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Session: RP 4 Managing traffic safety









Leveraging naturalistic Connected for spatial surrogate safety measure

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risk

- Road crashes remain a leading cause of death
- Progress in crash reduction has plateaued
- Traditional crash data is slow and mostly reactive
- Proactive safety analytics is now possible using Connected Vehicle data
- The data comes directly from the vehicle sensors. The vehicle becomes the road risk detector





Department of Infrastructure - Aus



Data from connected vehicles can identify high-risk locations before crashes occur – High braking G-forces



Department of Transport – UK



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Connected LCV's provide speed & braking data

- Data obtained from 57,935 unique LCVs

- Correlation was analyzed between connected LCV harsh braking incidents and crashes

A large dataset from Compass IoT containing connected LCVs in Greater London (June – Dec 2024)

Metrics used: time, location, speed, acceleration, braking

• Focused on harsh braking as a surrogate safety measure

Braking events were compared spatially, using cross-Nearest-Neighbour analysis and Ripley's Cross K12 function

Map visualizations and spatial analysis indicate crash locations









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Strong evidence of near misses & crash locations Compass IoT provided CV data indicating 'near misses' - braking and swerving g-forces Evidence of strong Spatial Clustering of braking g-forces matched recorded crashes

Most harsh braking points are within 200 – 500 m of LCV crashes

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Strong correlation between braking & swerving g-force clusters with crash sites













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Mapping crash locations with vehicle braking Cata



LGV CV data indicating 'near misses' (including braking, acceleration and swerving g-forces) Mapped Recorded Crash locations



Harsh Braking events were isolated for analysis 57,935 individual connected LCV IDs Study period - June to December 2024





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Mapping Crash Locations with Vehicle Braking Data

Greater London Boundaries Analysis Potters Bar Taltham Cross Watford Enfield Londor Tibury Graveser Orpingtor 20 Epsom



Greater London LCV G-Forces

The date range for this dashboard is July 1, 2024, to December 31, 2024.



of Trips 3,097,468

1110 King Sevenoaks

of Harsh Braking points < -0.3 396,287

Harsh Swerving Location



Braking Analysis by Road, Sec	tion and Direction				
Road Name	Section of Road (ID)	Direction	Avg Braking	% Harsh Braking (<-0.2) 😖 👻	% Harsh Braking (<-0.3) 🛛 🔫
Langton Road	7830268777586	WB	-0.2	33.33%	33.33%
Crescent Road	3385682269306	NB	-0.19	38.46%	30.77%
Robin Hood Lane	1443316852610	WB	-0.21	42.86%	28.57%
Oaklands Avenue	13280011839354	WB	-0.3	58.33%	25%
Alverstone Avenue	4889659020410	EB	-0.16	37.5%	25%
Arcadian Road	391519627138	WB	-0.19	25%	25%
Heysham Lane	2561954518138	WB	-0.2	46.15%	23.08%
Northumberland Road	5213861942394	WB	-0.2	46.15%	23.08%
Bedale Road	7660080698498	WB	-0.25	44.44%	22.22%
Bray Road	10977674499194	SB	-0.15	22.22%	22.22%

Greater London LCV G-Forces The date range for this deal-based is July 1, 2026, to December 21, 2026. TorVehicles 762,813 Heah Ballog = 112 Heah Swening > 0.5

Braking Analysis by Road, Section and Direction

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Harsh Braking Location

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Harsh braking data compared to crash datase Methodology

Where:

- ٠ two datapoint sets

- of type 1.

$$K_{12}(r) = \frac{1}{N_1} \sum_{i=1}^{N_1} \frac{m_2(B_i(r))}{area(B_i(r))}$$

 $K_{12}(r)$ is the cross-K function value at a set distance r, denoting the spatial interaction between the

 N_1 is the number of points of type 1 (i.e., deceleration points).

 $B_i(r)$ describes the circular region of radius radius r centered at the *i*-th point of type 1. $m_2(B_i(r))$ is the number of points of type 2 (i.e., crash points) within a distance r from the *i*-th point

 $area(B_i(r))$ is the area size of the circular buffer of radius r centered at the *i*-th point of type 1.

Cross-K Function: Harsh braking Points vs Crash Points



Nearest Neighbor Distances

1000 2000 3000 4000 5000 6000

Distance (meters)

All near misses mapped

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Findings highlight the predictive value of connected vehicle data by identifying road safety risk locations

Harsh braking data from thousands of **connected LCV vehicles** corelate strongly with **actual crash** locations

The **vehicle itself** is used as a real time road **risk detector** from its own sensors providing **direct evidence of** risk

It's time to shift from reactive to predictive road safety methodologies using data from connected vehicles

We don't have to wait for crashes to happen to act; we can see the risk, map it, and prevent it

Connected vehicle data is redefining how we understand and address road safety

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