Transportation Behavioral Psychology & Safety Lab
心路同行 安全相随 • Mindful Journey, Safe Passage

Driving Automation & Driving Safety

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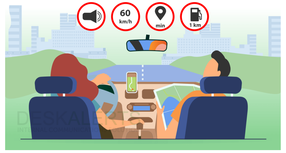
Background

- Traffic accidents claim thousands of lives daily, with over 94% linked to human error.
- Driving automation (ADAS) may enhance traffic safety and efficiency, yet its effectiveness depends on drivers' understanding of these systems.
- To fully exploit the benefits of driving automation, it is essential to understand how drivers use these technologies and guide their behaviors.



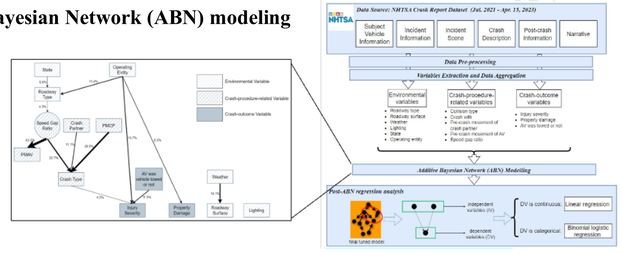
Why ADAS/ADS- involved crashes still happen?

➢ **Dataset:** NHTSA crash report

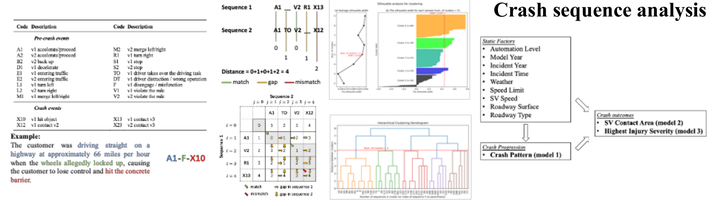
➢ **Method:** Additive Bayesian Network (ABN) & crash sequence analysis

- Crash progression is influenced by dynamic factors, such as vehicle speed, and speed limits.
- Crash outcomes are determined by static factors, such as road type, and time of incident.
- Rear-end collisions account for the majority of driving automation-involved incidents

Additive Bayesian Network (ABN) modeling



Crash sequence analysis

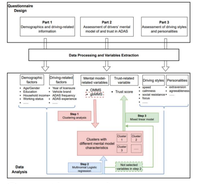


Crash sequence encoding | Sequence alignment & clustering | Logistic regression

How are Drivers informed of ADAS?

➢ **Method:** Survey study with 287 drivers & interview study with 18 salespersons

- Most drivers still had limited knowledge of ADAS.
- Inaccurate depiction of ADAS functionalities, limitations & capabilities during salesperson–customer interactions.



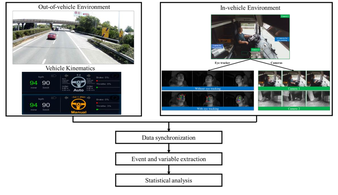
Questionnaire survey

Salesperson interview

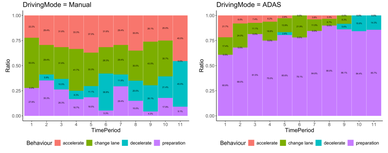
How ADAS affect driver behaviors?

➢ **Method:** Naturalistic driving study among truck drivers, with over 120 hours of highway data.

- ADAS helps reduce truck driver fatigue during long-haul driving



Naturalistic driving experiment

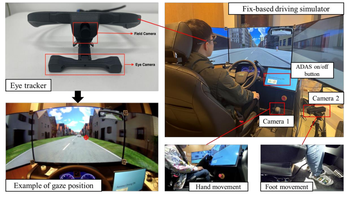


Defensive driving behavior

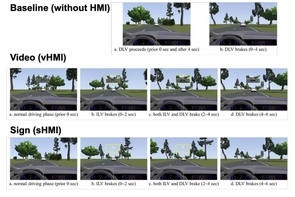
What can we do? – Driver training & HMI design

➢ **Method:** Video simulation & driving simulator experiment

- ADAS users need to be trained in two aspects, ADAS knowledge & hazard perception skills.
- Human-machine interfaces (HMIs) providing beyond-visual-range and ADAS transparency information can enhance driving safety.



Driver training experiment



HMI for chain-braking scenarios