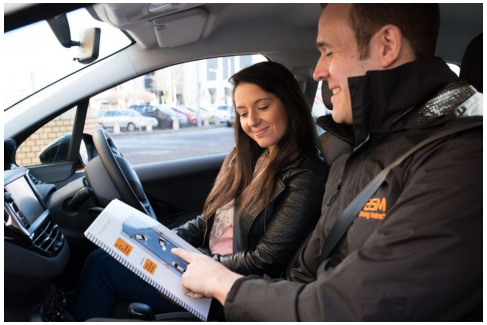
360°

feedback



Driver Coach

A driving coach for everyone
to make driving safer

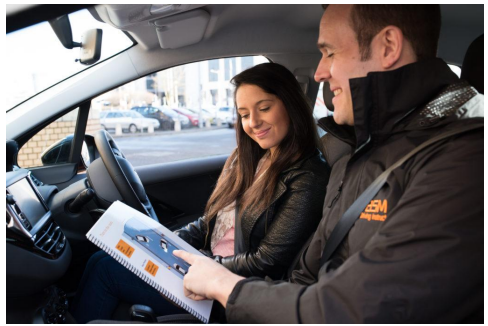
An ECO system to share data

Tauvic Ritter, 2020-12-08, https://github.com/Tauvic/DriverAwareness

Contents

- Introduction
- Distracted driving and a safe driving style
  - What can we do about it
    - Prevent distracted driving
    - Promote safe driving style
    - Identify risky situations
  - How it works
- Vehicle driving ECO system (vision)
- What do do next
- Demo

feedback



Personal driver coach

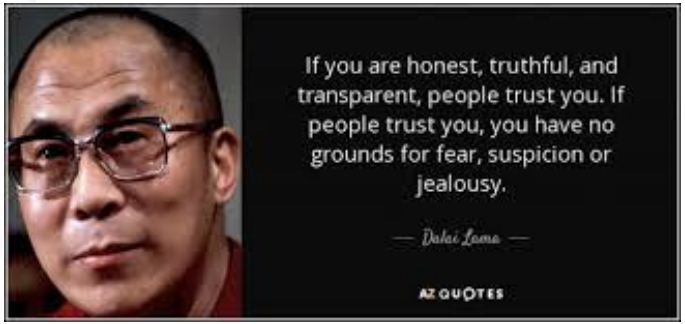
What really matters in life

Safety

Privacy

Transparency

Trust



You drive the same road every day

- You know it by heart
- Every turn
- Every tree
- Nothing special
- That’s when you start day dreaming

"It came out of nowhere!"

We are all perfect drivers, but

We sometimes forget what we have learned

We are so hungry

We are so busy

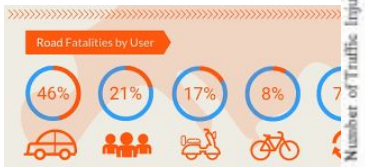
We get tired

It came out of nowhere

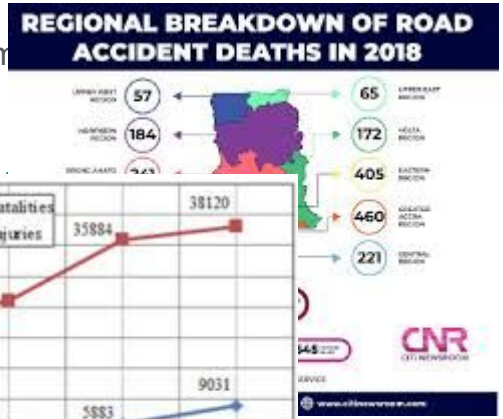
So human, so busy, totally unaware

This results in Road Accident Statistics

According to the British Royal Society for the Prevention of Accidents, driver fatigue contributes up to 20% of road accidents and up to a quarter of fatal and serious accidents. The statistics are that an estimated 1,550 deaths, 71,000 injuries, and $12.5 billion in monetary losses each year due to driver fatigue. ……..



's ranging from



I don't want to end up in those statistics

We are all perfect drivers, but

Research

- We miss what happens around us
- By tracking head and eye movement we can evaluate our level of situational awareness

What are our major distractions?

1. We get distracted by our phone
2. We are hungry or tired
3. We get day dreaming

1. We should disable the phone
2. We should be in good physical shape
3. We should be focused

There are four types of driver distraction:

- Visual – looking at something other than the road.
- Auditory – hearing something not related to **driving**.
- Manual – manipulating something other than the steering wheel.
- Cognitive – thinking about something other than **driving**.

We forget how we should drive safely
We should be constantly reminded

360 degree awareness

Good driving habits

- Wearing seat belt
- Active driving posture
- Hands on the steering wheel
- Looking in the general driving direction
- Checking for traffic from all directions
- Left/right/rear mirror checking
- Signalling direction changes to other drivers

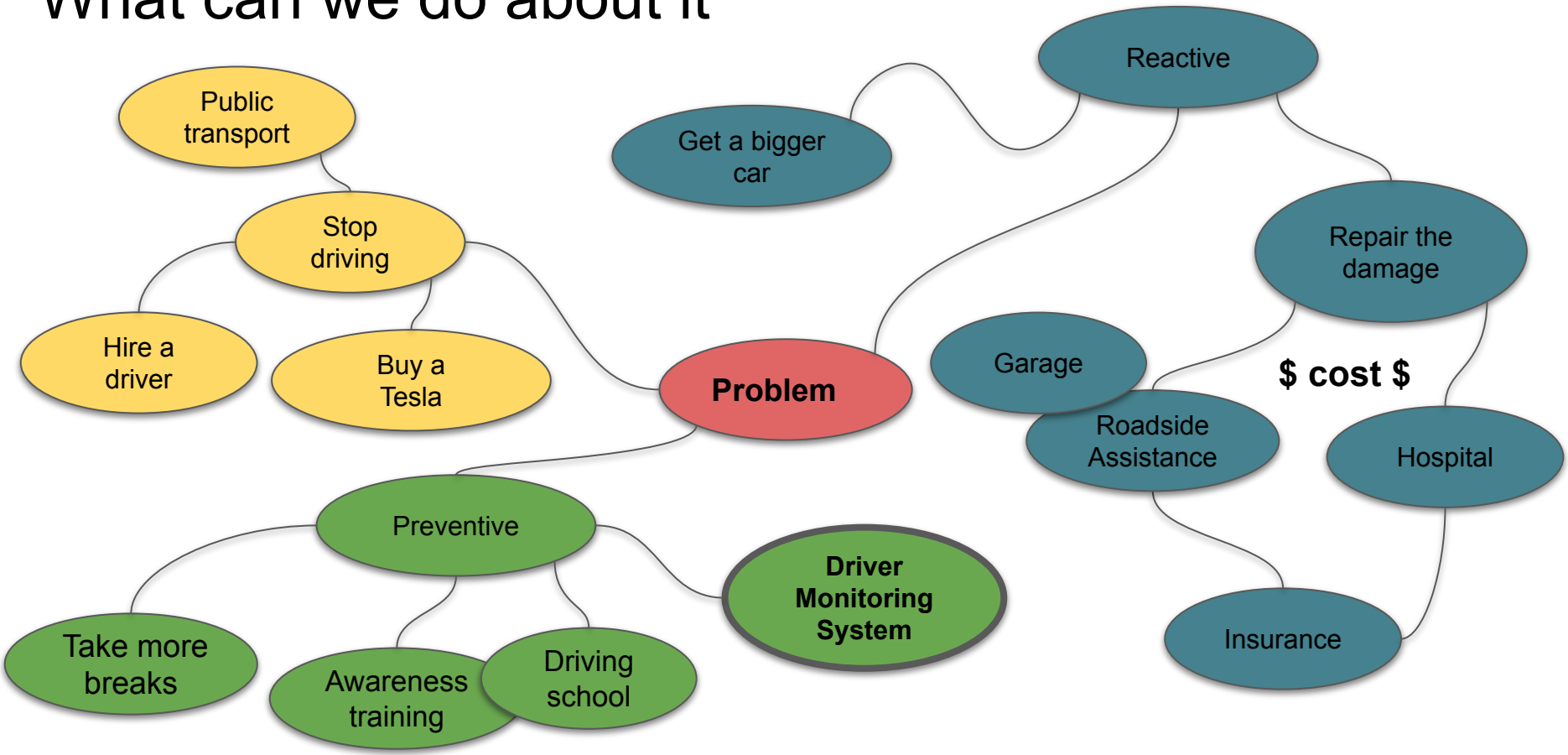
Bad driving habits

- Mobile phone usage (handheld, call, texting)
- Operating the console (radio / airco)
- Talking to passengers
- Eating or drinking
- Other activities (reaching for something, singing)

Ugly driving habits

- Falling asleep

What can we do about it



Driver Monitoring System (drowsiness)

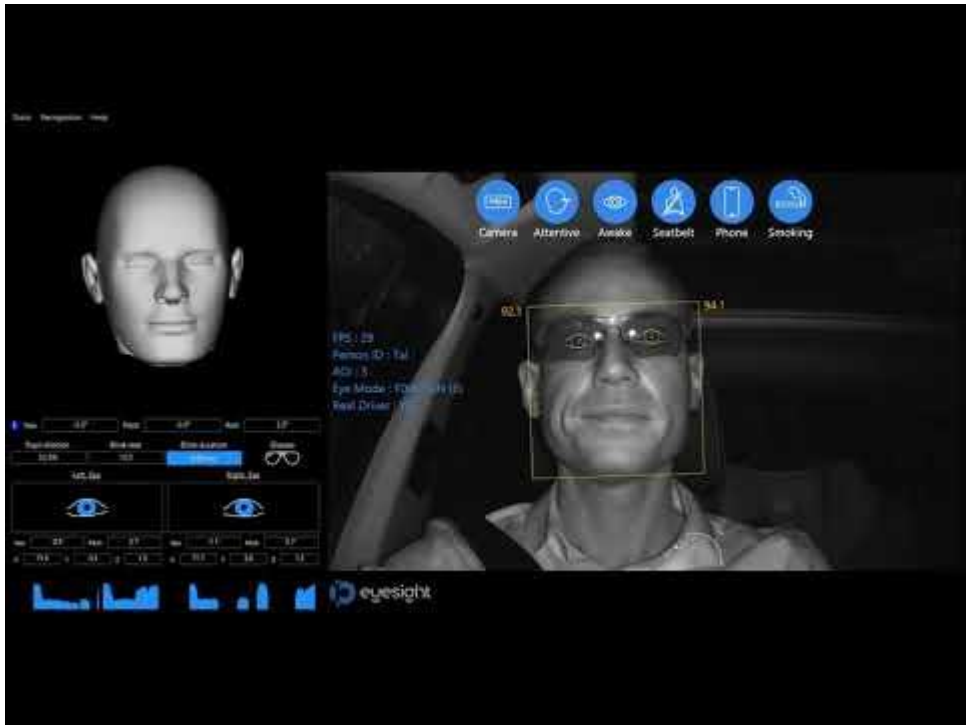
- Warns when driver is tired
- Detects only drowsiness
- Build-in in expensive cars
- Most regular cars don’t have this feature
- Effect on safety is limited

Driver Monitoring System (distractions)

Detects:

- Drowsiness
- Wearing a seatbelt
- Distractions
  - Holding a phone
  - Smoking

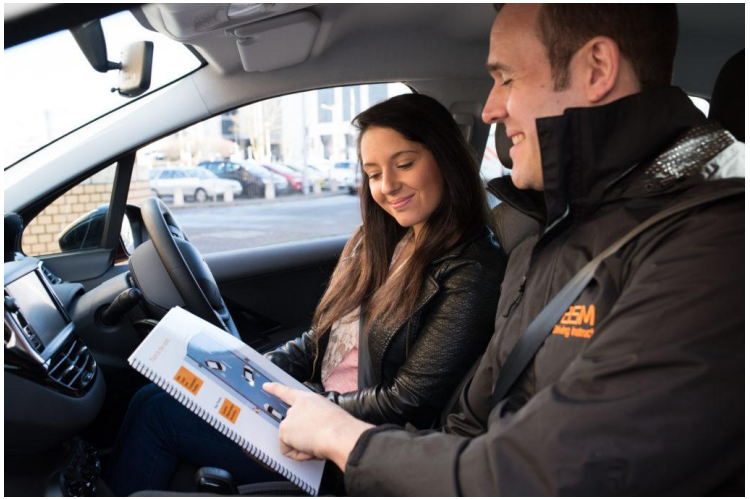
Effect on safety is better but still not complete



Driver Monitoring System (driving skills and style)

Detects:

- Drowsiness
- Distraction
- Driving skills
  - Steering
  - Acceleration/ Deceleration
  - Braking (timing)
  - Gear (timing, gear selection)
- Driving style
  - Driver alertness
  - Mirror checking
  - Over the shoulder checking
  - Indicator lights usage
  - Stop signs / traffic lights

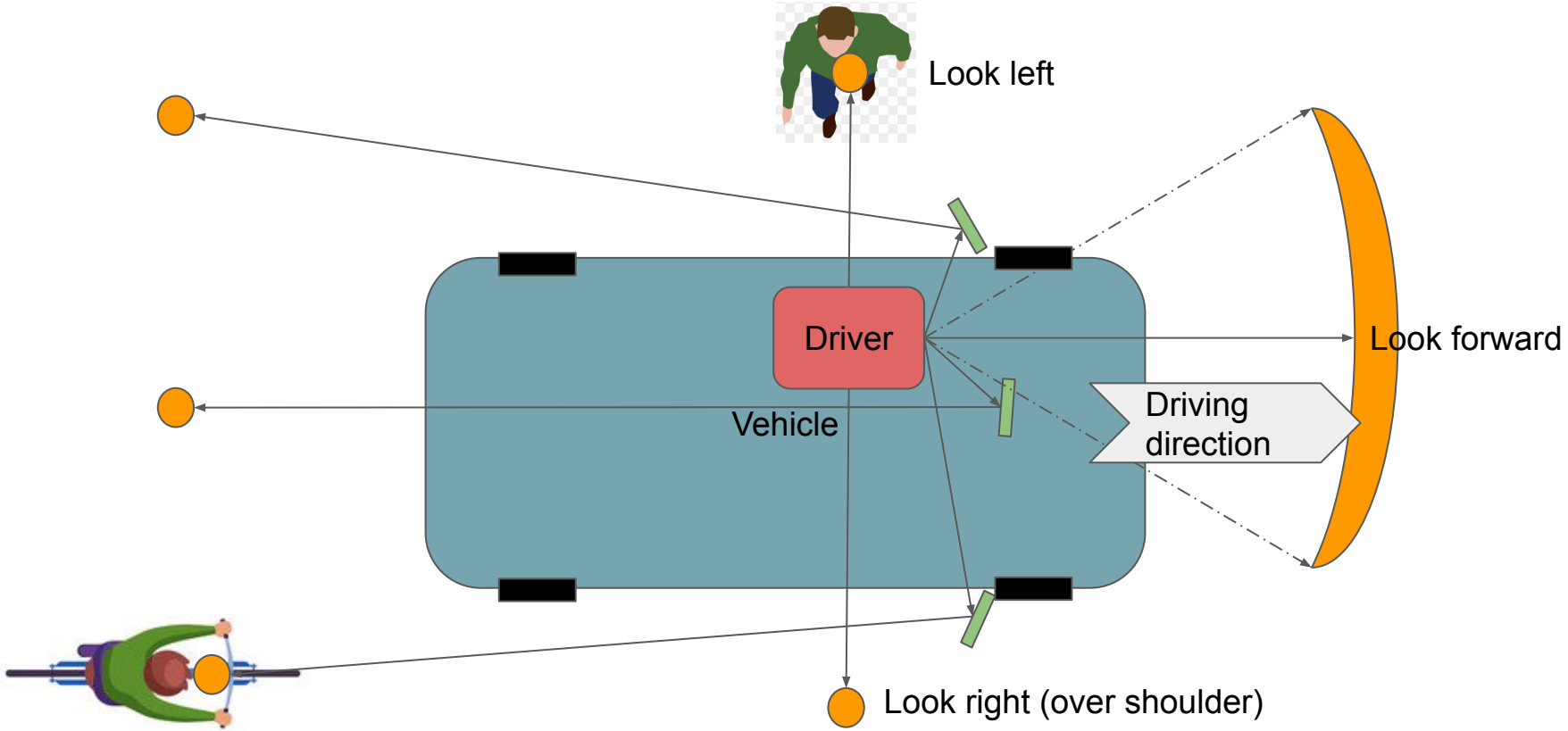


Getting a more complete driver profile

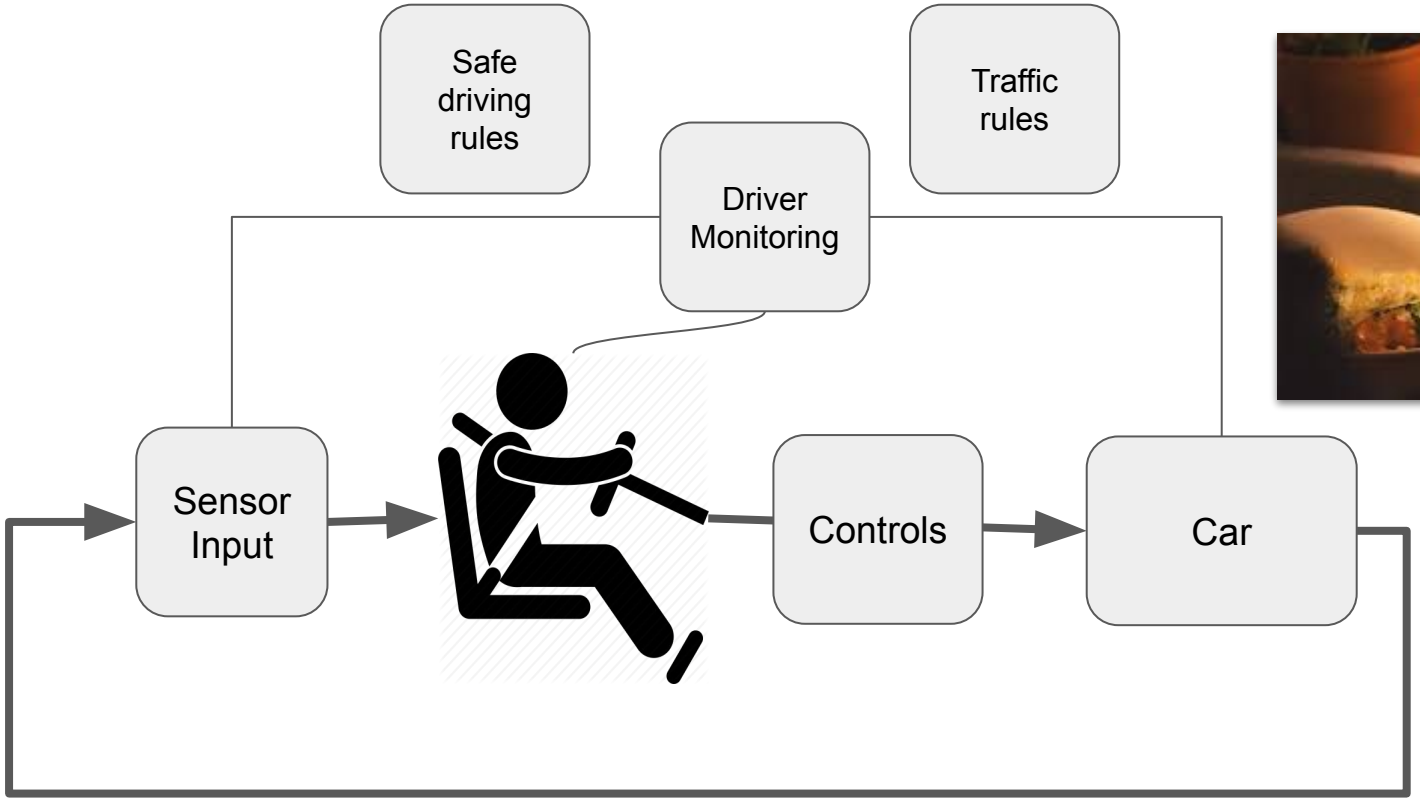
Making a proper left turn

- Assess the traffic situation
  - May i do (legal)
  - Can i do (is it safe, sensible)
- Check rear mirror
- Use direction indicator lights
- Slow down
- Come to a full stop
- Watch out for other traffic
- When traffic allows
- Check side and mirrors
- Turn left

Driver situational awareness



Provide feedback to the human in the loop

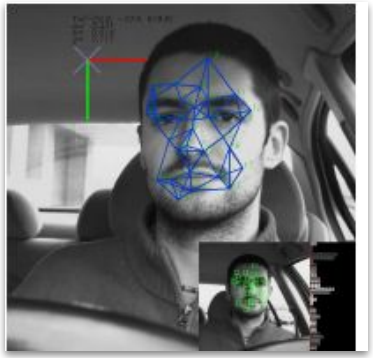


Sensors

- Camera
  - Infrared
- Acceleration
- Velocity
- GPS location
- Indicator lights

Features

- Driver recognition
- Head pose
- Gaze direction
- Eyes closed / blink
- Hand position
- Distraction



Algorithm

- Machine learning
- State machine
- Rules & parameters

Driver state

- Alert
- Distracted
- Drowsy

System services

- Display
- Buzzer
- Processor
- Memory
- Storage
- Network

Let’s take a step backward

Vehicle driving ECO system

- Environment
  - Road design
  - Road conditions
  - Traffic / Pedestrians
  - Weather
- Vehicle
  - Physics
  - Safety features
- Driver
  - Driving skills
  - Driving style
  - Mental/Physical state

Every vehicle senses its environment

- Car sensors collect data
- Road conditions
- Vehicle behaviour
- Driver behaviour

This data can provide valuable feedback

Driving style ⇒ Improve your driving, reduce accidents, reduce insurance costs

Road safety ⇒ Improve roads, make your neighborhood safer

Make driving safer by providing feedback to drivers, road owners and organisations

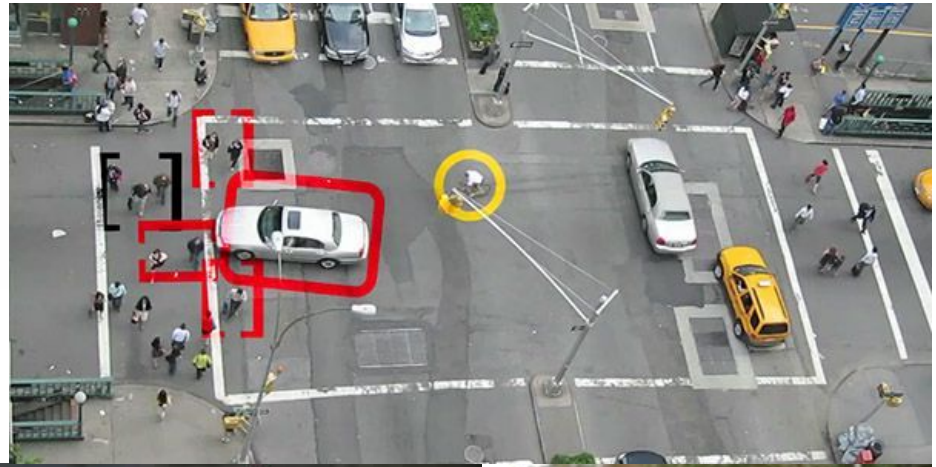
Why should we share data and learn to trust each other

- Working together on a common goal
  - To make driving safer
  - To spot unsafe traffic situations
  - Raise driver awareness
  - Reduce number of traffic incidents
  - Because i want to make my neighborhood safer
  - To reduce cost for society as a whole
- We need to share data
  - To improve specific traffic situations (share data anonymously with local government)
  - To make vehicles safer (share driving data anonymously with car manufacturers)
  - To reduce insurance cost (share driving behaviour with insurance)
  - To improve my own driving style (calculate driving score and compare anonymously with other drivers)

Make driving safer by providing feedback to drivers, road owners and organisations

Reporting dangerous traffic situations

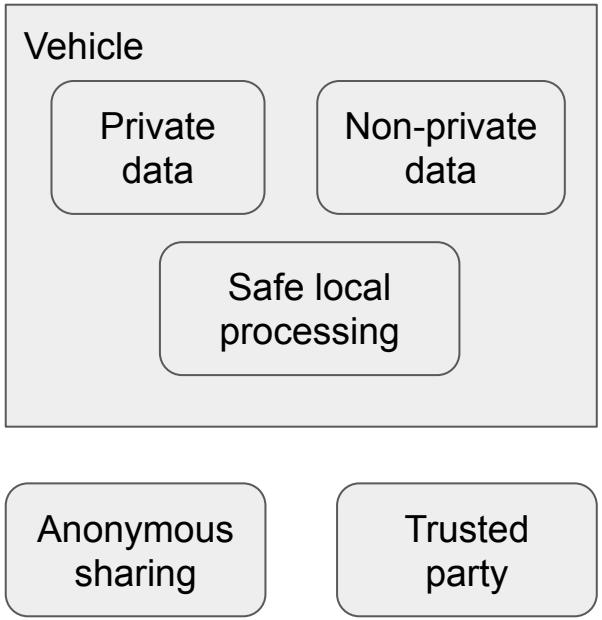
- Accidents / near accidents
- Dangerous driving
- Confusing traffic situations
- Obstacles
- Slippery roads
- Dysfunctional bicycle lights



Anonymous reporting to gather road safety statistics for making driving safer, not for naming and shaming

But how about security and privacy

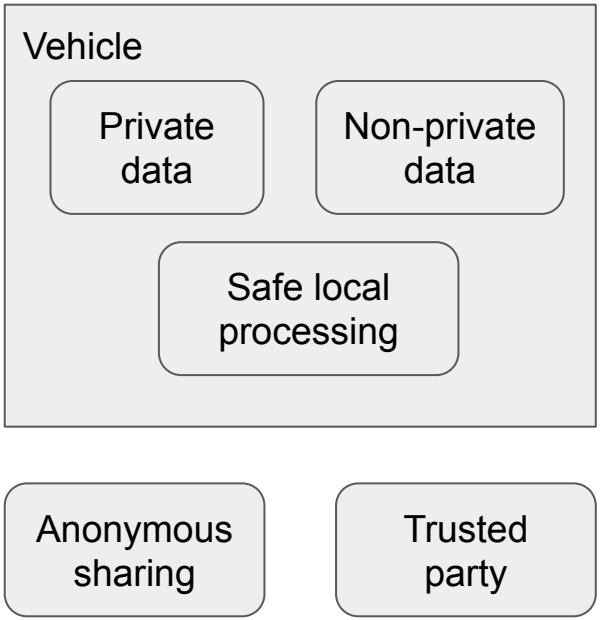
- Requirements
  - Data ownership
  - Assured privacy
  - Driver in control
- Local data processing
  - calculate driver safety score
  - calculate insurance risk
  - signal potential unsafe situations
- Be GDPR compliant
  - Share minimum amount of data
  - Share anonymised data anonymously
  - Crystal clear algorithms



Data ownership, privacy and mutual trust between parties are key

Smart mobility with multiple parties

- Parties
  - First responders
  - Roadside assistance
  - Insurance company
  - Car Manufacturer
  - Local Government
- Equal playing field
  - Common infrastructure / architecture
  - Open interfaces / secured data exchange
  - All organisations have equal access
  - Vehicle driver chooses its partners
  - Open data whenever possible



Data ownership, privacy and mutual trust between parties are key

What to do next, so many questions

- Questions for the audience:
  - Will these ideas help to reduce car accidents and make our life safer?
  - Are there any major issues that hinder this and need to be addressed in more detail.
  - Should it end here and we all just return to *“business as usual”* or do we go for the next step
- The next step:
  - Share these ideas within our organisation, mobility partners
  - Discuss, investigate and experiment to learn more
  - Look out for partners?

Millions of euro’s are spend each year on Road Safety and scientific research programmes

The average car has safety belts and airbags but does not communicate

Can we do better?

SWOV
WETENSCHAPPELIJK ONDERZOEK VERKEERSVEILIGHEID

Ministerie van Infrastructuur en Waterstaat

VEILIGVERKEER

TASKFORCE VERKEERSVEILIGHEIDSDATA
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Verkeerskunde.
VAKVISIE VAKKENNIS VAKMENS

STAR
Smart Traffic Accident Reporting

VERBOND VAN VERZEKERAARS

kennis netwerk spv
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