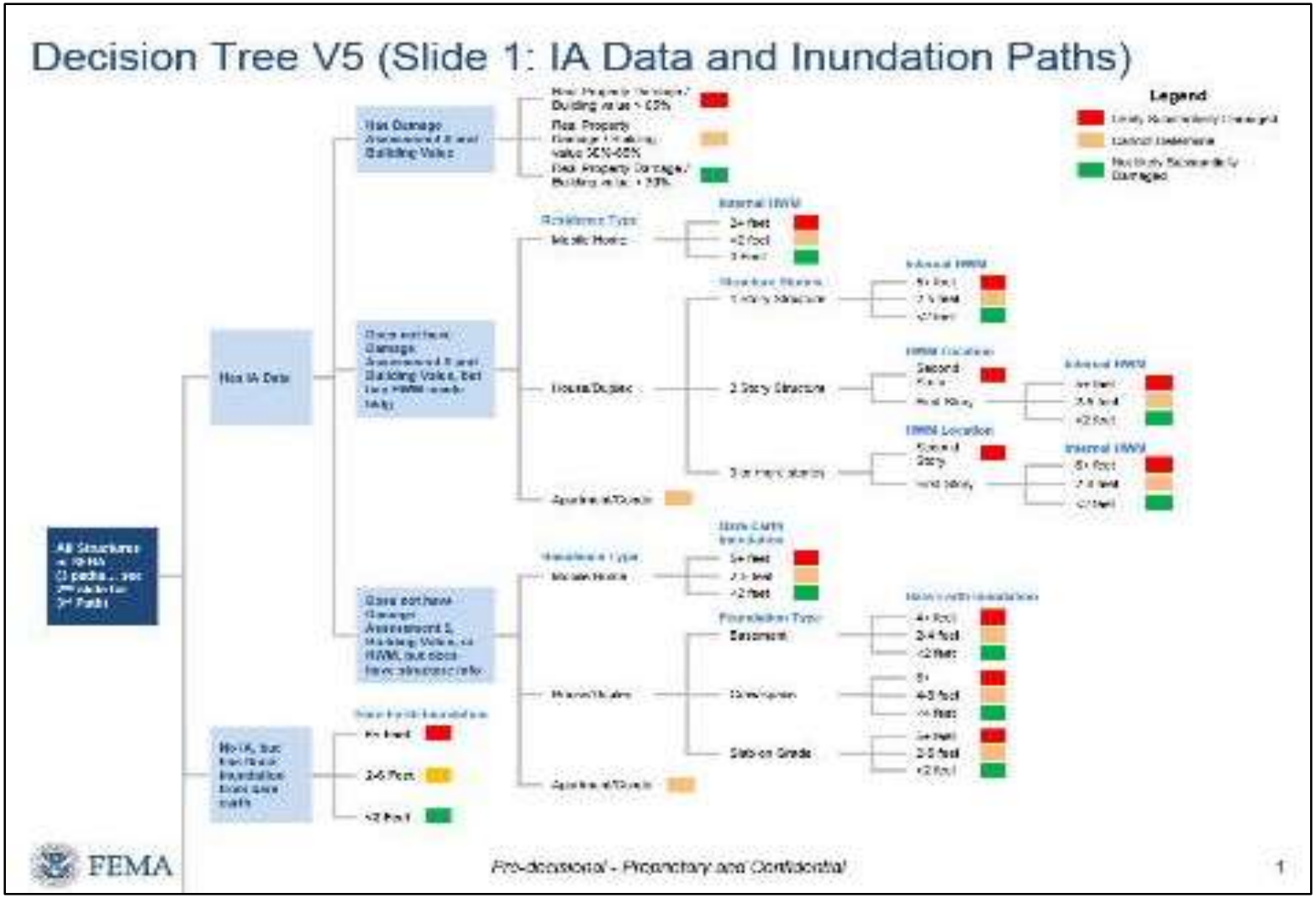
– Stood up Analytic cells for all three events

Harvey Analytic Cell

- FEMA initiated AC in JFO and developed initial tool
- Transitioned to Compass
- Python based Script
- Implemented the results and reduced the number of SDE inspections

As many as 10 inspections can occur in the recovery process

Harvey AC - Decision Trees



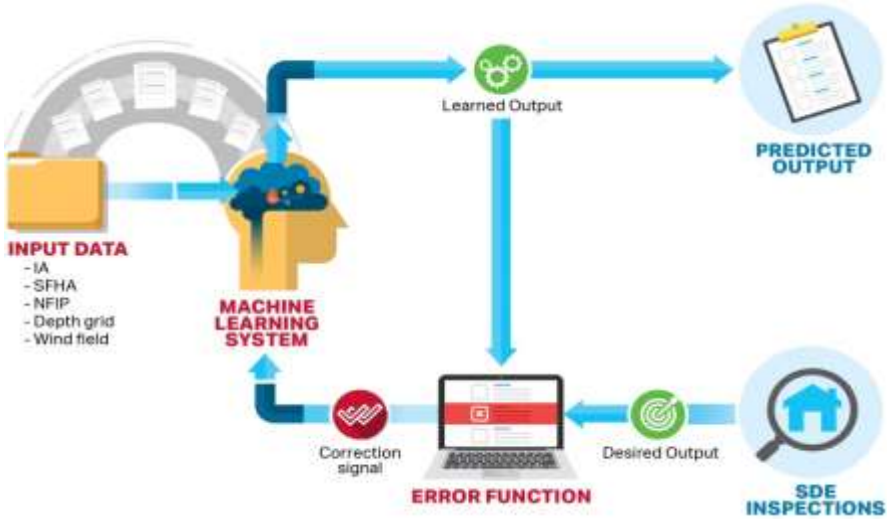
Harvey AC

Sensitivity and Validation Analysis

Validated Decision Tree Model V8 for binary classification of the two classes – *Not Likely Significantly Damaged* and *Likely Significantly Damaged* using standard statistical techniques

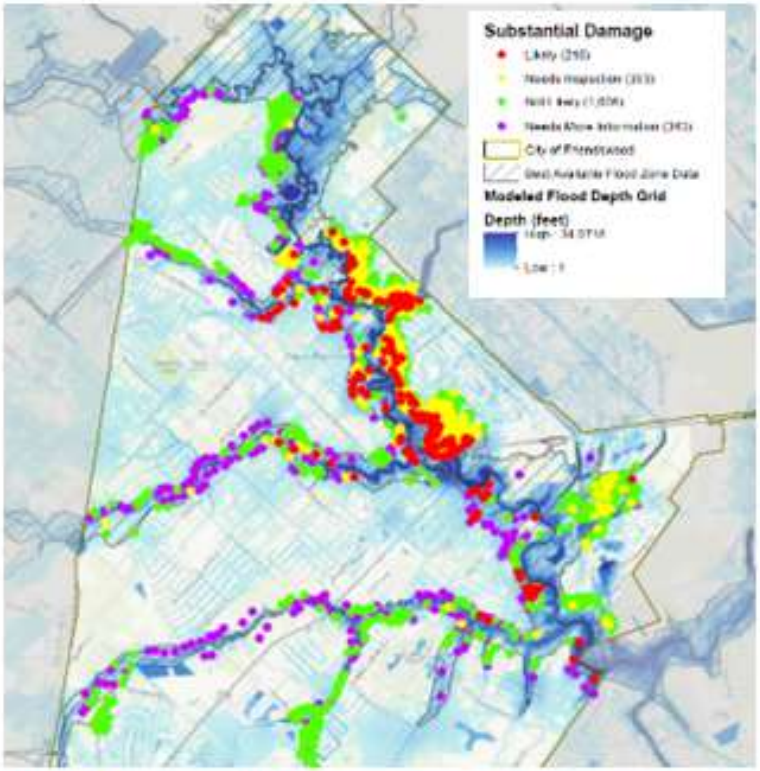
Findings

- IA-based (path 1) predictions were meaningfully correlated with actual SD determinations



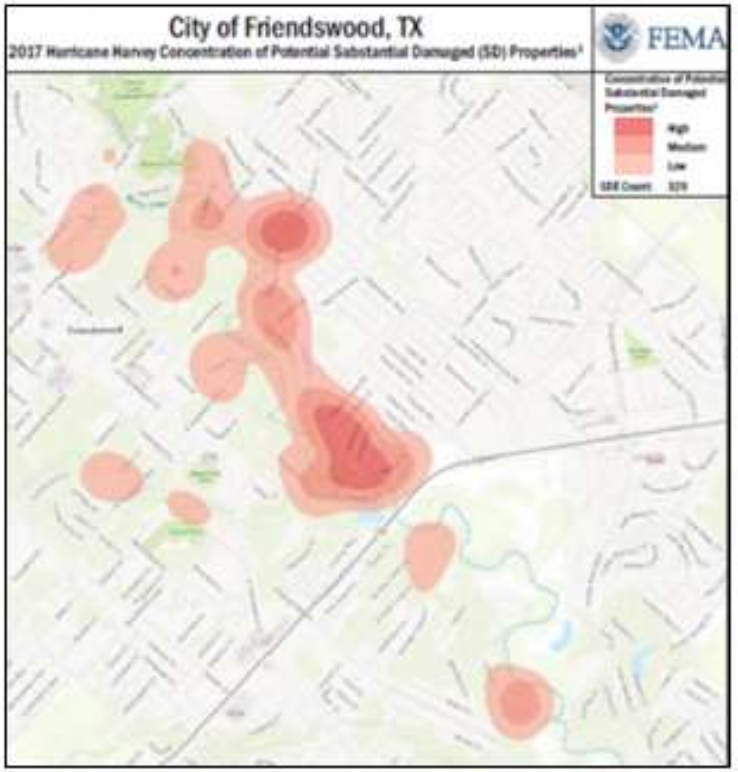
Harvey AC –Automated Products

- **Pre-inspection:** Developed products to support triage meetings, initial model output



Initial Model Output Provided at Triage Meeting

- **Post Inspection:** Developed products to support mitigation discussion



Hot Spot Map

Training

- Training provided on FEMA Region VI's new Rapid Artificial intelligence Damage Triage (RADAT) tool to to support the substantial damage estimation process

- Attendees from Regions 2, 3, 4, 6, 7 and headquarters learned about the Harvey Analytics Cell's efforts immediately following the disaster to develop a model that triaged structures that required in-field SDE inspections.

New SDE Tool | RADAT

- Includes all validated components of the existing FEMA process
- Deploys machine learning artificial intelligence (AI) tools to provide additional predictive capacity when structure-specific inspection findings from the IA process are not available
- Provides an adaptable framework for the future

RADAT
Rapid AI Damage Triage BETA

Irma Analytic Cell

- No FEMA Analytic Cell Team JFO

- Compass commenced after inspections were underway so not used for screening of SDE inspection

- Initially coordinated with FEMA AC team for background, processes, and data needs

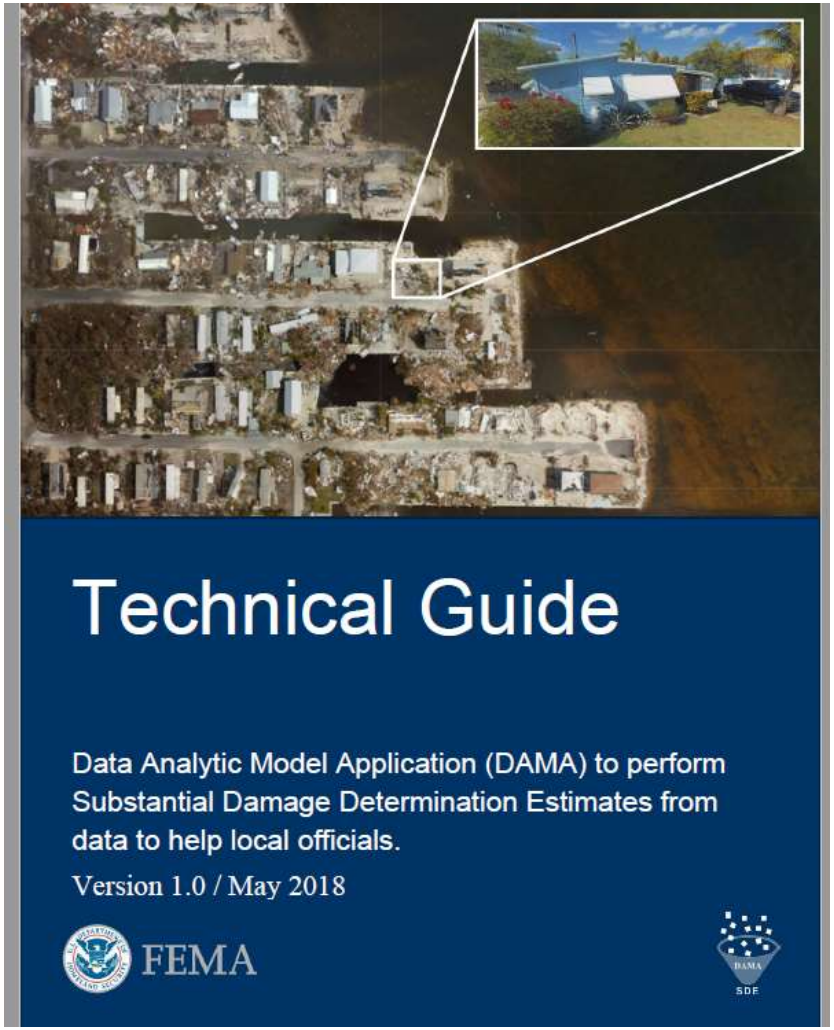
- Focus on new model for future disasters

Irma Analytic Cell

Data Analytic Model Application

- Web based application to;
  - Identify hotspots
  - Provide recommendations to Floodplain Administrators in making SD determinations
  - Generate Inspection ready assignments
  - Efficiently share information between stakeholders

  Allows users to update input with field verified data (HWH)

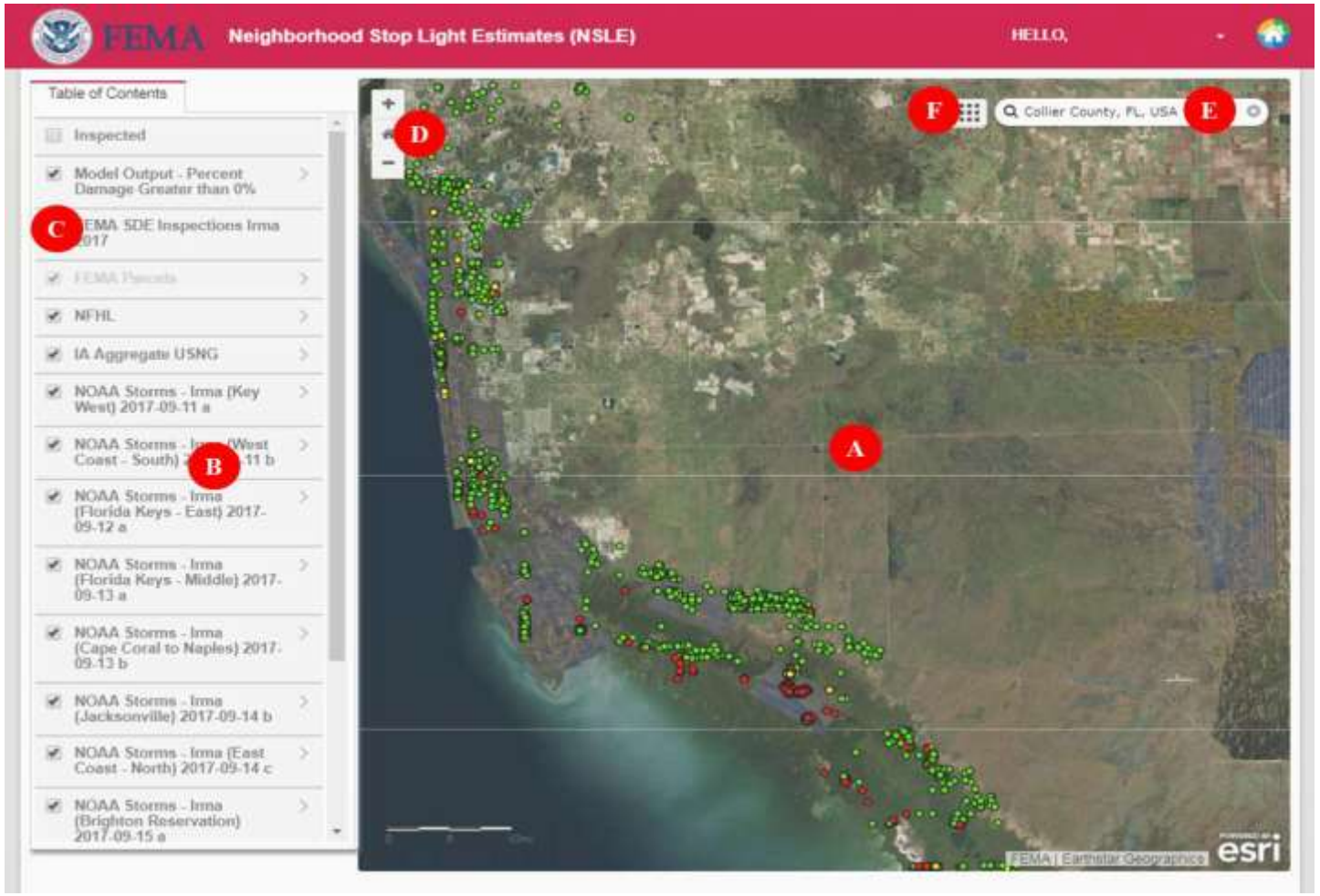


Irma Analytic Cell

3 main Modules

- Greatest Order of Magnitude (GOME)
- Neighborhood Stop Lights Estimates (NSLE)
- Structure Level Inspection List

IRMA Analytic Cell



THANK YOU