

Tennessee's Commercial Vehicle Predictive Analytics

October 30, 2018



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



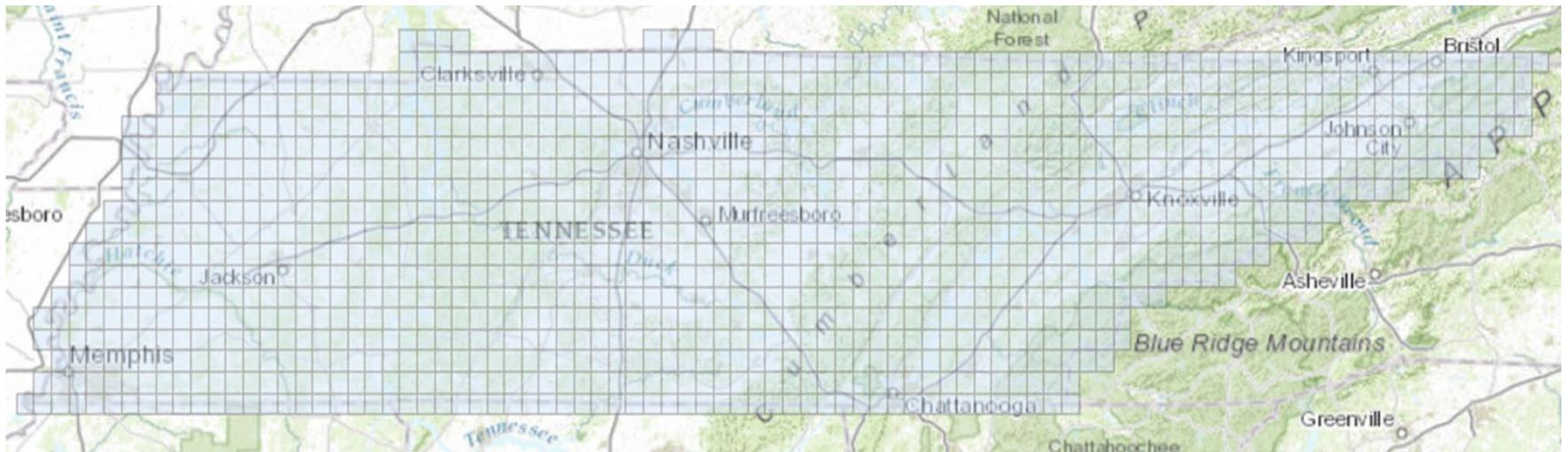
SPSS Modeler



ArcGIS

Methodology

- **Geographic Bins:**
 - **Tenth-Degree (6.8 mi. x 5.6 mi.) Squares**
 - **0.1° latitude by 0.1° 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

Partition

Generate Preview

Settings Annotations

Partition field: Partition

Partitions: Train and test Train, test and validation

Training partition size: 60 Label: Training Value = "1_Training"

Testing partition size: 40 Label: Testing Value = "2_Testing"

Validation partition size: 0 Label: Validation Value = "3_Validation"

Total size: 100%

Values: Use system-defined values ("1", "2" and "3")
 Append labels to system-defined values
 Use labels as values

Repeatable partition assignment

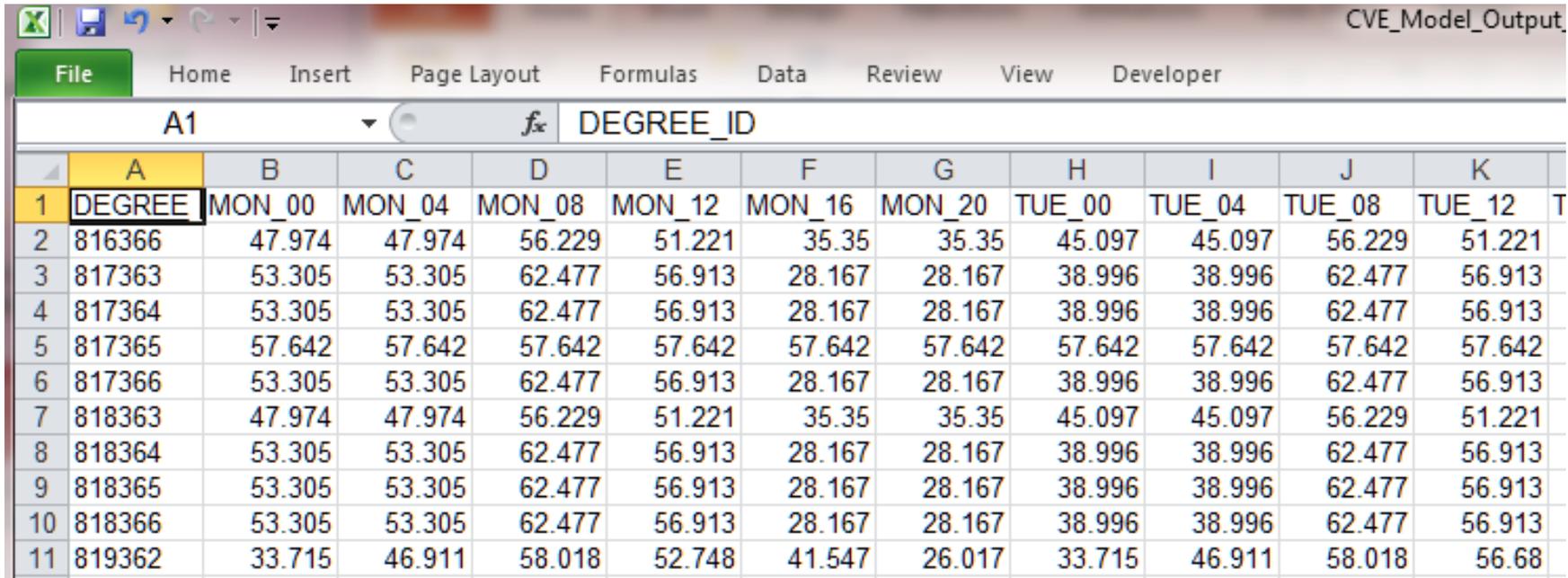
Seed: 1234567 Generate

Use unique field to assign partitions:

OK Cancel Apply Reset

Results

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



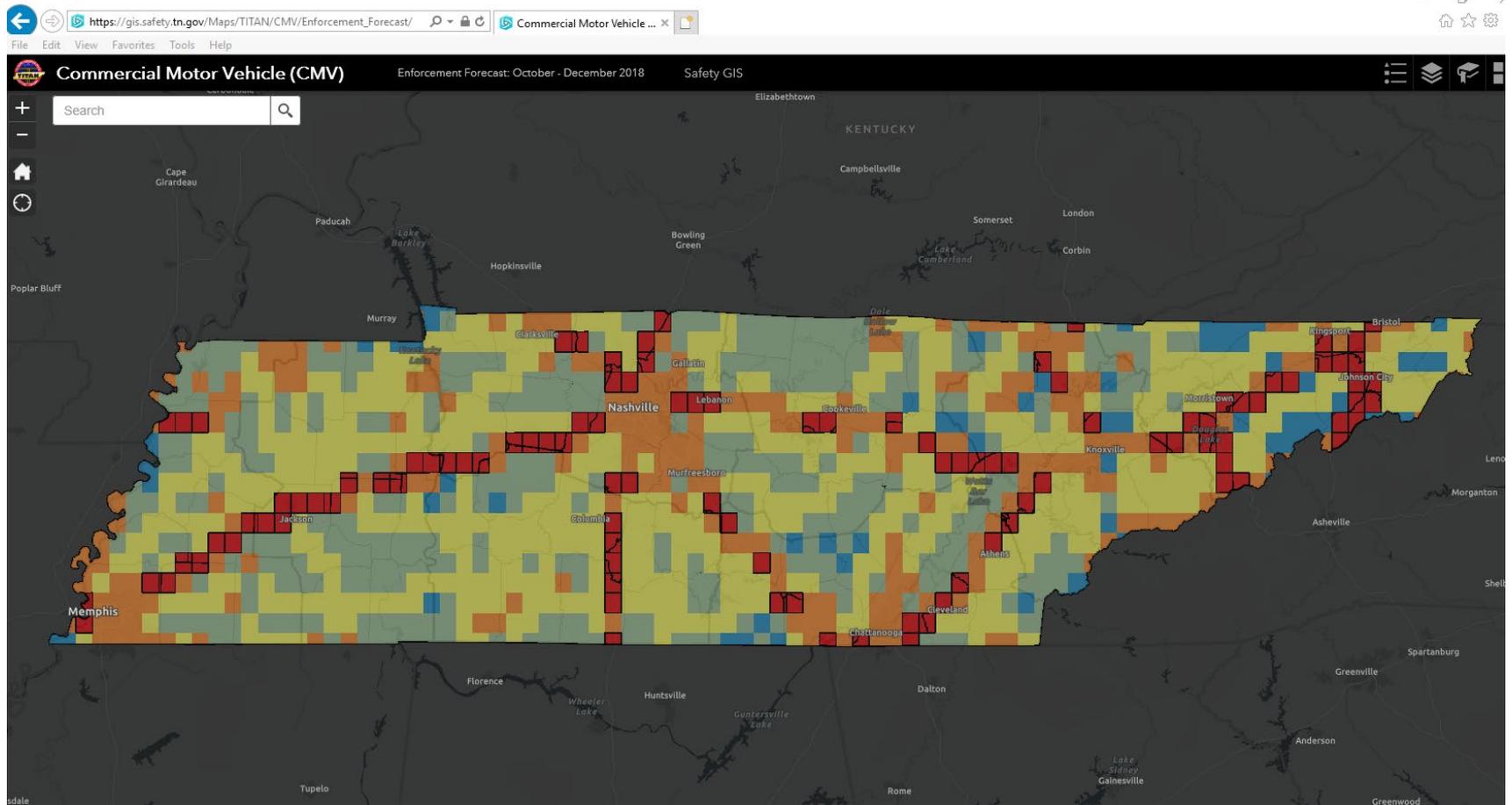
The screenshot shows an Excel spreadsheet titled 'CVE_Model_Output'. The active cell is A1, containing the text 'DEGREE_ID'. The spreadsheet displays a table of propensity values for 11 different degree IDs (rows 1-11) across 12 time periods (columns A-K). The columns are labeled with day and time period abbreviations: A (DEGREE_ID), B (MON_00), C (MON_04), D (MON_08), E (MON_12), F (MON_16), G (MON_20), H (TUE_00), I (TUE_04), J (TUE_08), K (TUE_12), and L (TUE_16). The values range from 26.017 to 58.018.

	A	B	C	D	E	F	G	H	I	J	K	L
1	DEGREE_ID	MON_00	MON_04	MON_08	MON_12	MON_16	MON_20	TUE_00	TUE_04	TUE_08	TUE_12	TUE_16
2	816366	47.974	47.974	56.229	51.221	35.35	35.35	45.097	45.097	56.229	51.221	35.35
3	817363	53.305	53.305	62.477	56.913	28.167	28.167	38.996	38.996	62.477	56.913	28.167
4	817364	53.305	53.305	62.477	56.913	28.167	28.167	38.996	38.996	62.477	56.913	28.167
5	817365	57.642	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	28.167
7	818363	47.974	47.974	56.229	51.221	35.35	35.35	45.097	45.097	56.229	51.221	35.35
8	818364	53.305	53.305	62.477	56.913	28.167	28.167	38.996	38.996	62.477	56.913	28.167
9	818365	53.305	53.305	62.477	56.913	28.167	28.167	38.996	38.996	62.477	56.913	28.167
10	818366	53.305	53.305	62.477	56.913	28.167	28.167	38.996	38.996	62.477	56.913	28.167
11	819362	33.715	46.911	58.018	52.748	41.547	26.017	33.715	46.911	58.018	56.68	26.017

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

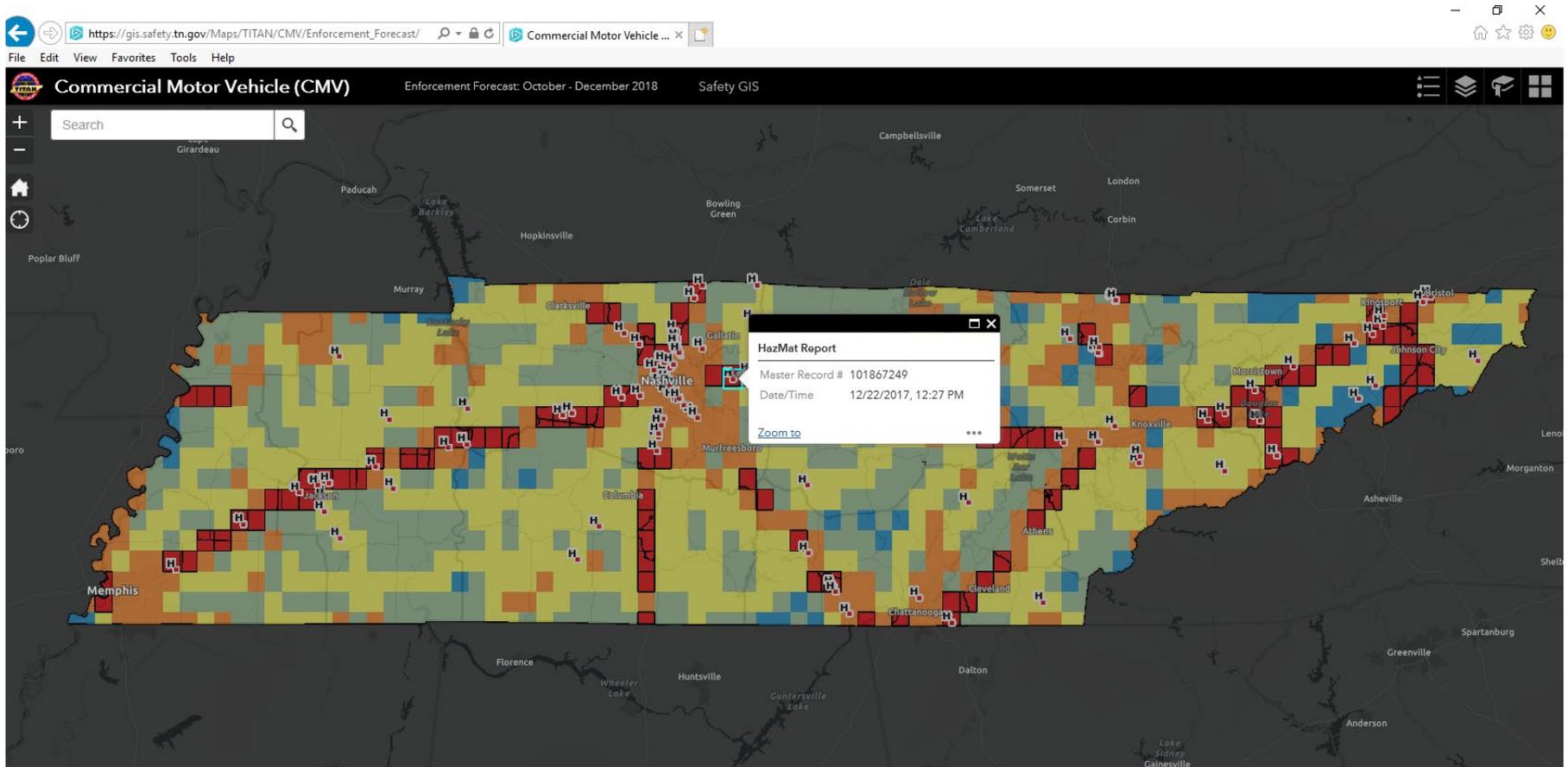


Supplemental Data

- **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/>

The screenshot shows the website header with the TN Department of Safety & Homeland Security logo and the title 'Public Safety Maps'. A search bar is located in the top right. The main content area is titled 'Tennessee Crash History and Prevention' and features several interactive map and data tools:

- TTTAN (Login Required)**: A heatmap of Tennessee showing crash density.
- Public Safety Maps and Statistics**: A map of Tennessee with numerous small green markers representing crash locations.
- Predictive Crash Analysis**: A table with columns for days of the week (FRI to THU) and rows for dates in October 2018.
- Crashes with Unrestrained Occupants**: A section with three sub-items: 'Unrestrained Pickup Truck Occupants: January 1, 2015 - March 31, 2018', 'All Unrestrained Crashes: January 1, 2015 - March 31, 2018', and 'All Terrain Vehicle (ATV) Crashes: Jan 2013 - July 2018'.
- Weekly DUI Likelihood**: A section with two sub-items: 'October 12 - 18, 2018' and 'October 19 - 25, 2018'.
- Quarterly Commercial Motor Vehicle Enforcement**: A section with one sub-item: 'October 1, 2018 through December 31, 2018'. This section is circled in red in the original image.
- Commercial Motor Vehicle Incidents by Topic**: A section with one sub-item: 'CMV Rollover or Large Truck Rollover: January 1, 2015 - March 31, 2018'.
- Unlicensed Drivers**: A section with one sub-item: 'Unlicensed Driver Crash Locations: January 1, 2015 - March 31, 2018'.

THANK YOU!

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