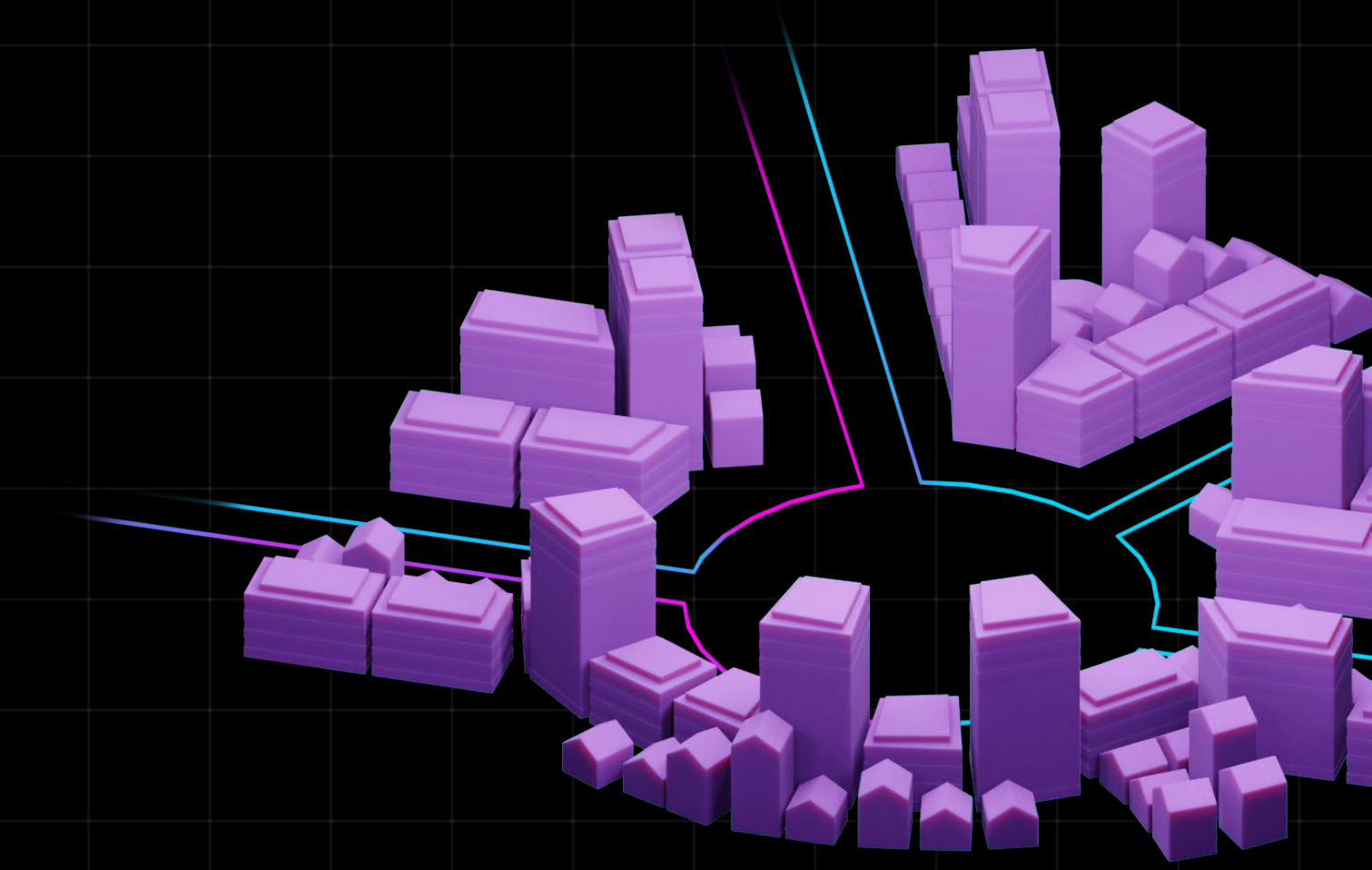
RoadTrace

Connected insights by AISIN

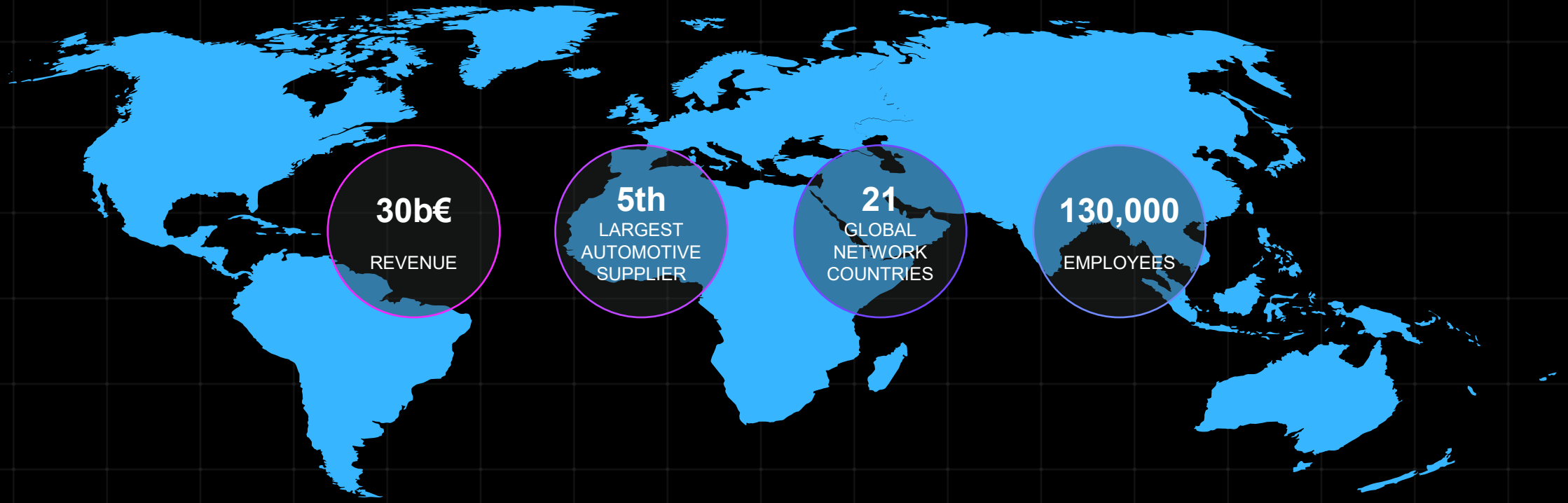
Can data predict road collisions?



Lorna Payne
Business Manager, RoadTrace by AISIN

AISIN

Global support for the automotive industry

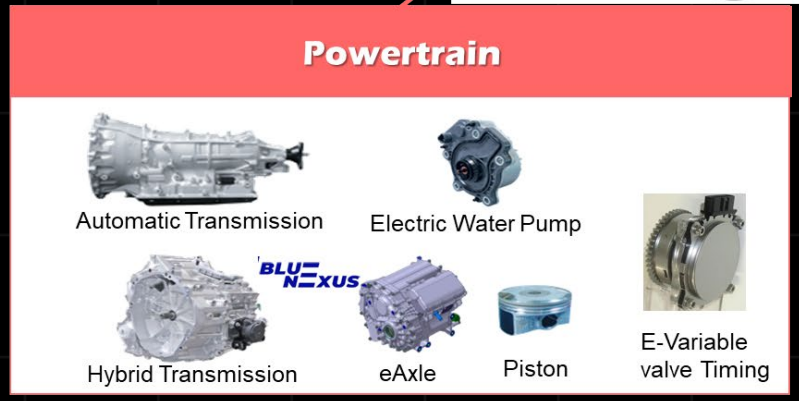


RoadTrace

AISIN has been driving in-vehicle safety for decades

- Safety-critical components, such as braking and steering

- Driver monitoring systems
- Intelligent speed assist
- Driver coaching



-> Analysis of driver and vehicle behaviour

Extending our contribution to the **Safe System approach** beyond safe vehicles and drivers

Extending our contribution to the **Safe System approach** beyond safe vehicles and drivers

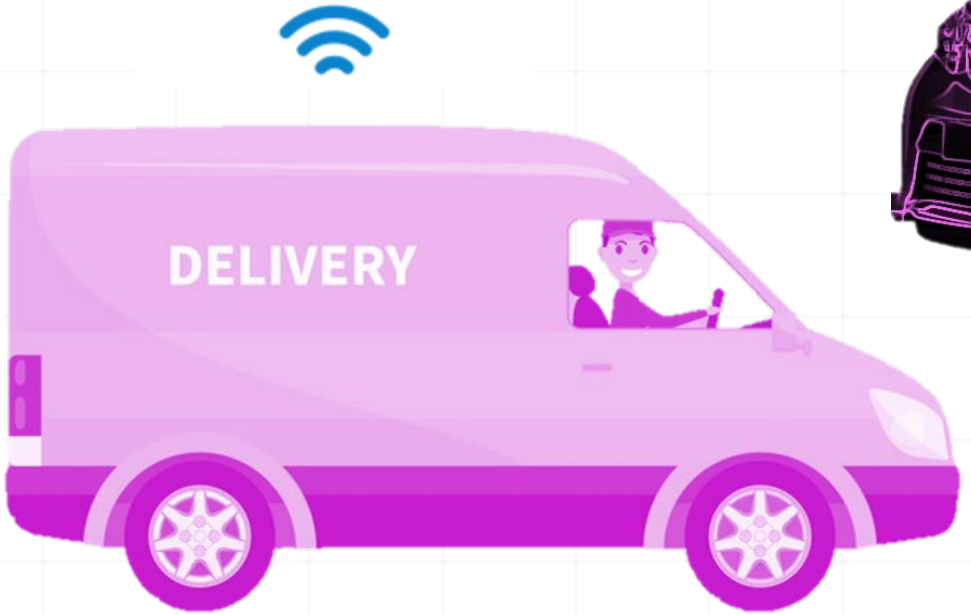
to include safe roads

Towards **Road Management 4.0** ?

Leveraging data
to assist road operators,
to improve safety & asset management.

Connected vehicles

- Any vehicle able to transmit data
- Most new vehicles since 2015
- **Mandatory for all new cars since 2018**



What kind of data?

Level 1: GPS position (Floating Car Data or « FCD »)

Level 2: Driving behaviour or « events », from vehicle sensor data : accelerometers, wheel speeds,…

→ Accelerometers are required for airbags and ABS/ESC control → deployed widely since the 90s

→ Accelerometers allow accurate detection of **harsh braking** (very high frequency signal)

Correlation with KSI

Studies show a strong correlation between **harsh braking events*** and real crashes :

"recommending that **hard-braking event data** be used by agencies **to quickly identify emerging work zone locations** that show relatively large number of hardbraking events for further evaluation."

Desai J. et al., "Correlating Hard-Braking Activity with Crash Occurrences on Interstate Construction Projects in Indiana", Journal of Big Data Analytics in Transportation (2021)

"Results indicated a **strong correlation between hard-braking events and rear-end crashes** occurring more than 400 ft upstream of an intersection(…) providing an opportunity for agencies to follow up with mitigation measures **addressing emerging problems much quicker than typical practices** that rely on 3–5 years of crash data."

Hunter M. et al., "A Proactive Approach to Evaluating Intersection Safety Using Hard-Braking Data", Journal of Big Data Analytics in Transportation (2021)

"(...) it is concluded that HBI (Harsh Braking Issues) records **can be used to support accident modelling**, they are **a source of much more numerous data than accidents**, and this may be important in considering changes or trends in accident risk over a much shorter time than for accident studies."

J. Kamla et al., "Analysing truck harsh braking incidents to study roundabout accident risk," Accident Analysis & Prevention (2019)

"**Incident detection** based on vehicle can-data within the large-scale field operational test "euroFOT".

In Proceedings 22nd International Technical Conference on the Enhanced Safety of Vehicles (ESV).

Benmimoun, M., F. Fahrenkrog, A. Zlocki, L. Eckstein (2011)

"**Cluster-based correlation** of severe braking events with time and location".

In Proceedings of the 10th System of Systems Engineering Conference (SoSE), San Antonio, TX, USACao, G et al. (2015)

*Common threshold is 0.3g

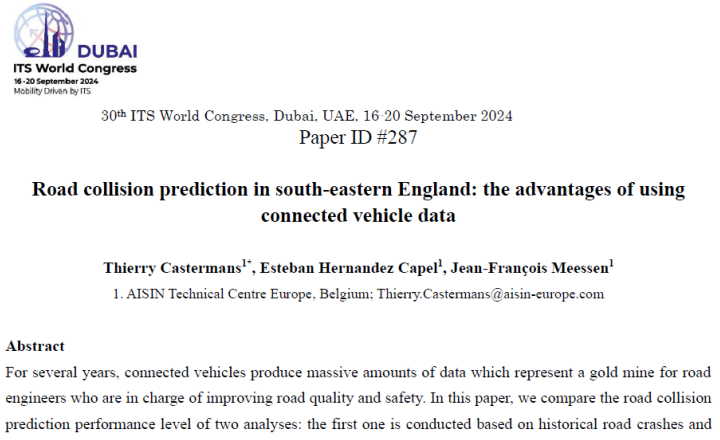
But is it better than looking at historical KSIs?

Our study in the UK

- Comparing our **unique** approach, based on harsh braking clusters, to the usual historical collisions data approach (STATS19, UK)

- Validated in different regions (rural, urban, various traffic densities)

- Selected by jury of experts to be presented at ITS World Congress



DUBAI
ITS World Congress
16 -20 September 2024
Mobility Driven by ITS

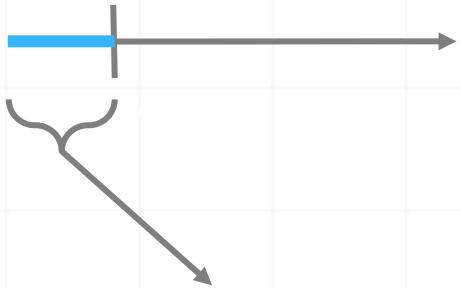
30th ITS World Congress, Dubai, UAE, 16-20 September 2024
Paper ID #287

Road collision prediction in south-eastern England: the advantages of using connected vehicle data

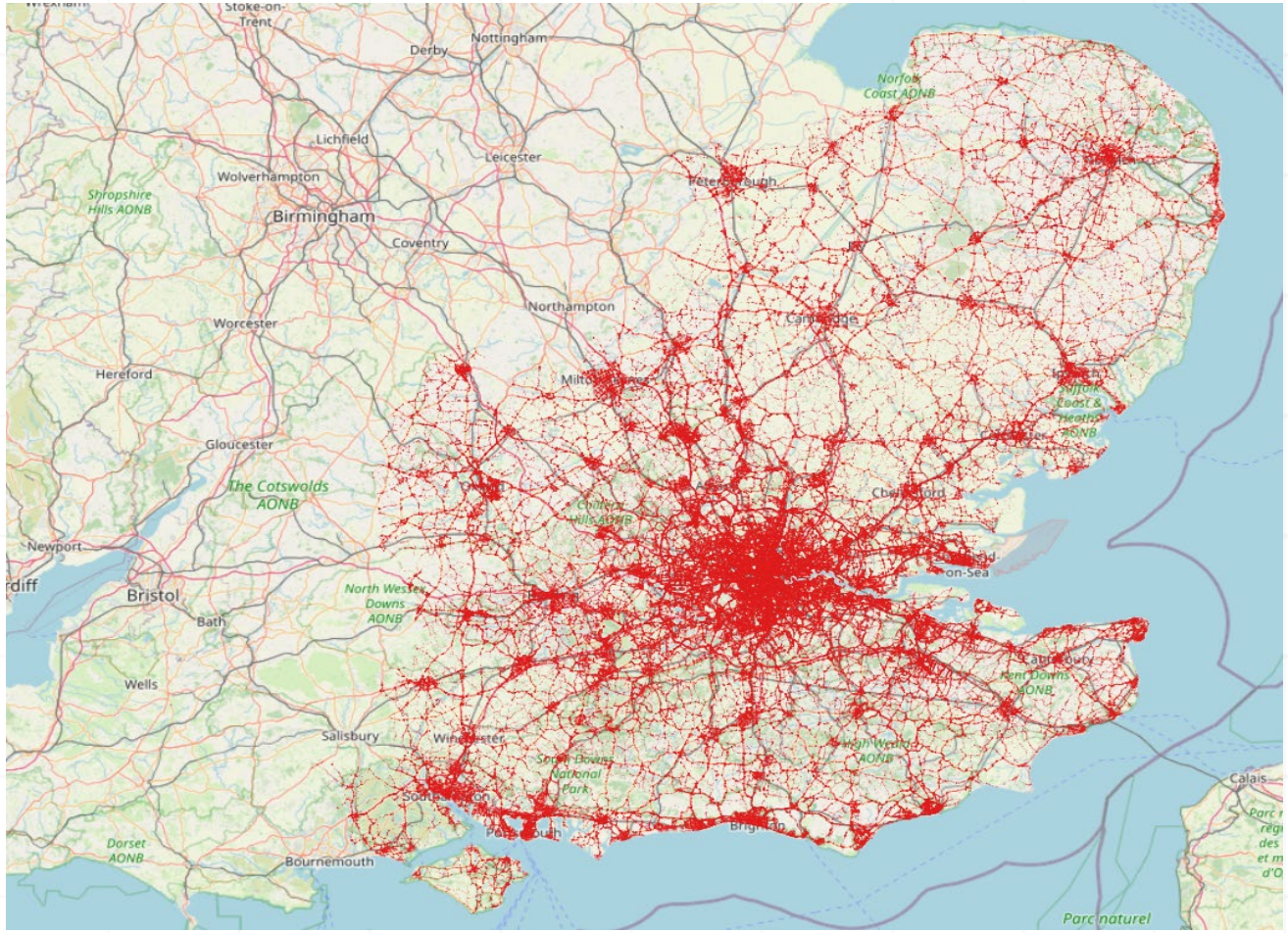
Thierry Castermans[1*], Esteban Hernandez Capel[1], Jean-François Meessen[1]
1. AISIN Technical Centre Europe, Belgium; Thierry.Castermans@aisin-europe.com

Abstract
For several years, connected vehicles produce massive amounts of data which represent a gold mine for road engineers who are in charge of improving road quality and safety. In this paper, we compare the road collision prediction performance level of two analyses: the first one is conducted based on historical road crashes and

3 months of harsh braking data to predict where crashes will occur

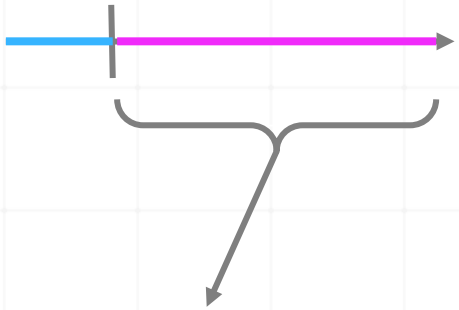


Harsh braking data*
used to identify clusters

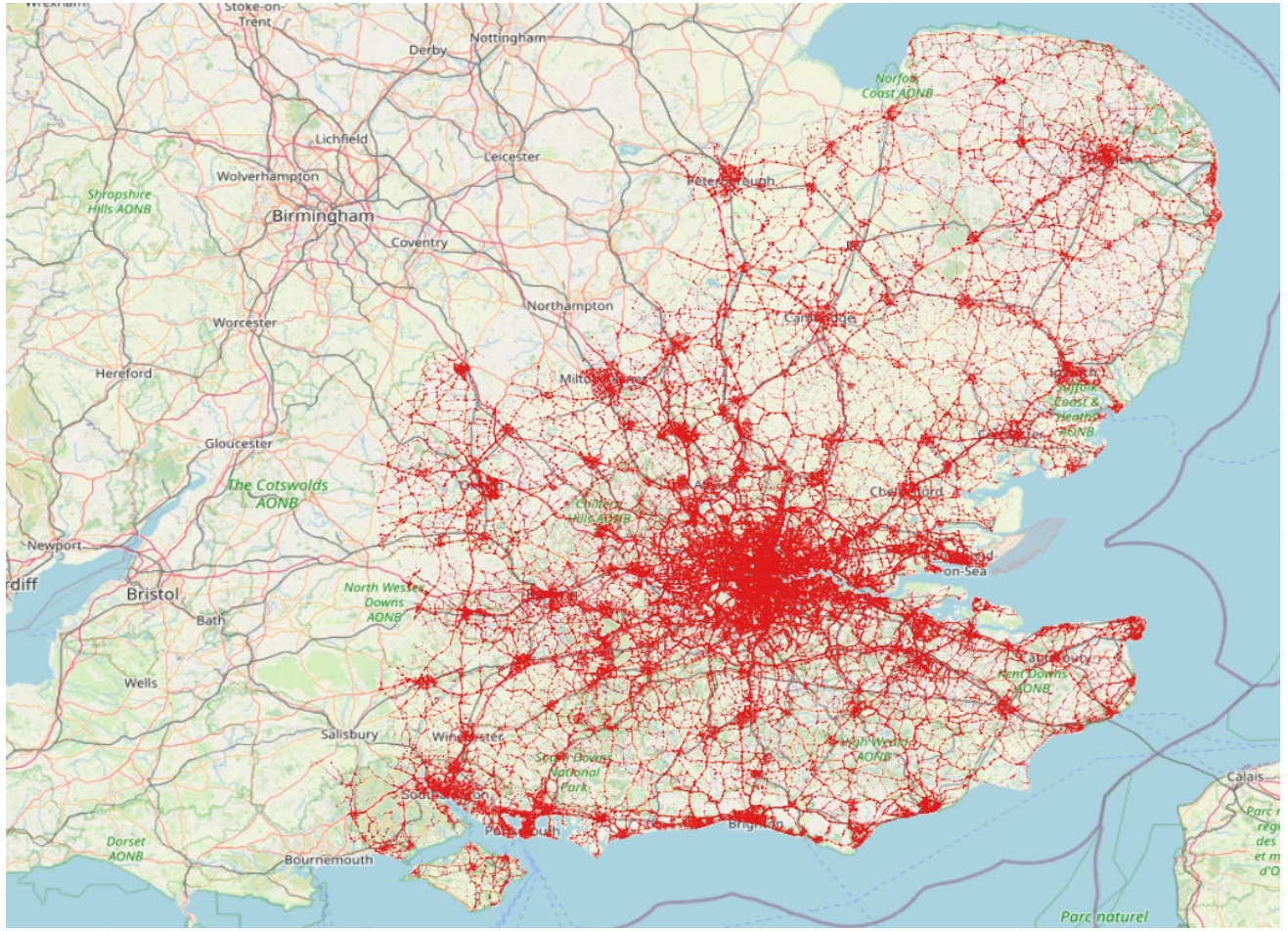


*Jan-March 2022, providers under NDA

Check against **real collision** reports from <u>following 9 months</u>



Real collisions*



*STATS19 Apr.-Dec. 2022

Results

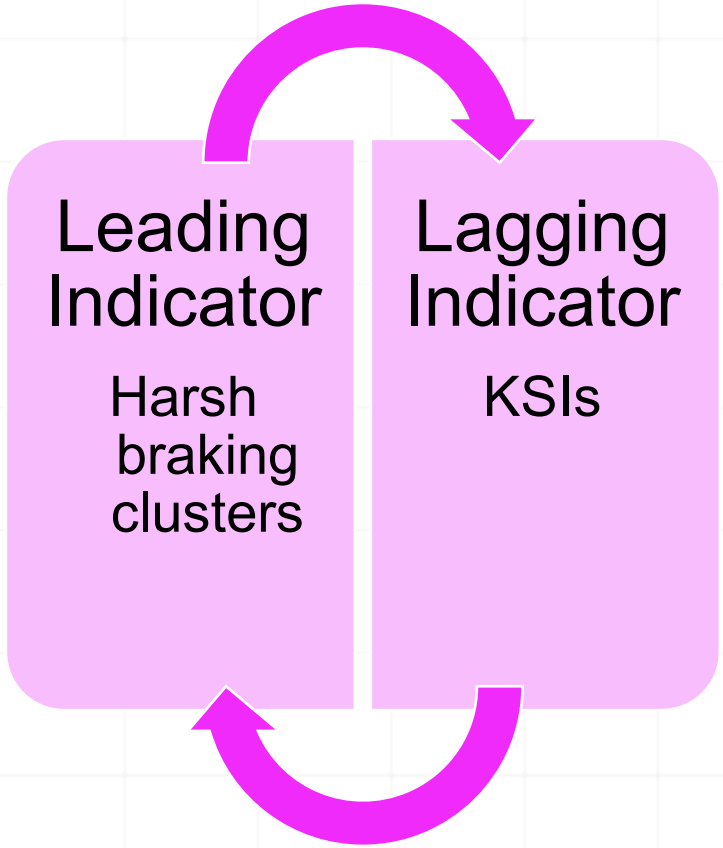
Case studies in UK (Cambridgeshire, Kent, London, East & South East UK), using **3 months** **of harsh braking data** to predict collisions:

- On average, **21%** of « RoadTrace » harsh braking **clusters** turned into real collisions **in the following 9 months**
- Using **5 years** of KSI data would have given maximum **6%** **conversion rate**

Our technology is, on average, **3.23 times** more efficient at predicting the exact location of future collisions compared to historical data

Results – Vision Zero tool

DUBAI
ITS World Congress
16 -20 September 2024
Mobility Driven by ITS



- Prediction efficiency
- « Fresher » data
- Better statistical relevance (far larger sample)
- More precise positioning

download the white paper

Delivering quality data insights

Automotive Grade **Connected Vehicle Data Insights**

5. Flexible delivery format

Report | CSV file | Platform

4. Product option #2

Hotspot analysis:
severity prioritisation, clustering, contextualisation

3. Product option #1

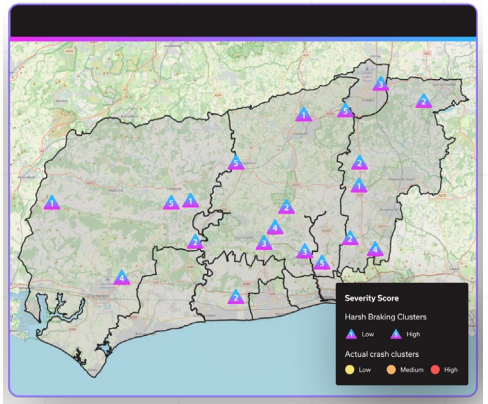
Enriched raw safety events

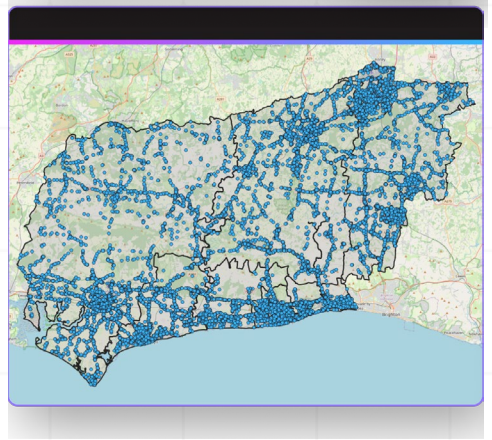
2. Quality enhancement

Anomaly filtering, map matching for precise positioning

1. Quality source data

Ingest vehicle sensor data across diverse vehicle brands / vehicles / driver types

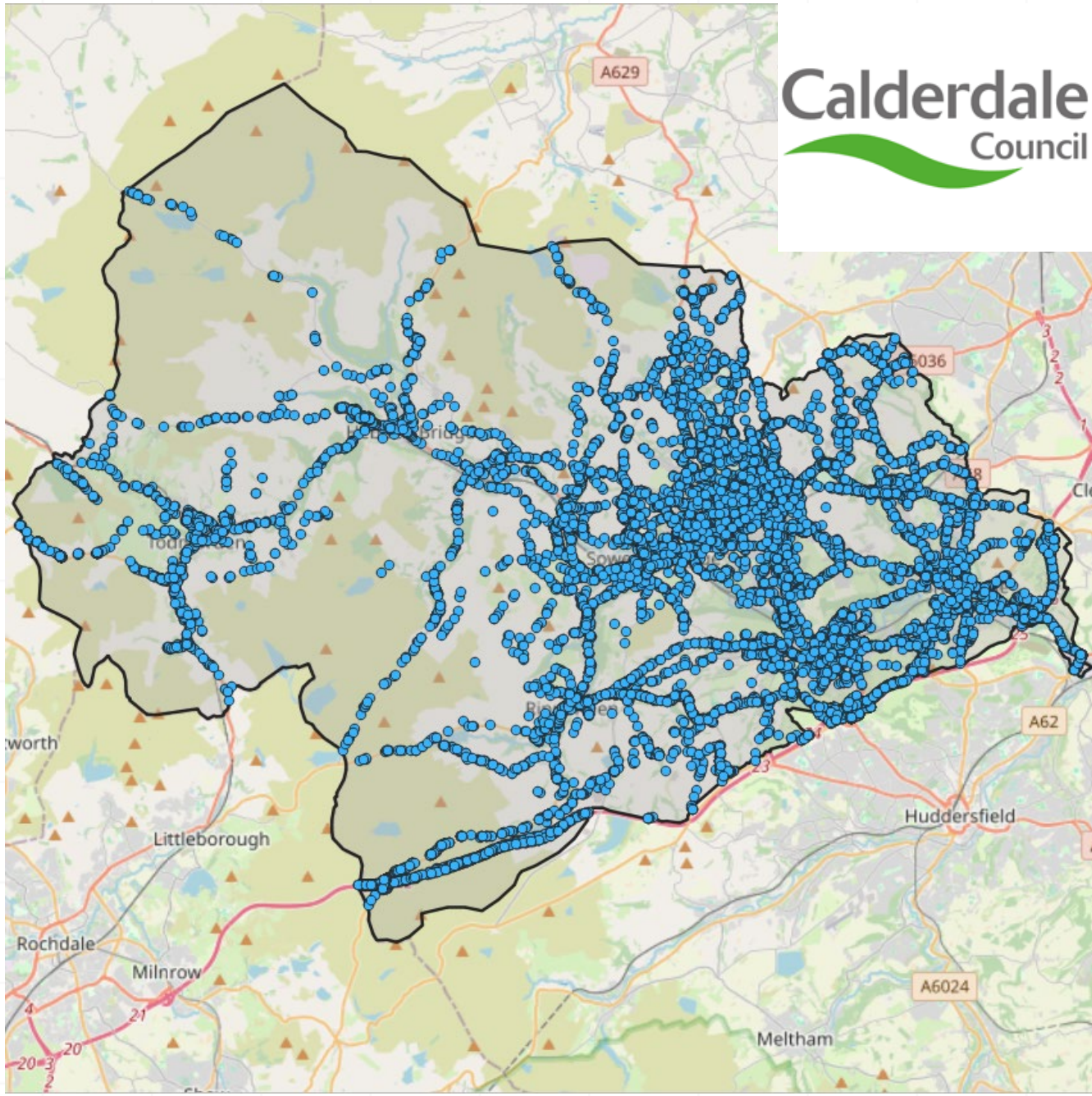




How road authorities are using our insights

Enriched raw safety events

Our analysis is based on **32,149** harsh braking events detected between 2024-07-01 and 2024-11-30



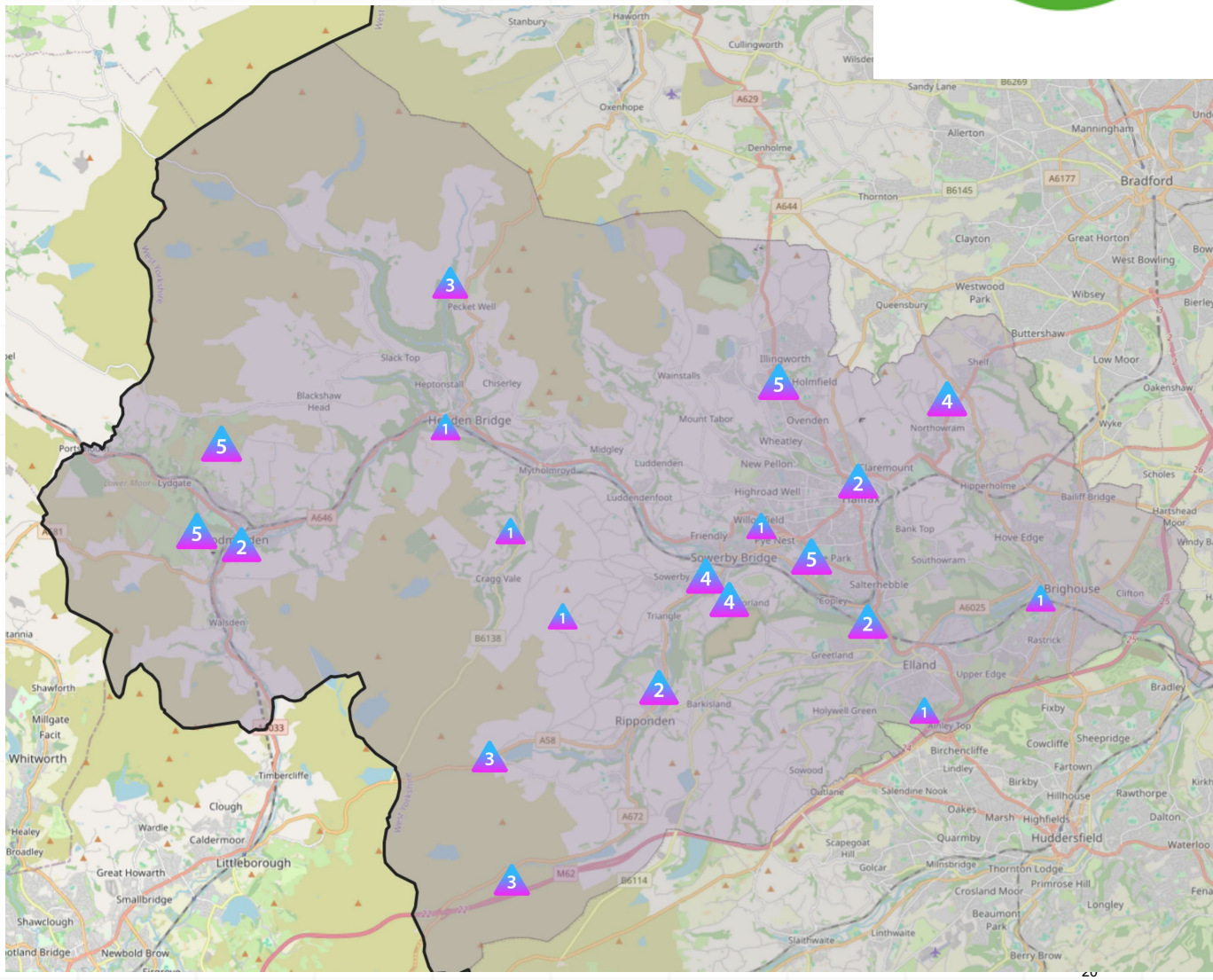
Calderdale Council

West Yorkshire VISION ZERO
No more road deaths

Hotspot analysis:
severity prioritisation, clustering, contextualisation

Calderdale Council

We analysed the Top 20 most critical areas and prioritised according to severity (1 – 5)

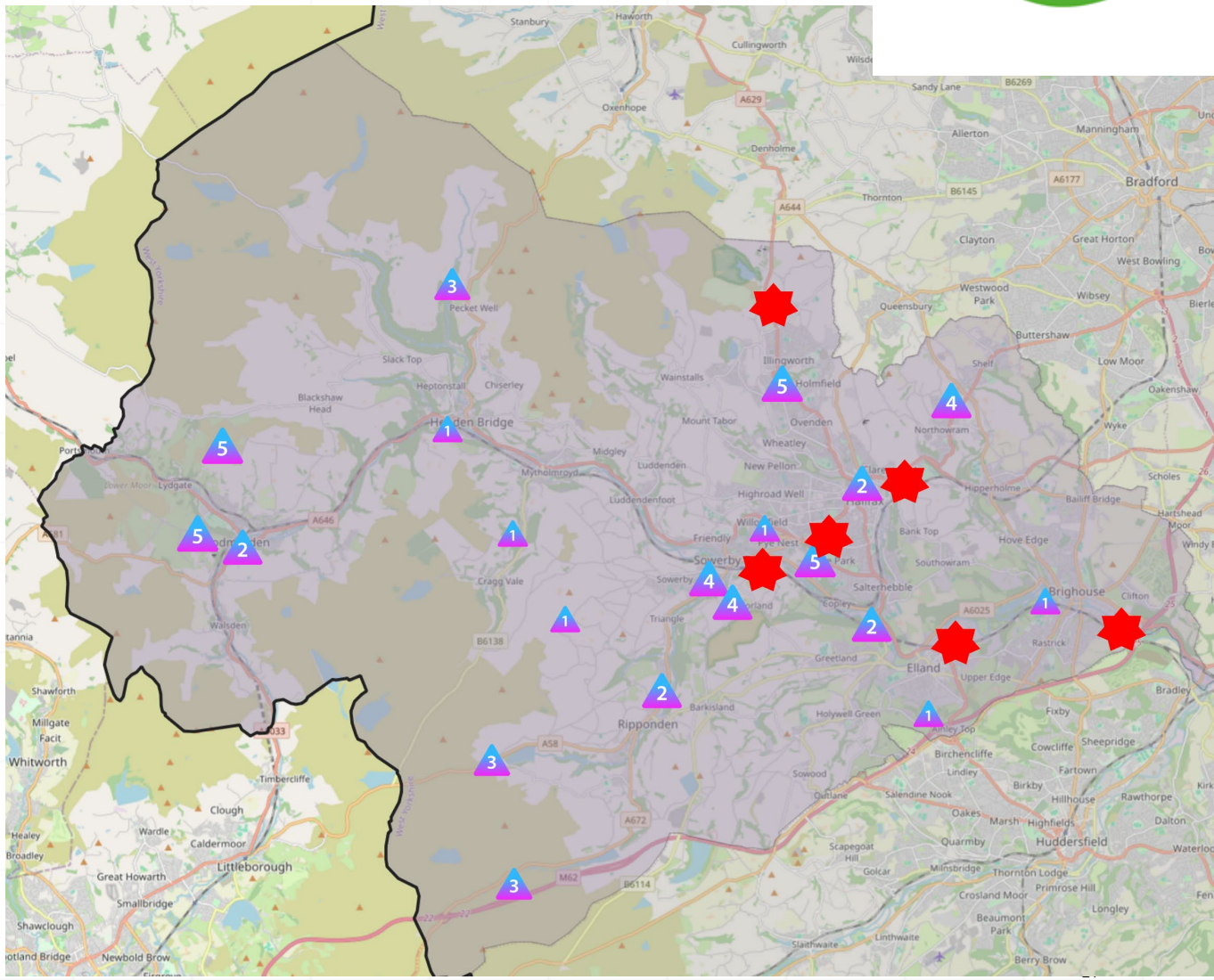


West Yorkshire VISION ZERO
No more road deaths

Collisions – KSI hotspots

and correlated with STATS19 from 2019 to 2023

Total: **1,565** collisions (KSI)



Calderdale example #1

Day	**96.0**	**%**
Night	2.0	%
Dawn	0.0	%
Dusk	2.0	%
Rain	**25.0**	%
Fog	11.0	%
Snow	0.0	%
Hail	0.0	%
Weekend	4.0	%
Start speed	24	Mph
End speed	12	Mph
Max deceleration	0.528	g
Speed limit	30	Mph
Rush hour	**44.0**	%
Nbr of KSI	0	-
KSI type		-

Calderdale example #2

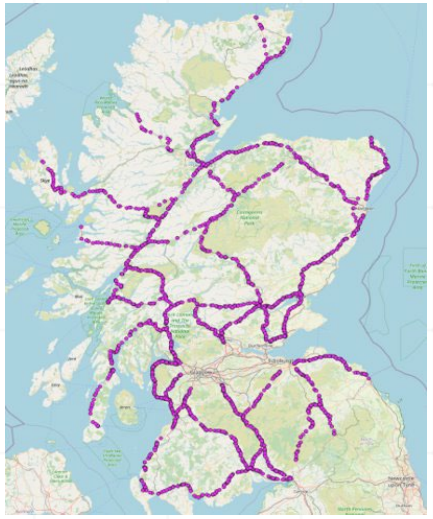
Day	**92.0**	**%**
Night	0.0	%
Dawn	4.0	%
Dusk	4.0	%
Rain	16.0	%
Fog	8.0	%
Snow	0.0	%
Hail	0.0	%
Weekend	0.0	%
Start speed	**28**	Mph
End speed	6	Mph
Max deceleration	0.464	g
Speed limit	20	Mph
Rush hour	**40.0**	%
Nbr of KSI	0	-
KSI type (STAT19)		-

London – Urban Safety

Day	81	%
Night	16	%
Dawn	0	%
Dusk	3	%
Rain	6	%
Fog	6	%
Snow	0	%
Hail	0	%
Weekend	3	%
Start speed	21	mph
End speed	4	mph
Max deceleration	0.476	g
Speed limit	20	mph
Rush hour	**45**	%
Nbr of KSI	1	

How road authorities are using our insights

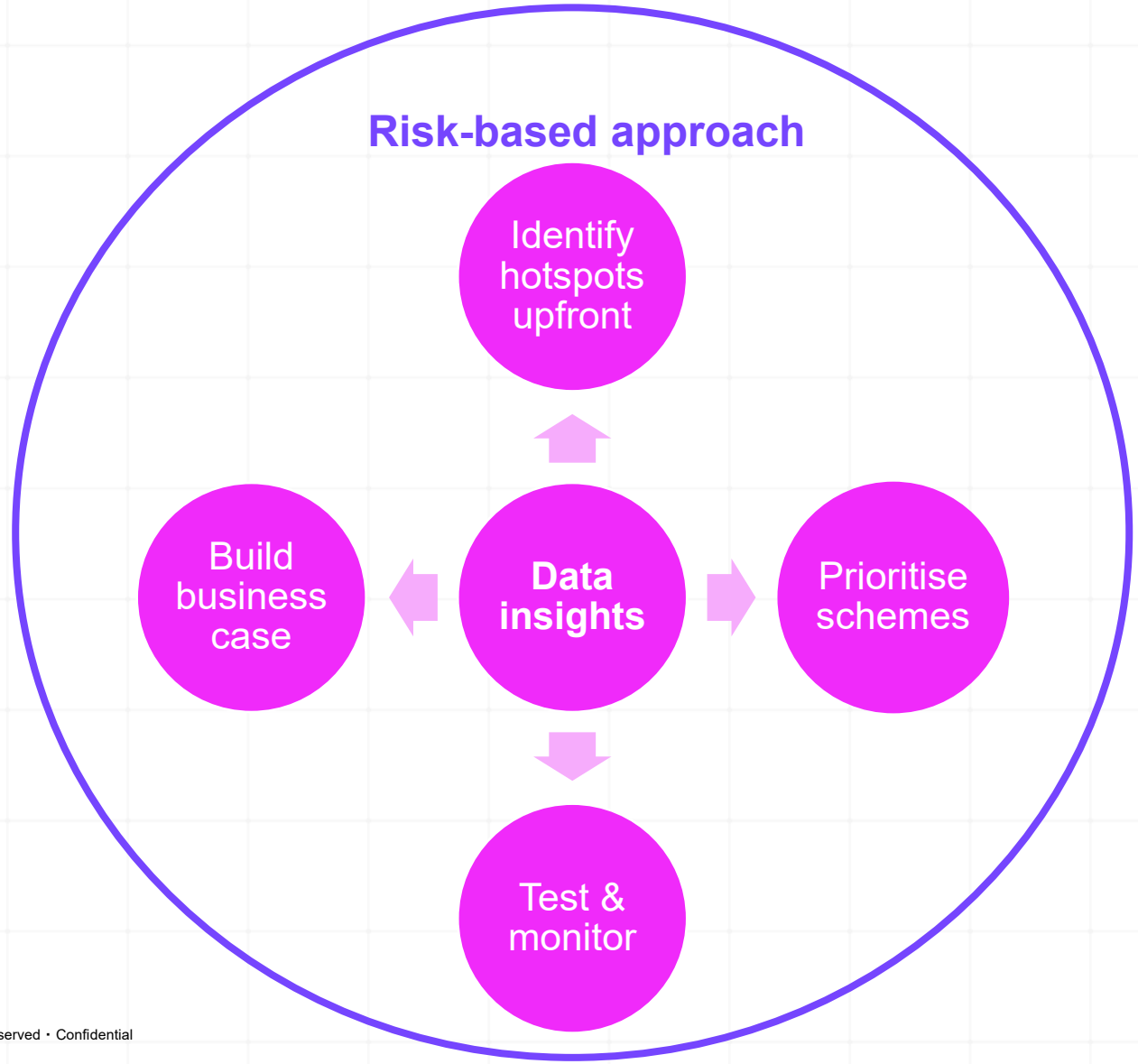
Harsh braking events
before clustering



KSI data from STATS19

1. Input data based on >80k Harsh Braking events in 3 months
2. Risk score applied to produce clusters of repeated, collective Harsh Braking
3. Correlation to collisions using 4 years of STATS19 data
4. Comparison of Summer and Winter seasons

Measuring is knowing



Key take-aways

DUBAI
ITS World Congress
16 -20 September 2024
Mobility Driven by ITS

Clusters of harsh braking = Risk-based approach to Proactive Road Safety

- Around **3x more efficient** than KSI clusters to predict future crashes (21% vs. 6%)
- Identify likely **new collision hotspots**
- Enable **quicker prediction** of future crashes
- **Better accuracy** for precise location
- **Validated approach** (ITS paper, DfT award)

Question : Are we still going to ignore vehicle data in our decisions?

Lorna.Payne@aisin-europe.com

Wesley.Bateson@aisin-europe.com

Contact us / Website to discuss

Roadtrace.eu