

Background

- The trucking industry plays a vital role in supporting the U.S. economy by moving over 70% of the cargo volume
- However, due to the large size and operational demands, crashes involving trucks often lead to fatalities
- Distracted driving and seatbelt non-compliance are two major contributing factors to crash severity
- According to NHTSA, in 2022, 3,308 deaths and 289,310 injuries were recorded due to driver distraction, with FMCSA reporting that 7–8% of these fatal crashes involved large trucks
- Fatality rates for seatbelt non-use for truck drivers are more than 5 times higher compared to all other drivers
- Around 51% fatal crashes for all vehicles could have been prevented if the driver had been wearing seatbelts

Objectives

- Identify distracted driving and seatbelt non-use incidents for truck drivers using innovative methods
- Determine the influencing factors for truck-involved crashes based on temporal and geometric features, roadway and vehicle types, weather conditions, and driver behavior

Data Collection

- More than 315 hours of video data were recorded across 22 high-risk corridors in New Jersey using the floating car method
- More than 111 hours of video data were recorded using the static camera method
- Historical crash data (2016-2022) for 3,071 large truck crashes were obtained from the NJ CAT database

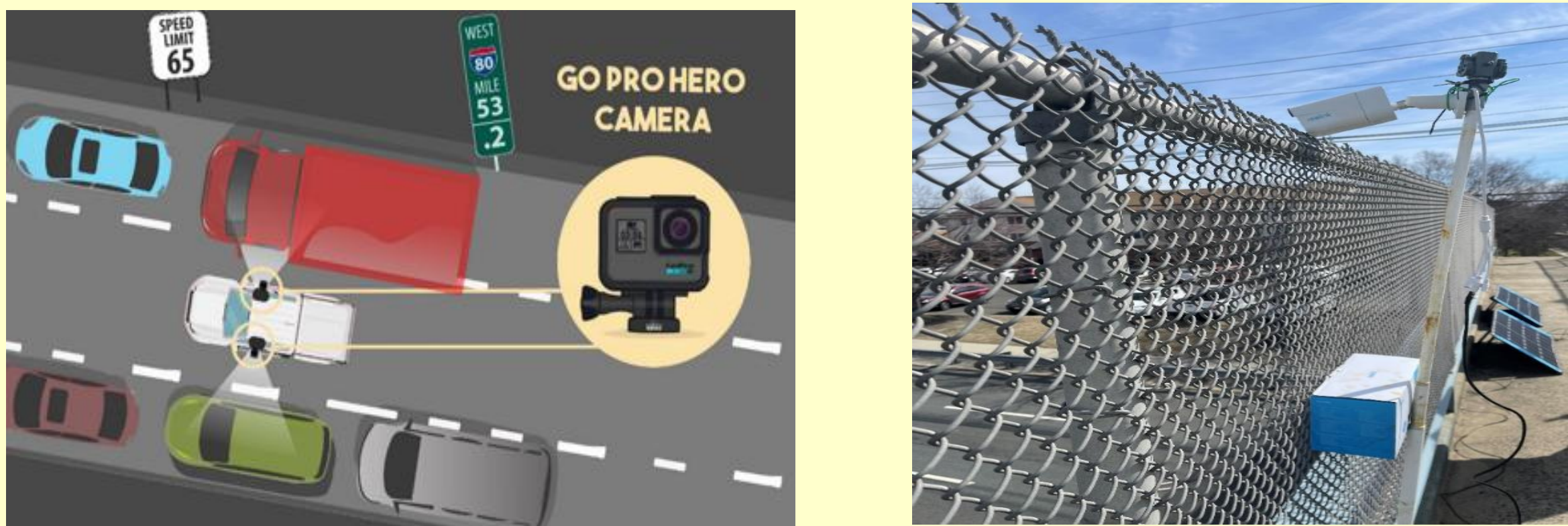
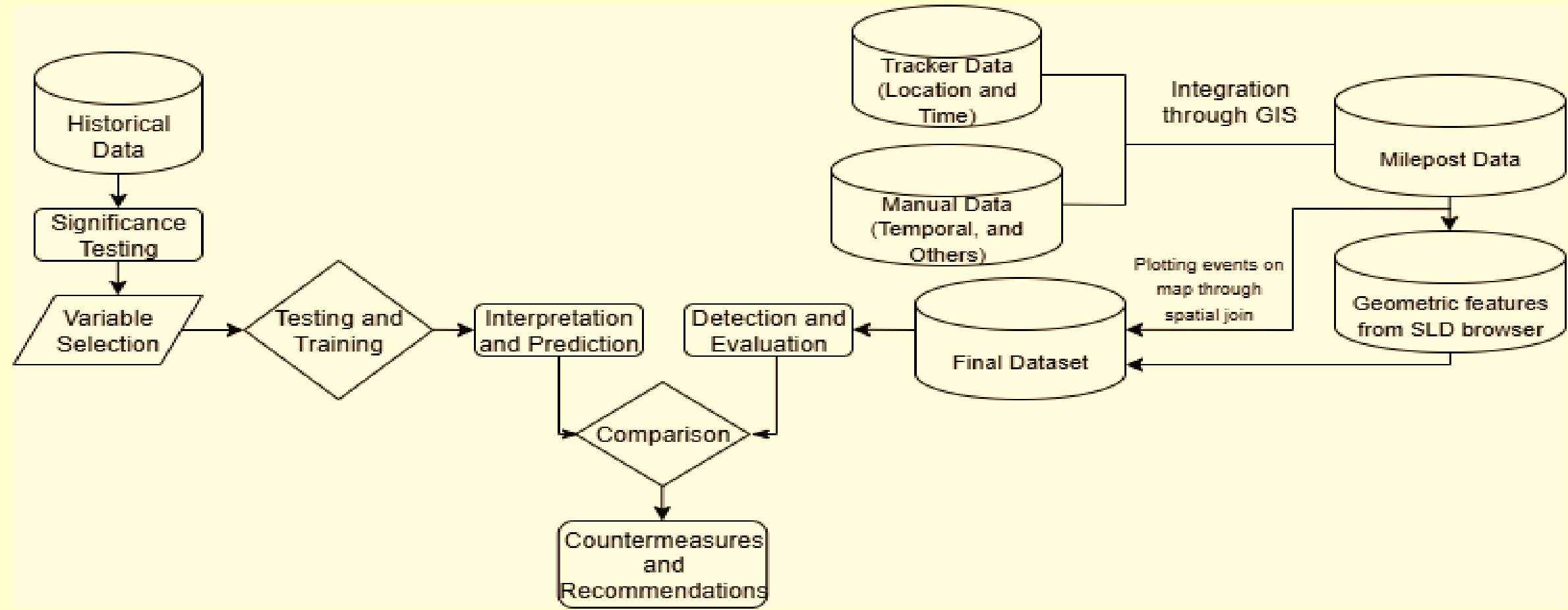


Figure 1: Data collection using floating car (Left), and static camera (Right)

Methodology



Results

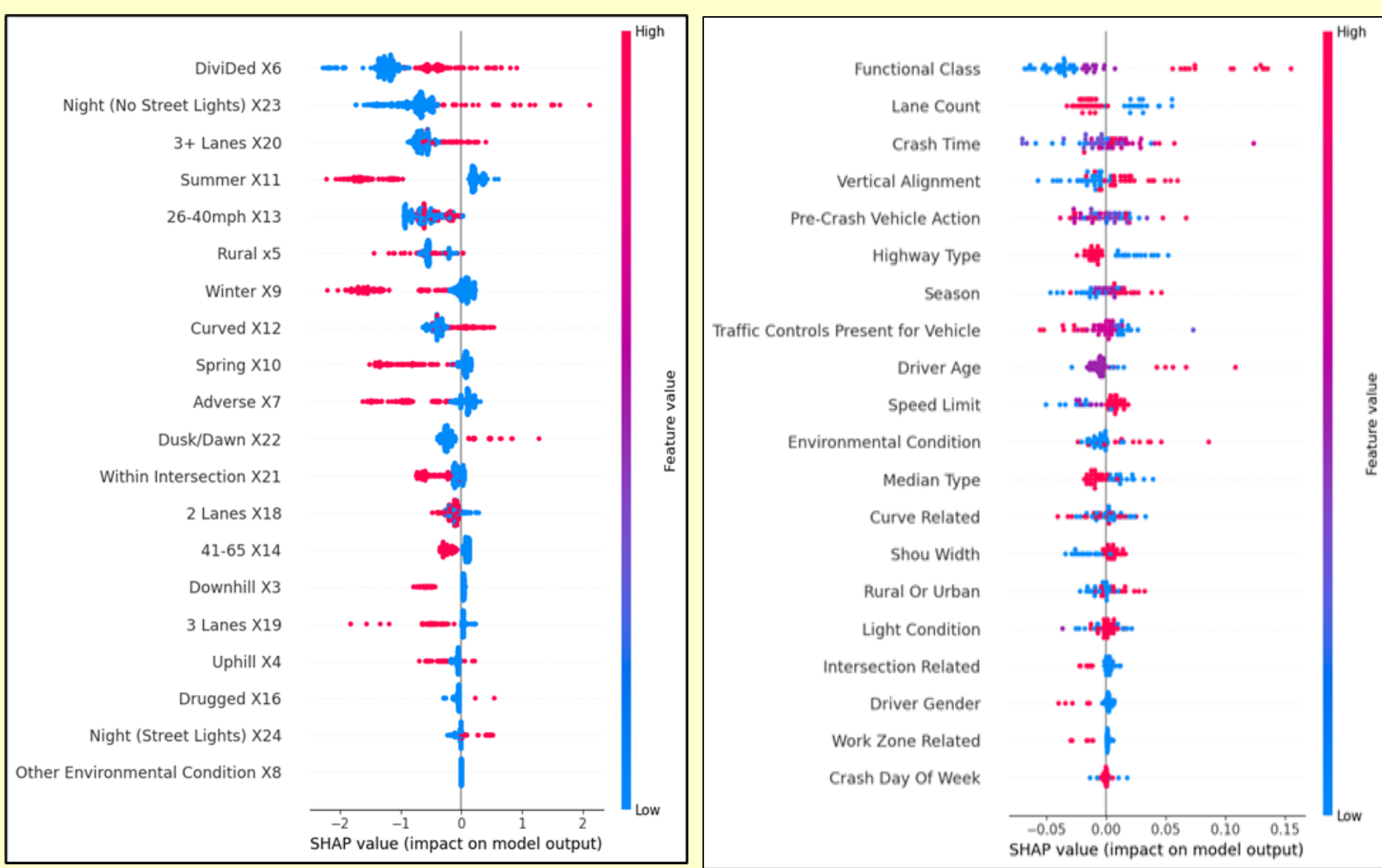


Figure 2: SHAP plots for distracted driving (left); seatbelt non-compliance (right) of fatal crashes for large trucks

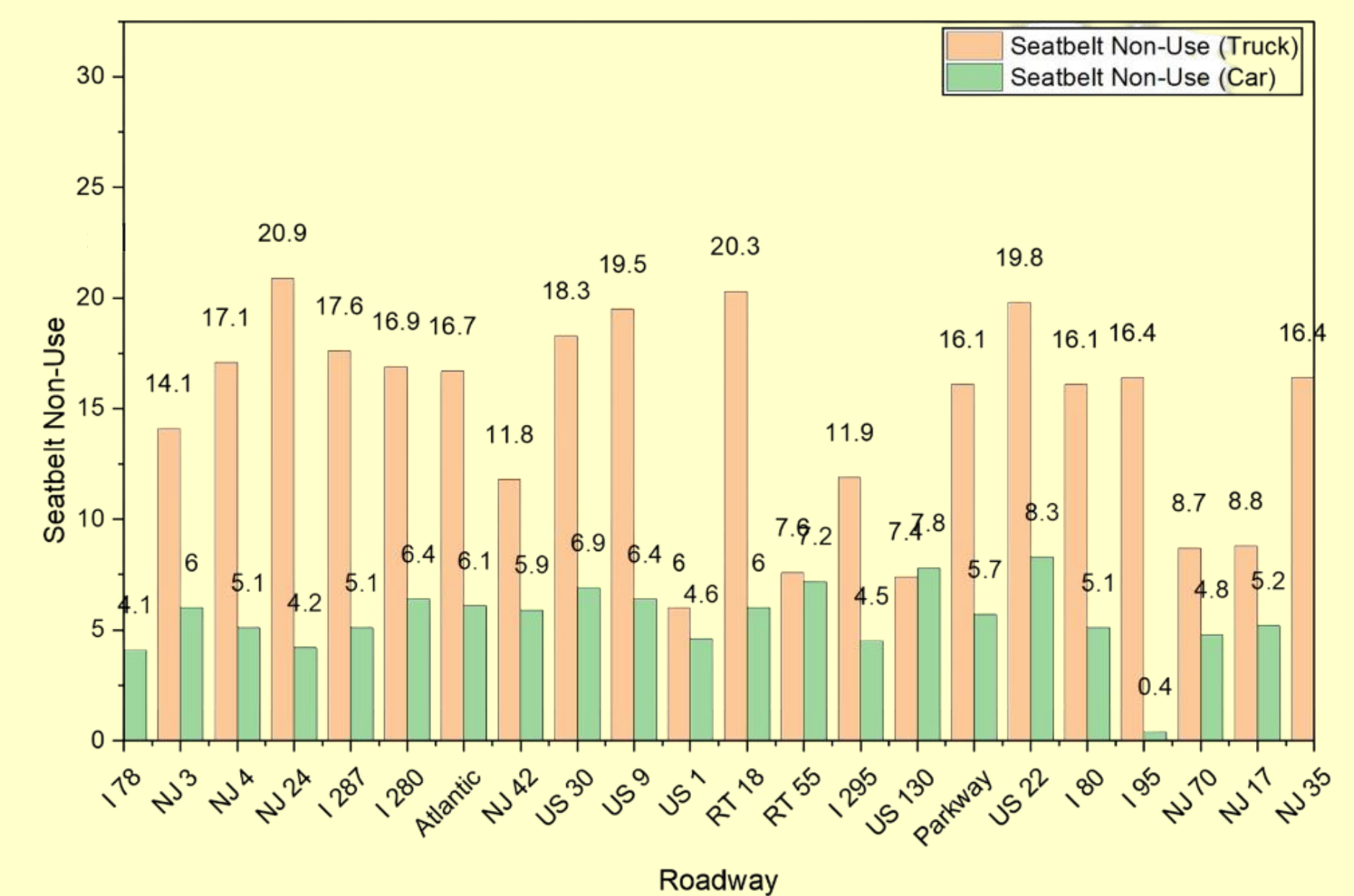


Figure 3: Route-based comparison for the seatbelt non-use

Table 2: Seatbelt non-compliance rate for instate and out of state

Type	State	Seat Belt Compliant	Seat Belt Noncompliant	Total	Noncompliance (%)
Truck	In State	1829	632	2461	25.6
	Out State	1464	383	1847	20.7
Car	In State	39134	2284	41418	5.5
	Out State	3923	347	4270	8.1

Findings

- Truck drivers had higher seatbelt non-use (22%) than car drivers (8%), especially on interstates, in winter, and among older drivers
- RT-18 (20.3%) and NJ-24 (20.9%) had the highest percentage of seatbelt non-compliance for the truck drivers
- Truck drivers are significantly less distracted (17.3%) than other drivers (22.2%); distraction is higher on weekends (19.7%) than on weekdays (17.3%)
- Positive median, higher speed limits (56-65 mph), 3+ lanes, summer, higher median width, and higher shoulder width had experienced a significant increase in distraction rates

Recommendations

- **Engineering:** Install cameras, in-vehicle alerts, and enhanced seatbelt systems (reminders, interlocks) with better design and sign visibility
- **Enforcement:** Enforce phone bans, increase patrols, checkpoints, and fines, supported by high-visibility campaigns (U Drive, U Text, U Pay / Click It or Ticket)
- **Education:** Promote driver-focused training and public campaigns using social media, road signs, and outreach programs that highlight risks of distraction and consistent seatbelt non-use, with special attention to older drivers and high-risk routes

Acknowledgement

- We express our gratitude to the New Jersey Division of Highway Traffic Safety (NJDHTS) for supporting this study

Table 1: Distraction Rates of various classes for temporal and geometric variation

Temporal/ Roadway Feature	Non-Dist.	Handhe ld Cellpho ne	Eating/ Drinking/ Smoking	Receivin g Calls	Talking to Passen gers	Drowsy	Radio/ Reachi ng Object	Fidgetin g/ Groomin g	Distraction Rate
Distraction Rates (%) (T=Truck, NT= Non-Truck)									
Day of Week									
Weekday (T)	82.7	5.0	4.6	1.4	0.3	0.2	2.4	3.4	17.3
Weekday (NT)	77.8	7.3	3.8	1.7	0.6	0.5	2.2	6.1	22.2
Weekend (T)	80.3	4.5	4.9	1.6	0.6	1.3	2.9	3.9	19.7
Weekend (NT)	79.1	6.4	3.5	1.3	1.8	0.5	1.8	5.6	20.9
Hour of Day									
Congestion (T)	81.3	4.9	5.1	2.1	0.5	0.5	1.9	3.7	18.7
Congestion (NT)	77.3	7.2	4.3	1.5	1.0	0.6	2.1	6.0	22.7
No-Cong. (T)	82.6	4.9	4.5	1.3	0.3	0.4	2.6	3.4	17.4
No-Cong. (NT)	78.5	6.9	3.5	1.6	1.0	0.5	2.1	5.9	21.5
Presence of Signal									
Signal (T)	82.3	4.5	4.8	1.0	0.3	0.3	2.9	3.9	17.7
Signal (NT)	76.1	7.6	4.3	1.5	1.0	0.4	2.5	6.6	23.9
No-Signal (T)	82.4	5.1	4.5	1.7	0.3	0.5	2.2	3.3	17.6
No-Signal (NT)	79.8	6.5	3.3	1.6	1.0	0.5	1.8	5.5	20.2
Toll									
Toll (T)	81.2	5.5	4.2	1.8	0.5	0.2	2.3	4.3	18.8
Toll (NT)	79.8	6.3	3.4	1.6	1.1	0.5	1.7	5.6	20.2
No-Toll (T)	82.8	4.7	4.8	1.3	0.3	0.5	2.5	3.1	17.2
No-Toll (NT)	77.4	7.4	3.9	1.4	1.0	0.4	2.3	6.2	22.6
Season									
Winter (T)	79.6	4.5	5.7	1.6	1.2	0.5	3.1	3.8	20.4
Winter (NT)	76.4	8.2	3.7	1.3	1.5	0.4	2.8	5.7	23.6
Spring (T)	80.4	4.3	5.5	0.9	0.2	0.5	3.4	4.8	19.6
Spring (NT)	76.6	6.7	4.0	1.6	1.0	0.6	2.3	7.2	23.4
Summer (T)	84.1	5.3	3.9	1.7	0.1	0.3	1.8	2.8	15.9
Summer (NT)	79.9	6.7	3.6	1.5	0.8	0.5	1.6	5.4	20.1
Type of Median									
Unprotected (T)	83.9	4.1	4.7	1.0	0.3	0.3	1.6	4.1	16.1
Unprotected (NT)	76.3	6.9	4.4	1.6	1.0	0.4	2.8	6.6	23.7
Curbed (T)	81.4	4.6	5.4	0.0	0.0	1.6	4.7	2.3	18.6
Curbed (NT)	77.2	7.8	4.0	1.5	1.0	0.3	2.5	5.7	22.8
Positive (T)	82.0	5.1	4.6	1.7	0.4	0.3	2.5	3.4	18.0
Positive (NT)	78.7	7.0	3.6	1.5	1.0	0.5	1.9	5.8	21.3
No. of Lanes									
2 (T)	82.6	4.7	4.6	0.7	0.7	0.2	2.5	4.0	17.4
2 (NT)	77.6	7.1	3.9	1.5	1.0	0.4	2.2	6.3	22.4
3 (T)	80.9	6.3	4.5	1.9	0.1	0.5	2.7	3.1	19.1
3 (NT)	79.1	6.8	3.5	1.6	1.0	0.5	1.9	5.6	20.9
4 or more (T)	84.0	3.3	4.9	1.5	0.3	0.4	2.0	3.6	16.0
4 or more (NT)	77.7	7.1	3.9	1.5	0.9	0.6	2.2	6.1	22.3
Posted Speed Limit (mph)									
25-35 (T)	89.3	7.1	0.0	0.0	0.0	0.0	0.0	3.6	10.7
25-35 (NT)	77.7	6.0	4.2	1.6	0.8	0.2	3.7	5.8	22.3
36-45 (T)	84.0	3.6	5.5	0.5	0.0	0.0	1.4	5.0	16
36-45 (NT)	76.1	7.2	4.6	1.6	0.9	0.4	2.4	6.8	23.9
46-55 (T)	81.4	5.2	4.3	1.2	0.5	0.3	3.3	3.8	18.6
46-55 (NT)	77.0	7.7	3.7	1.6	1.2	0.5	2.4	5.9	23.0
56-65 (T)	82.4	4.9	4.8	1.8	0.3	0.6	2.2	3.0	17.6
56-65 (NT)	80.1	6.4	3.5	1.4	0.9	0.5	1.5	5.7	19.9