Applying European NCAP Driver State Monitoring Protocols to Heavy Vehicle Fleets

Prevalence of Distraction Alerts in Real -World Commercial Transport Operations

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Background

- Euro NCAP have published protocols for driver monitoring systems that outline distraction behaviours that must be detected in drivers in passenger vehicles
- Euro NCAP for Trucks was announced earlier this year - indirect driver monitoring was a focus in 2024, with 2026 the likely introduction of direct DMS into trucks.
  - This will likely be an adaptation of existing Euro NCAP driver monitoring protocols.
  - Euro NCAP distraction behaviours have been developed from evidence accumulated in passenger vehicle context.

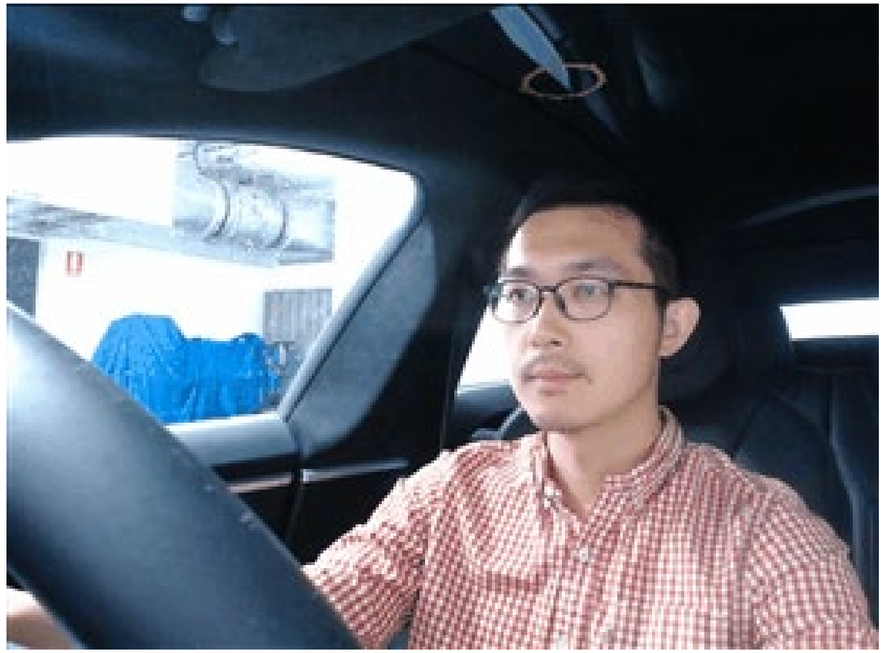
How do we adapt NCAP Distraction Behaviours to be appropriate for a trucking context?

Long Glance Away (LGA) and Visual Attention Time Sharing (VATS)

LGA

>3 seconds off road

VATS



10 seconds off road
within 30 seconds,
without looking on road
for >2 seconds.

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Naturalistic NCAP Distraction Behaviour in Car Drivers

- Previously published research reporting potential alerting rates for NCAP distraction behaviours in real-world driving
- N=20 (168 hours) naturalistic driving study conducted in Melbourne, Australia; participants passively monitored with DMS

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Online ahead of print.

European NCAP Driver State Monitoring Protocols: Prevalence of Distraction in Naturalistic Driving

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Advanced Safe Truck Concept Project

Australian Government
Department of Industry, Innovation and Science

Business Cooperative Research Centres Programme

Phase 1: 70 car drivers in car simulator

Phase 2: 20 truck drivers in truck sim

Phase 3: 10 trucks and > 100 drivers in operational RFT trucks

Phase 4: Development and testing of HMI concepts

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Naturalistic Truck Study Data Description

Australian Government
Department of Industry, Innovation and Science

Business Cooperative Research Centres Programme

Number of vehicles
- 10

Number of trips
- 22,215

Number of shifts
- 2,482

Total distance
- 1,705,093.78 km

Total time
- 31188 hrs

Number of Drivers
- 120

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Data summary - LGA

	Passenger Vehicles	Heavy Vehicles
1 event per x hours	1.1	1.04
Events per hour	0.89	0.96
Alert range	0.07-4.55	0.16-9.83
Non-driving related region proportion	57.3%	41.9%
Most frequent region	Console	Off Road
Driver lap %	8.6%	7.3%

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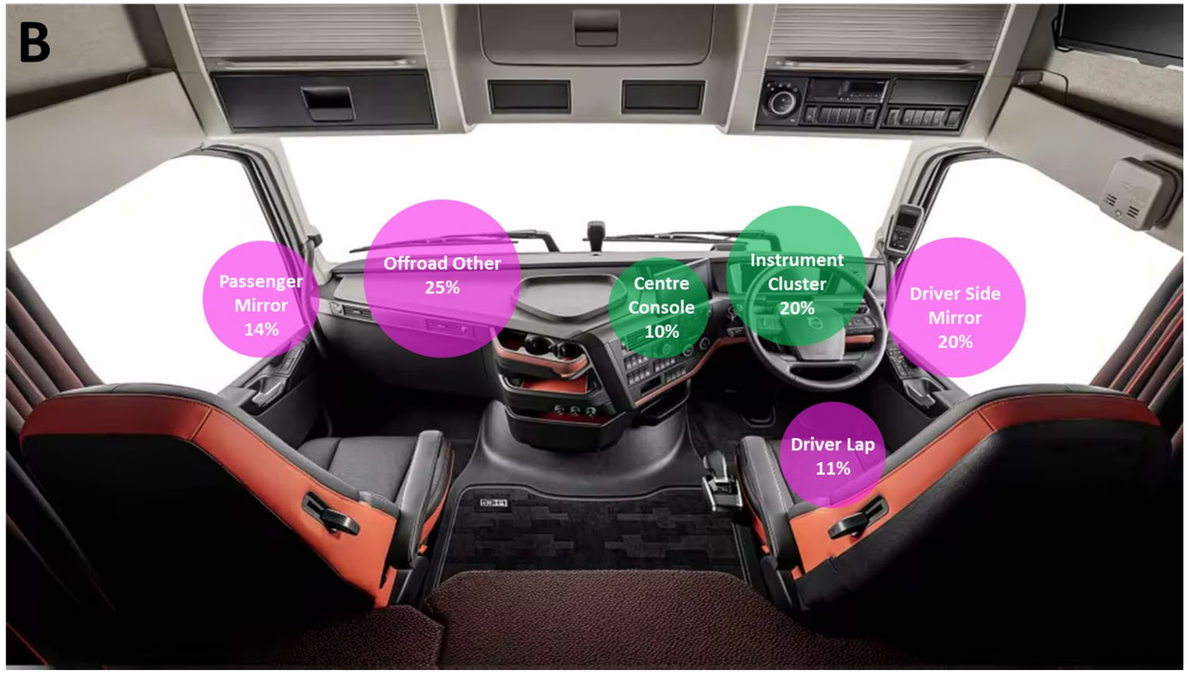
LGA - Car vs Truck Drivers



Increased proportion relative to car drivers

Decreased proportion relative to car drivers

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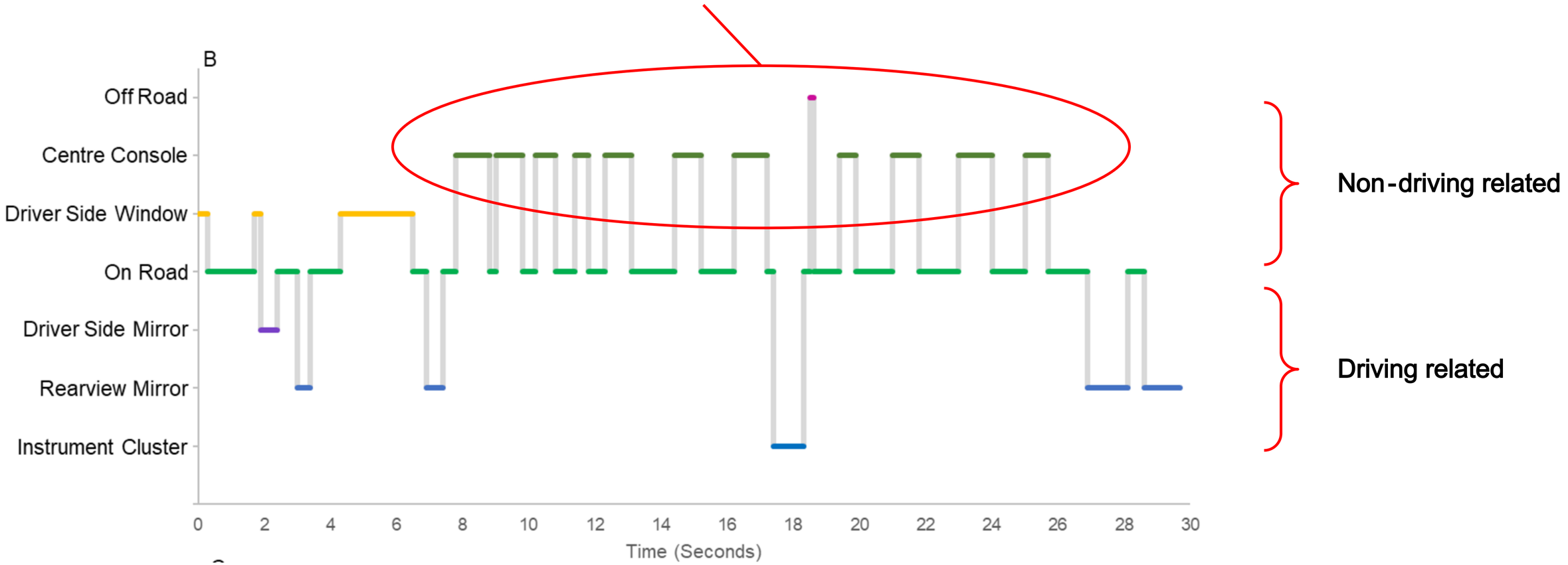
VATS Data Reduction

Excluding 'On Road', **Most Frequent Region** = Centre Console



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Data summary - VATS

	Passenger Vehicles	Heavy Vehicles
1 event per x hours	2.13	0.71
Events per hour	0.47	1.4
Alert range	0.00-0.69	0.07-16.83
Non-driving related region proportion	51.3%	46.3%
Most frequent region	Instruments	Instruments
Driver lap %	7.5%	12.2%

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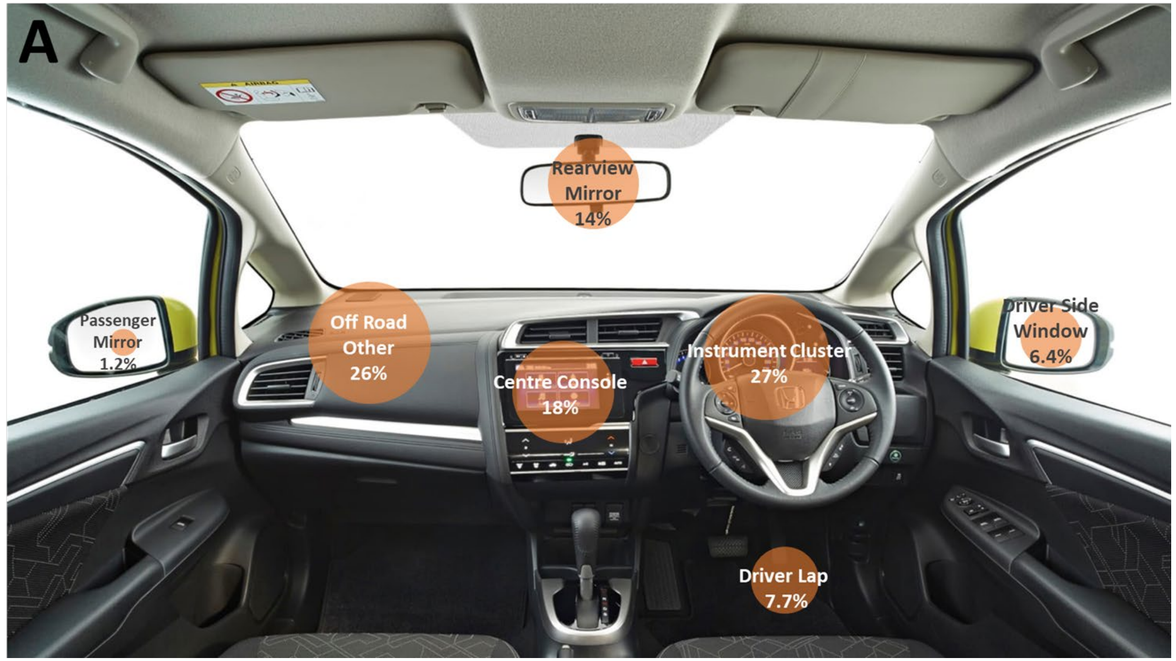
VATS - Car vs Truck Drivers



Increased proportion relative to car drivers

Decreased proportion relative to car drivers

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Inferring Driving Context from Vehicle Speed - LGA

Vehicle Speed	>10km/h (~6mph)	>10km/h, <=60 km/h (~6mph,37mph)	>80km/h (~ 49mph)
Non-driving related region proportion	41.9%	46.7% ↑	35.4% ↓
Most frequent region	Off Road	Off Road	Instruments
Driver lap %	7.3%	2.7% ↓	13.3% ↑

Inferring Driving Context from Vehicle Speed - VATS

Vehicle Speed	>10km/h (~6mph)	>10km/h, <=60 km/h (~6mph,37mph)	>80km/h (~ 49mph)
Non-driving related region proportion	46.3%	53.8% ↑	45.4% ↓
Most frequent region	Instruments	Off Road	Instruments
Driver lap %	12.2%	3.5% ↓	14.4% ↑

VATS - Low vs High Speed

>=10km/h, <60km/h

>80km/h

Increased proportion relative to events at all speeds >= 10km/h

Decreased proportion relative to events at all speeds >=10km/h

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Results and Discussion

- **Overall alert rates**
  - Alert rates for car and truck drivers similar for LGA events
  - VATS alerts more frequent for truck drivers
- **Analysis by glance region**
  - LGA
    - Truck drivers spent more time glancing at mirrors and regions not defined in world model**
    - Car driver LGA glances predominantly to console and instruments
  - VATS
    - Truck driver VATS events predominantly to instruments and driver lap
    - Car driver VATS events predominantly to instruments and regions not defined in world model**
- **Analysis by vehicle speed**
  - Overall decrease in non-driving related regions with increasing vehicle speed
  - Higher proportion of mirror and off road** glances at lower speed; higher proportion of instruments, console, and lap glances at higher speeds

- **Limitations**
  - No safety critical outcomes to assess impact of distraction events
  - **Analysis based on gaze regions, not driver behaviour
  - Analysis based on speed thresholds, not road environment

Key Findings

1 Driver experience of distraction alerts can be fine-tuned by differentiating driving-related vs non-driving related regions

2 Driving context and occupational setting are likely to impact drivers' experience of distraction alerts

3 Existing usage of DMS in heavy vehicle industry presents opportunity for data-driven decisions on protocol implementation, maximising applicability and user-acceptance

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