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**

```
<table>
<thead>
<tr>
<th>Partition field</th>
<th>Train and test</th>
<th>Train, test and validation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training partition size</td>
<td>80</td>
<td>Label: Training Value: &quot;1_Training&quot;</td>
</tr>
<tr>
<td>Testing partition size</td>
<td>40</td>
<td>Label: Testing Value: &quot;2_Testing&quot;</td>
</tr>
<tr>
<td>Validation partition size</td>
<td>0</td>
<td>Label: Validation Value: &quot;3_Validation&quot;</td>
</tr>
</tbody>
</table>
```

Values: Use system-defined values ("1", "2", and "3")

Option: Repeatable partition assignment

Seed: 1234567

Use unique field to assign partitions:
Results

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