Tennessee's Commercial Vehicle Predictive Analytics

October 30, 2018

TN Department of Safety & Homeland Security

TENNESSEE INTEGRATED TRAFFIC ANALYSIS NETWORK TITAN

TENNESSEE STATE TROOPER HIGHWAY PATROL

Purpose

- Use predictive analytics to develop and identify future areas having increased risk of crashes for use in resource planning and development

Objectives

- Reduce fatal and serious injury crashes
- Optimize resources and manpower allocation
- Reduce THP response times
- Increase visibility where most likely to impact traffic safety

Methodology

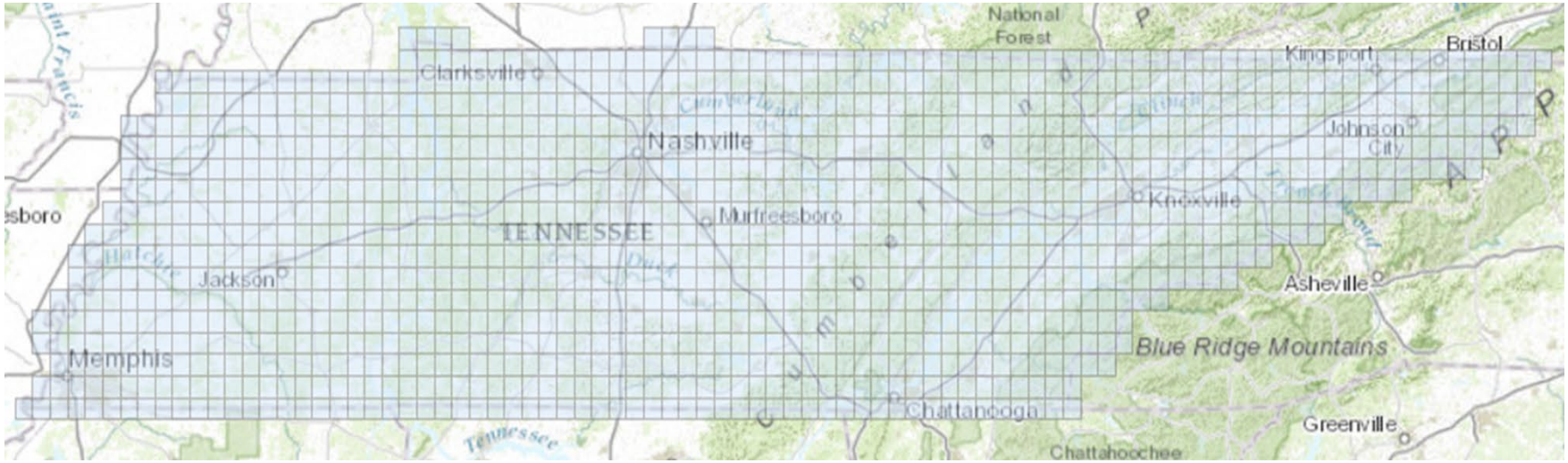
- Software

SPSS Modeler

ArcGIS

Methodology

- Geographic Bins:
  - Tenth-Degree (6.8 mi. x 5.6 mi.) Squares
  - 0.1º latitude by 0.1º longitude
  - Define unique identifier (first 3 digits of the latitude + first 3 digits of the longitude)



Methodology

- CMV Crash Model
  - Subset of crash data
  - CMV crashes – both FMCSA reportable and non-reportable
  - Data from January 1, 2015 through September 30, 2018
    - 740,275 crashes
    - 55,121 CMV crashes

Methodology

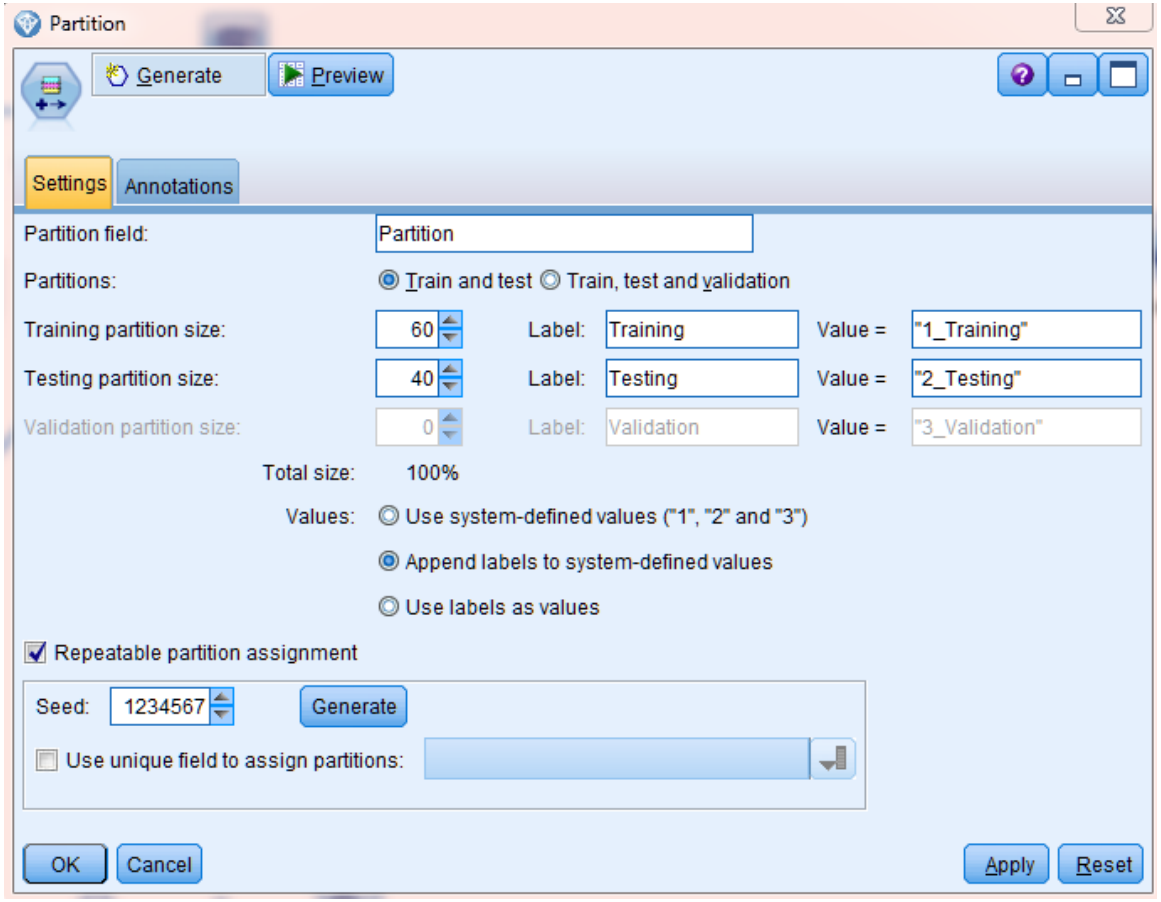
- Model Inputs:
  - Crash location, date, time
  - Season, month, day of week
  - Weather
  - Construction/Maintenance Zone
  - Roadway factors
  - Speed limits
  - Special Events
  - Holidays
  - Light Condition
  - Average daily traffic history

Methodology

- Model Selected Variables:
  - Maximum roadway speed
  - Time
    - Start hour for each four-hour block
    - Day of week
  - Average daily traffic volume
    - Maximum average daily traffic volume for interstates within geographical bin
    - Maximum average daily traffic volume for state highways within geographical bin
  - Light condition
  - Location
    - Geographic bins
  - Weather

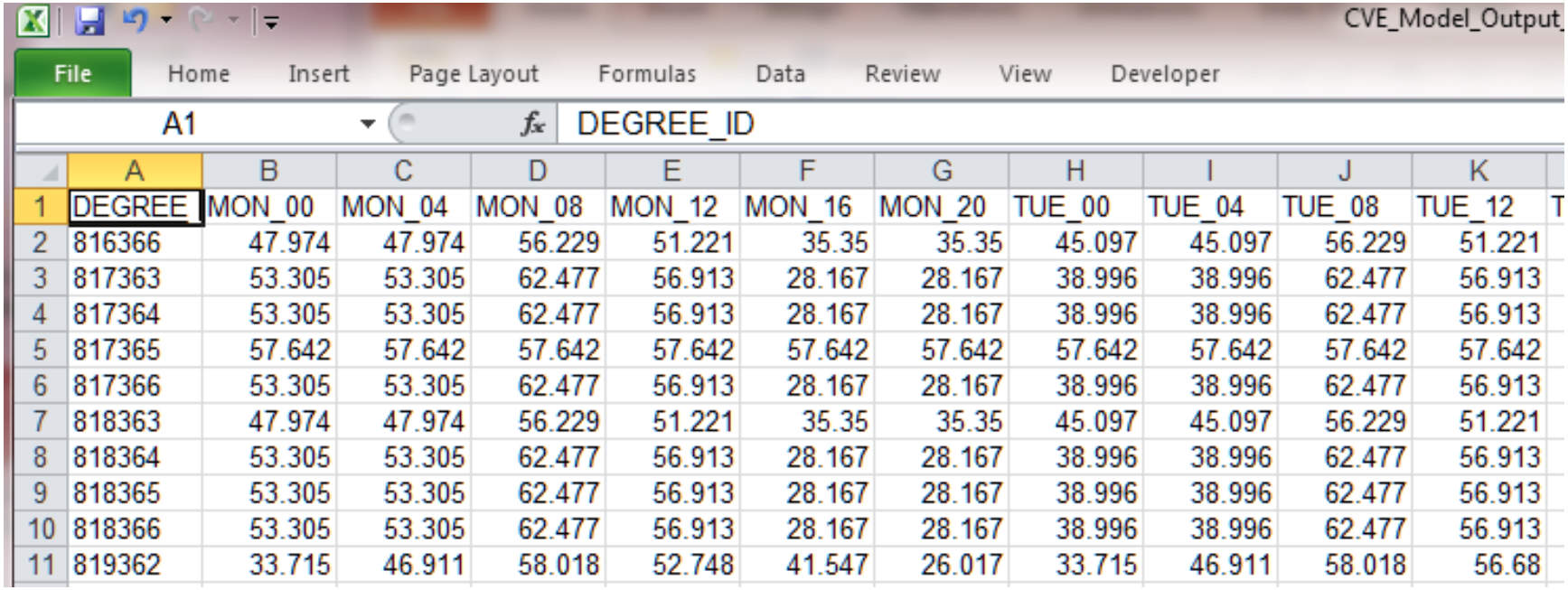
Methodology

- Model Validation



Results

- Output File
  - Propensity values by day of week and four-hour period of day for each block on state grid map



CVE_Model_Output

File | Home | Insert | Page Layout | Formulas | Data | Review | View | Developer

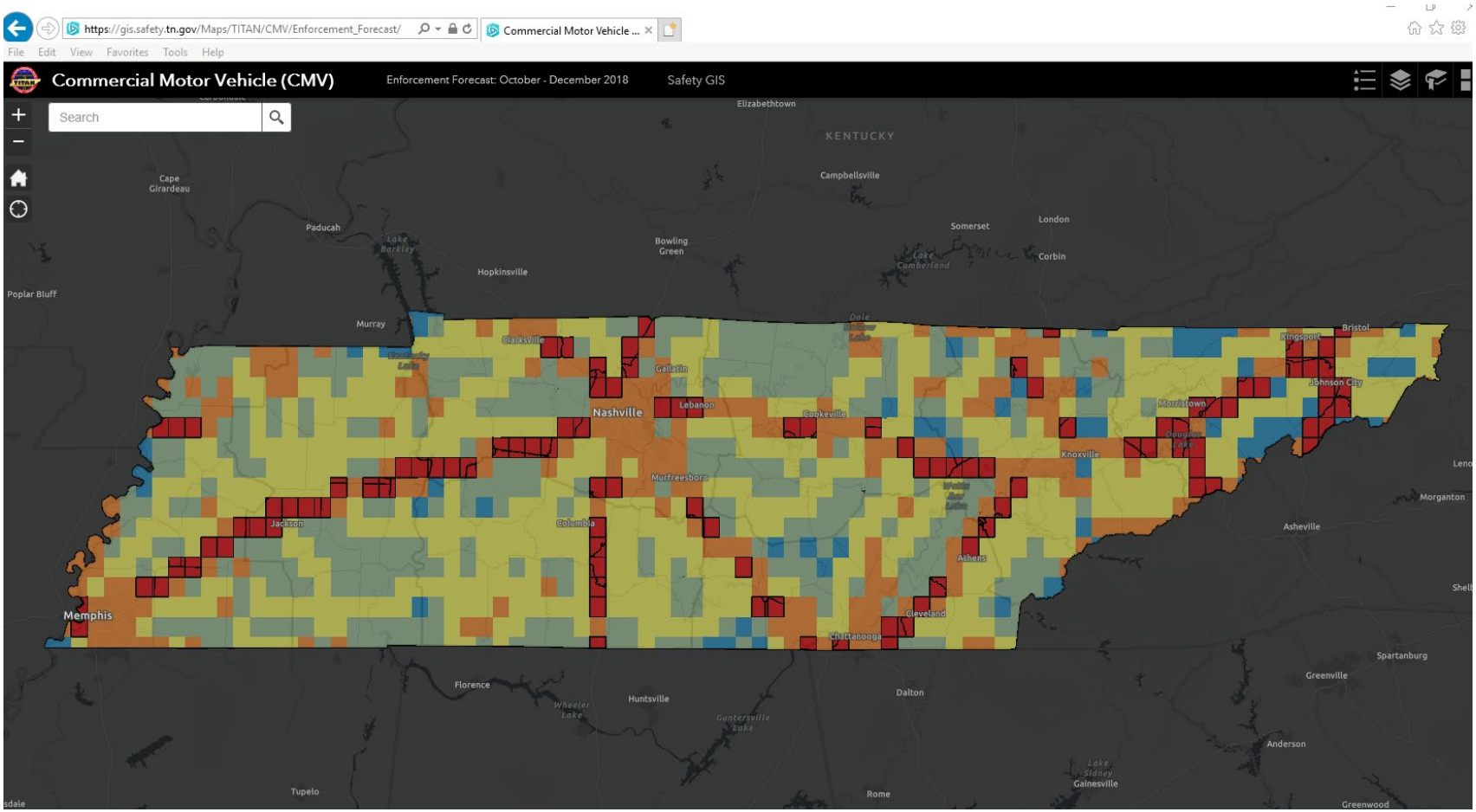
A1 | DEGREE_ID

	A	B	C	D	E	F	G	H	I	J	K
1	DEGREE	MON_00	MON_04	MON_08	MON_12	MON_16	MON_20	TUE_00	TUE_04	TUE_08	TUE_12
2	816366	47.974	47.974	56.229	51.221	35.35	35.35	45.097	45.097	56.229	51.221
3	817363	53.305	53.305	62.477	56.913	28.167	28.167	38.996	38.996	62.477	56.913
4	817364	53.305	53.305	62.477	56.913	28.167	28.167	38.996	38.996	62.477	56.913
5	817365	57.642	57.642	57.642	57.642	57.642	57.642	57.642	57.642	57.642	57.642
6	817366	53.305	53.305	62.477	56.913	28.167	28.167	38.996	38.996	62.477	56.913
7	818363	47.974	47.974	56.229	51.221	35.35	35.35	45.097	45.097	56.229	51.221
8	818364	53.305	53.305	62.477	56.913	28.167	28.167	38.996	38.996	62.477	56.913
9	818365	53.305	53.305	62.477	56.913	28.167	28.167	38.996	38.996	62.477	56.913
10	818366	53.305	53.305	62.477	56.913	28.167	28.167	38.996	38.996	62.477	56.913
11	819362	33.715	46.911	58.018	52.748	41.547	26.017	33.715	46.911	58.018	56.68

Results

- Criteria for Presenting Output
  - Viewable
    - Can the map be easily interpreted?
  - Accessible to Troopers/Supervisors/Staff
    - Is the map stored at an accessible site?
    - Is the site password protected?
  - Efficient to update
    - Is updating time consuming?
    - Are procedure easily repeatable?
  - Flexible
    - Can supplemental data be added?

Model Results

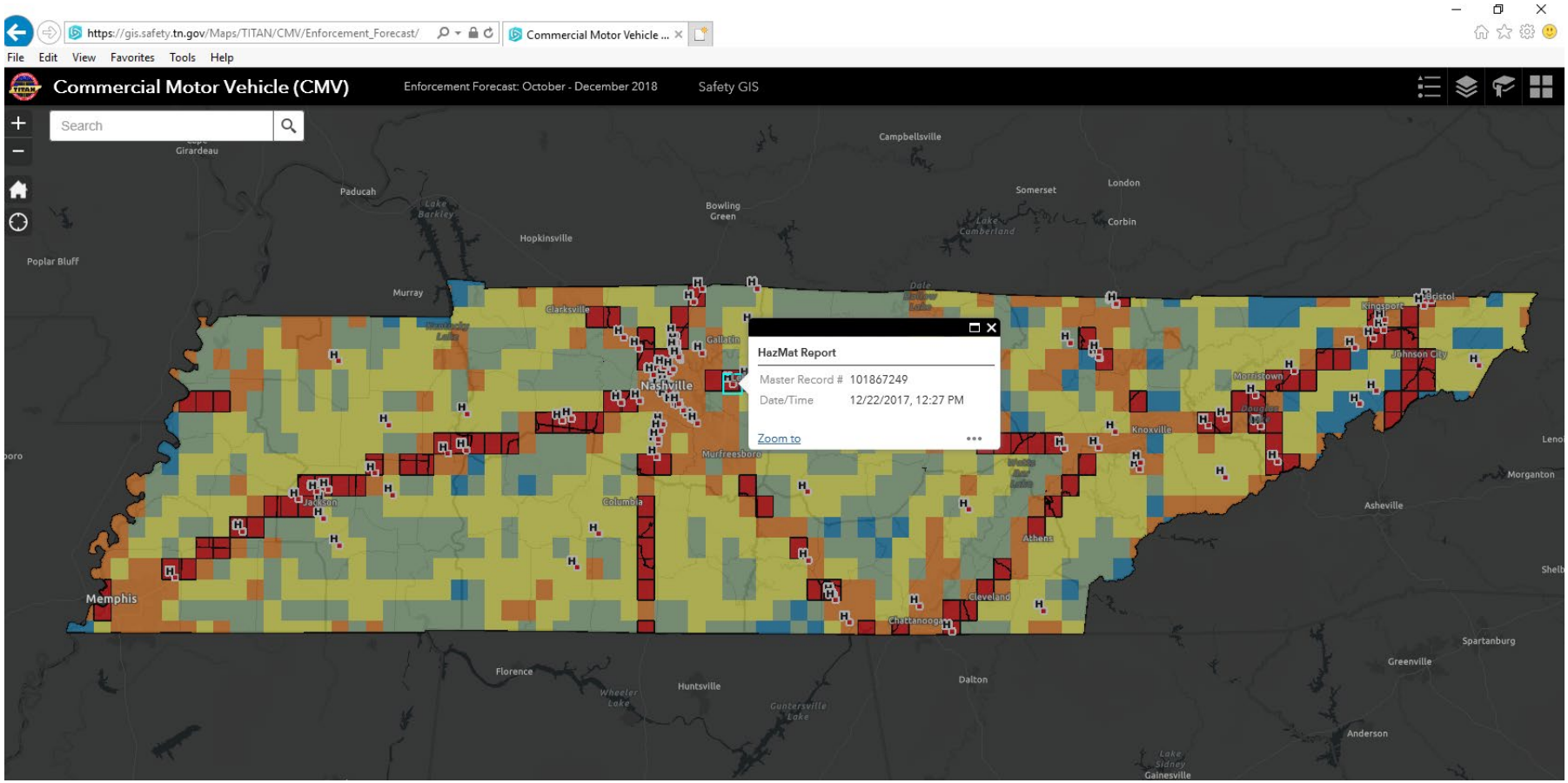


Supplemental Data

- FMCSA reportable crashes
- Rollover crashes
- Motor coach crashes
- School bus crashes
- Hazmat crashes
- Crash type: fatal, suspected injury, property damage

Supplemental Data

- Hazmat Crashes



Resource

- Website: https://gis.safety.tn.gov/

THANK YOU!

- Contact Information:

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