Predictive Analytics for TDOT HELP

AASHTO STSMO Meeting
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What is Predictive Analytics?

• An analysis tool that uses historical and current data to forecast future activity, behavior and trends.
• Tennessee Highway Patrol has developed a Predictive Analytics system called CRASH that seeks to identify future areas having increased risk of crashes for use in resource planning and deployment.
Ultimate Vision: Develop a Predictive Analytics system for TDOT that will take TDOT’s traffic management program to the next step by getting one step ahead of highway incidents.

Phase 1 Project: Develop a roadmap for TDOT HELP predictive analytics.
Tennessee Highway Patrol
CRASH Overview
CRASH Goals

• Reduce fatal and serious injury crashes
• Reduce THP response times
• Increase visibility and target enforcement activity where most likely to impact traffic safety

Source of Information and Graphics: Tennessee Department of Safety and Homeland Security
Using the Tools

• Resource allocation
  – Unobligated patrol time
  – Shift assignments by field supervisors
  – Grant-funded targeted enforcement

• Quick reference at beginning of shifts

Source of Information and Graphics: Tennessee Department of Safety and Homeland Security
Current Models

• **CRASH** - Predict likelihood of serious injury and fatal crashes

• **DUI** - Predict likelihood of “Impaired Driving Events,” i.e. alcohol/drug involved crashes and DUI arrests

• **CMV** – Commercial Motor Vehicle – Predict likelihood of commercial vehicle and large truck crashes

Source of Information and Graphics: Tennessee Department of Safety and Homeland Security
Crash Model Inputs

• Historical crash data from TITAN statewide repository

• Historical weather data, weather forecasts

Source of Information and Graphics: Tennessee Department of Safety and Homeland Security
Crash Model Inputs

• Special Events
  – THP District Captains
  – Internet Sources (Sporting Events, Holiday Events, Festivals, etc.)

Source of Information and Graphics: Tennessee Department of Safety and Homeland Security
CMV Crash Model Inputs

• CMV crashes – both FMCSA reportable and not reportable
• Selected Variables
  – Max speed
  – Time
  – Traffic volumes
  – Light condition
  – Location
  – Weather

Source of Information and Graphics: Tennessee Department of Safety and Homeland Security
Impaired Driving Model Inputs

- Historical crash data from TITAN statewide
- THP DUI Arrests 2013 – 2014
- State regulated alcohol sales establishments

Source of Information and Graphics: Tennessee Department of Safety and Homeland Security
Supplemental Data

• Historical Crashes
• Historical DUI Arrests
• Specific CMV Crashes
  – Rollover
  – Hazmat
  – School Bus
  – Others
• Upcoming special events

Source of Information and Graphics: Tennessee Department of Safety and Homeland Security
Criteria for Presenting Output

- Viewable
- Accessible to Troopers/Supervisors/Staff
- Efficient to update
- Flexible – ability to add supplemental data
- Map interface – ESRI ArcGIS
CMV Model Results

Source of Information and Graphics: Tennessee Department of Safety and Homeland Security
Impaired Driving Model Results

Source of Information and Graphics: Tennessee Department of Safety and Homeland Security
Actual Fatal and Incapacitating Injury Crashes Vs. Forecasted Risk
March 10th - May 11th (9 Weeks)

68% percent of the targeted crashes occurred in the red and orange boxes.

Source of Information and Graphics: Tennessee Department of Safety and Homeland Security
Nationwide in 2015: Traffic Fatalities Increased – **Up 17%**

In Tennessee in 2015: Traffic Fatalities Decreased Slightly – **Down <1%**

THP Crash Response Time Reduced by 33% from 36 to 24 minutes since 2012

In Tennessee, preliminary figures indicate that 2015 traffic fatalities are the 2\textsuperscript{nd} lowest annual total since 1963.

*Source of Information and Graphics: Tennessee Department of Safety and Homeland Security*
TDOT HELP Predictive Analytics Project
Phase 1

- TDOT HELP Predictive Analytics (THPA) Phase 1:
  - User input to develop a concept of operations,
  - system requirements,
  - data flows,
  - preliminary design,
  - basic training materials.
- System implementation will be a future phase.
High Level Requirements

• Build on the THP CRASH tool
• Real time decision support for HELP trucks – pre-deployment and deployment decisions
• HELP optimization and expansion support
• Training tool for new operators
High Level Requirements

• Show the output on a roadway view
• Develop an added value tool for TMCs and HELP operators
• Accessibility to TMC operators and HELP drivers
• Traffic engineering and planning outputs
Your Input (aka Detailed Requirements)

- Look and feel of the user interface
- Details of needed information at each level (TMC and Field)
- Accessibility details
- Others...
Questions and Discussion

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