

# Will robots drive our cars soon? Smart sensors – smart data

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**Vision trifft Realität.**

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**asut**

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super computing systems

## Futuristic ideas already 1956



Source: Youtube

## Driverless car in the 1980's



Source: Youtube

## DARPA Grande Challenge 2004



Winner car after 11.9km after start (5%)

Source: Youtube

# DARPA Urban Challenge 2007



Source: Youtube

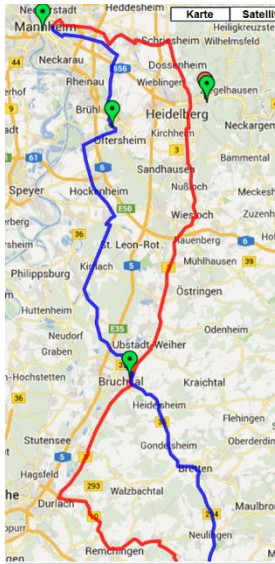
# Mercedes Benz Bertha prototype 2013



Source: Daimler



1888: Bertha Benz



# Google car with laserscanner (2014)



Source: Youtube

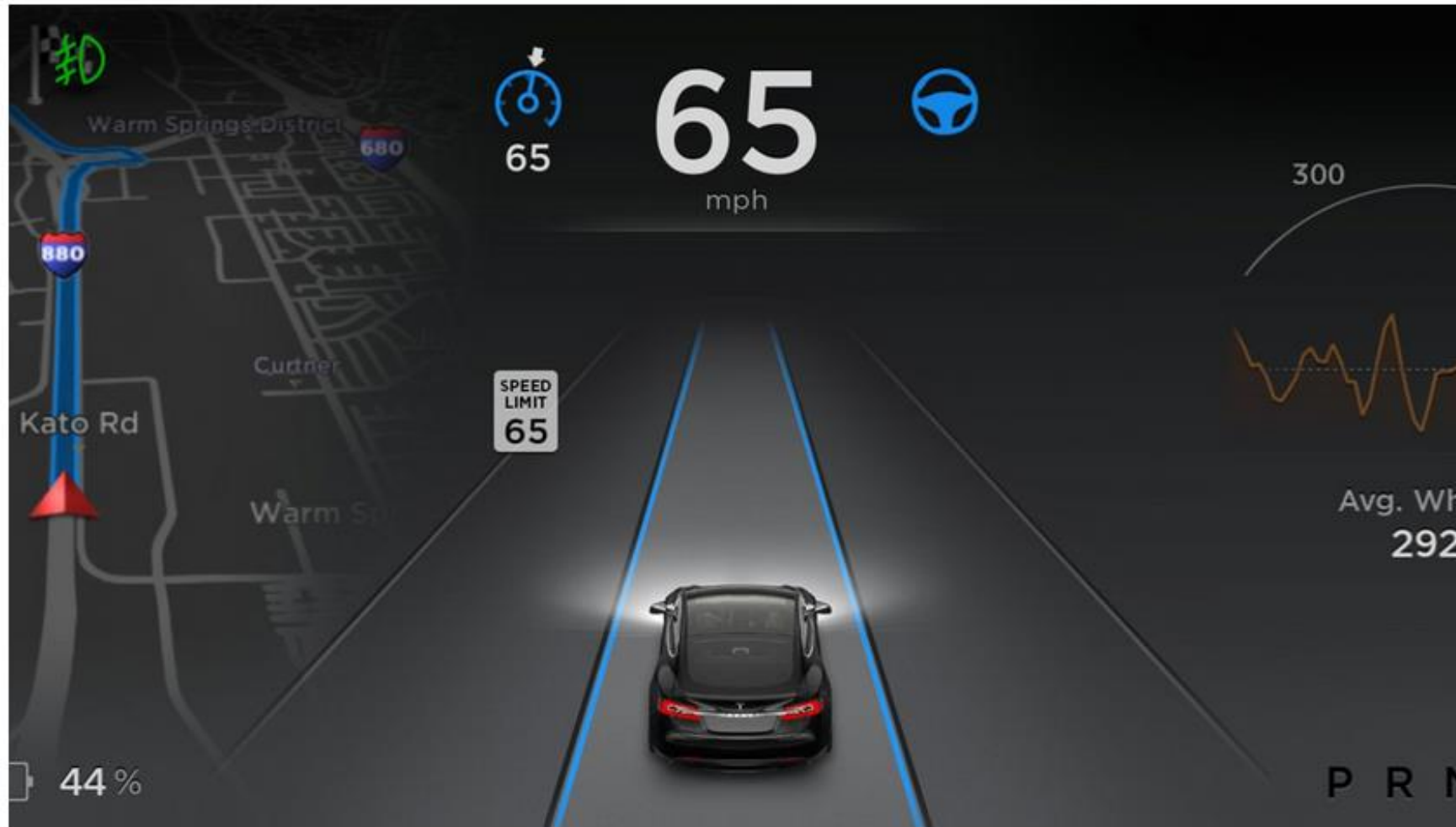
## First trials in Switzerland (Swisscom – 2015)



Source: Swisscom



## Tesla Level 2 Auto Pilot (2015)



Source : [https://www.teslamotors.com/de\\_CH/blog/your-autopilot-has-arrived](https://www.teslamotors.com/de_CH/blog/your-autopilot-has-arrived)

## NVIDIA BB8 (2016)



Source: NVIDIA

## Will robots drive our cars soon?



Source: WWW

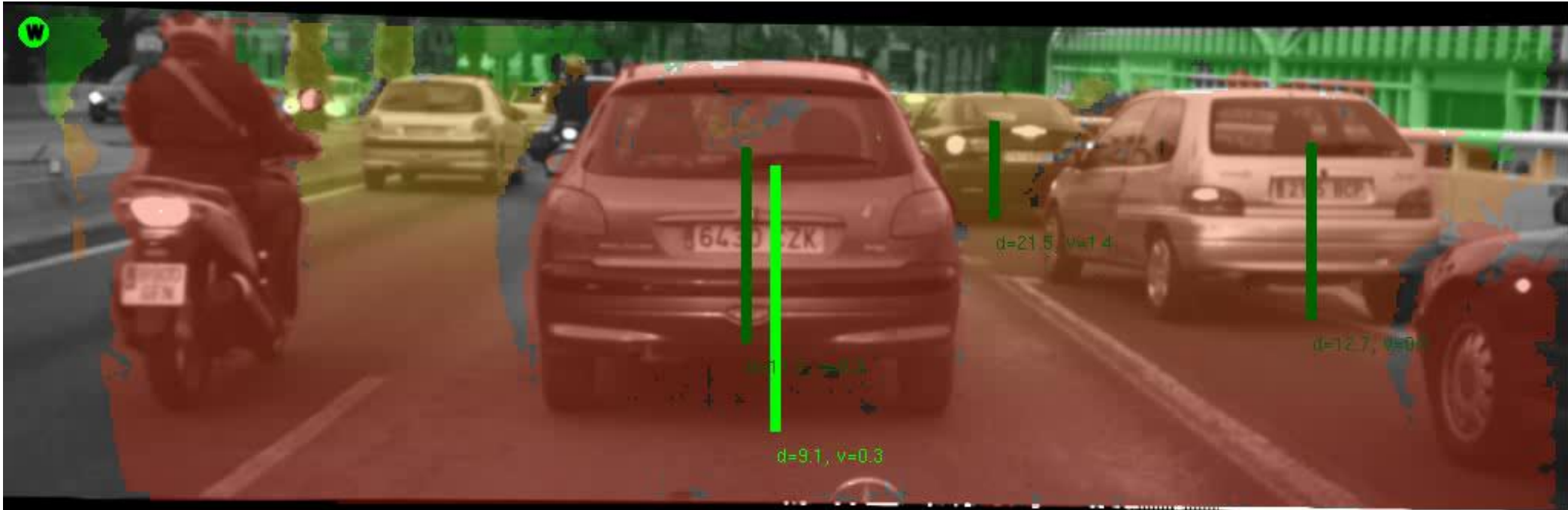
## But already in series as many driver assistant systems

- ADC (Distronic)
- Blind spot detection
- Break assist
- Pedestrian detection
- Park pilot
- Stop & Go Pilot
- Highway Pilot (steering assist)
- .....
- Lets see 😊



# Smart Sensors are the basis for autonomous driving

Sensor view for an Urban Drive



**green: Radar-Objects**



**Object-Position via 6D-Vision**

Source: Daimler

## Example: Stereo Vision Sensor

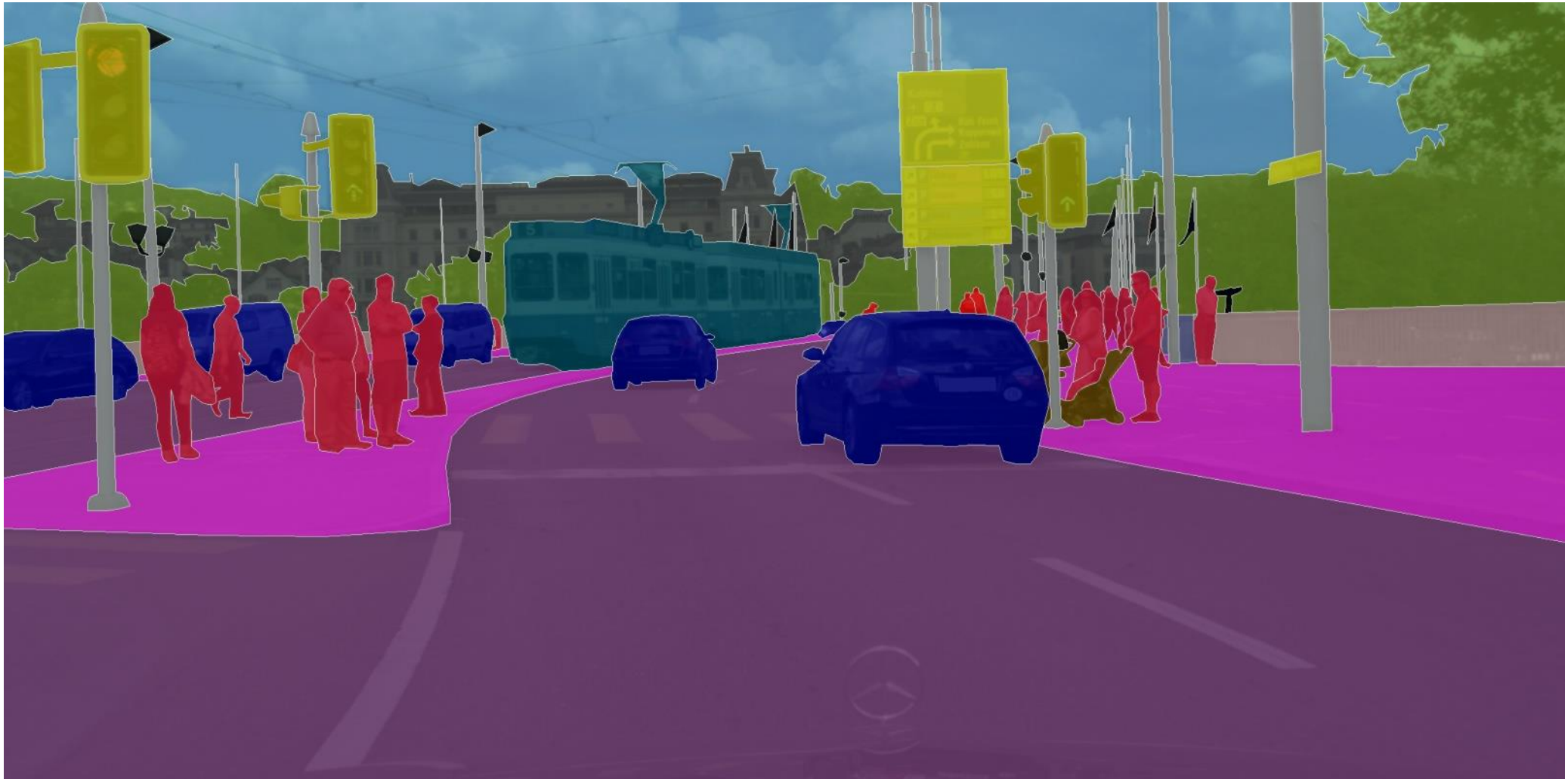


S.Gehrig, F.Eberli, T.Meyer, "A Real-time Low-Power Stereo Vision Engine Using Semi-Global Matching",  
ICVS 2009 (Best Paper Award)



DEUTSCHER ZUKUNFTSPREIS  
Preis des Bundespräsidenten  
für Technik und Innovation

## Current research focuses is a deeper understanding of the scene

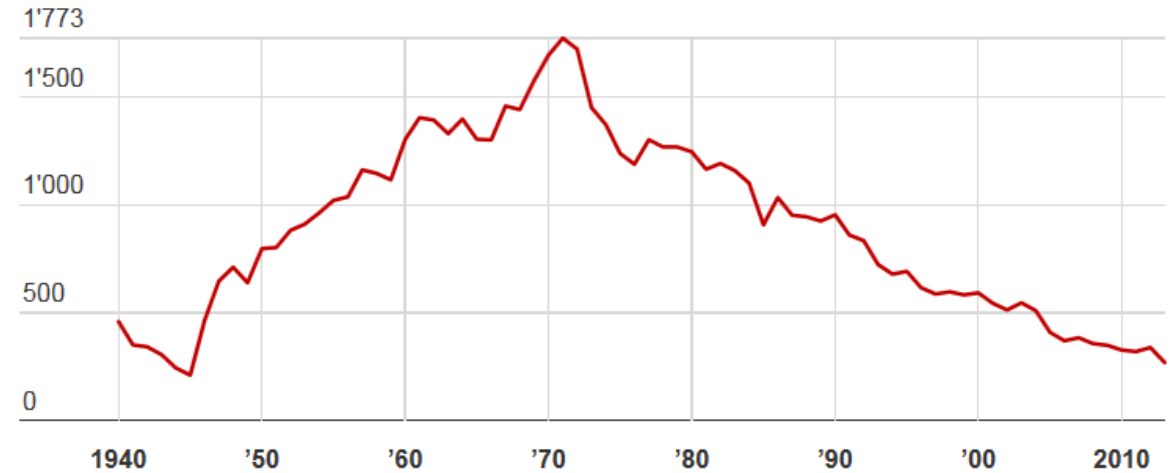


Source: <https://www.cityscapes-dataset.com/examples/>

## Why autonomous driving?

### Tödlich verunfallte Personen im Schweizer Strassenverkehr

Verkehrsmittel: Auto, Motorrad, Fahrrad, Fussgänger, Tram, Bus



Source: BFS ( [Data](#) )

- **Less fatalities** -> lower health cost
- **Less traffic jam** -> better use of infrastructure
- **More time for work or family**
- **Mobility for children, disabled or old people**
- **More mobility sharing** -> less cars, cars are more often used -> less resources used (environment)
- **Big impact on car charge infrastructure** -> because cars drive themselves to go charging
- **New mobility patterns.** Do we still need trains?



# Level definition for autonomous driving



Source: <http://www.ioti.com/transportation/what-are-5-levels-autonomous-driving>

# Announcements – Who will be first ...

Autonomer Pionier  
Mercedes-Benz Future Truck 2025



Es soll deutlich schneller gehen als bislang gedacht: Der  
Jahrzehnts den Autopiloten für den Straßenverkehr

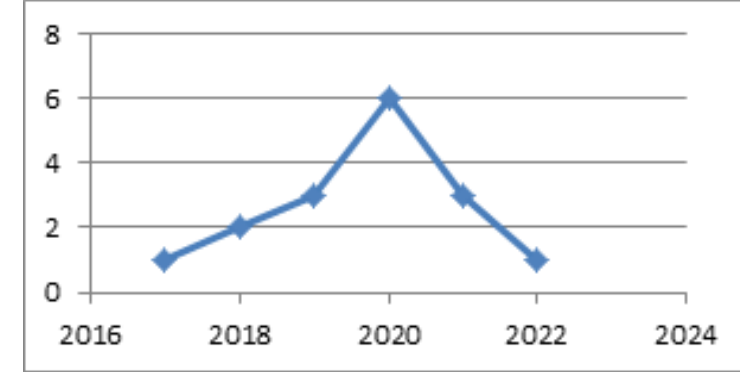
"Bitte beachten Sie, dass die Funktionalität für autonomes  
Softwaretests basiert und rechtliche Zulassung erforderlich  
Rechtsprechungen stark variieren kann. Wir können  
die einzelnen Elemente der oben beschriebenen  
sie jeweils die rechtliche Zulassung durch  
[https://www.tesla.com/de\\_DE/mo...](https://www.tesla.com/de_DE/mo...)

Während dieses Lernprozesses werden Tesla-Fahrzeuge mit der neuen Hardware sogar teilweise  
ohne Funktionen auskommen müssen, die bereits bei Fahrzeugen mit der alten Hardware verfügbar  
sind. So werden Funktionen wie die automatische Notbremsung, Kollisionswarner, Spurhaltefunktion  
und Abstandsregeltempomat zu Beginn nicht verfügbar sein.  
Wenn diese Funktionen im neuen System ausreichend validiert wurde, werden sie auch  
entsprechend Over-the-Air eingespielt. Zusätzlich dazu werden mit der Zeit auch völlig neue  
Funktionen freigeschaltet. Autonomiestufe Level 3 sollte in den kommenden Monaten erreicht  
werden. Bis 2018 werden dann Level 4 und anschließend Level 5 mit dem System erreicht sein.

Darüber hinaus hat Audi angekündigt, relativ flott mit einem komplett autonomen Fahrzeug für die Verbraucher  
aufwarten zu wollen. Bis 2020 soll der Verkaufsstart erfolgt sein, was durchaus ein ambitionierter Zeitplan der  
beiden Unternehmen ist.

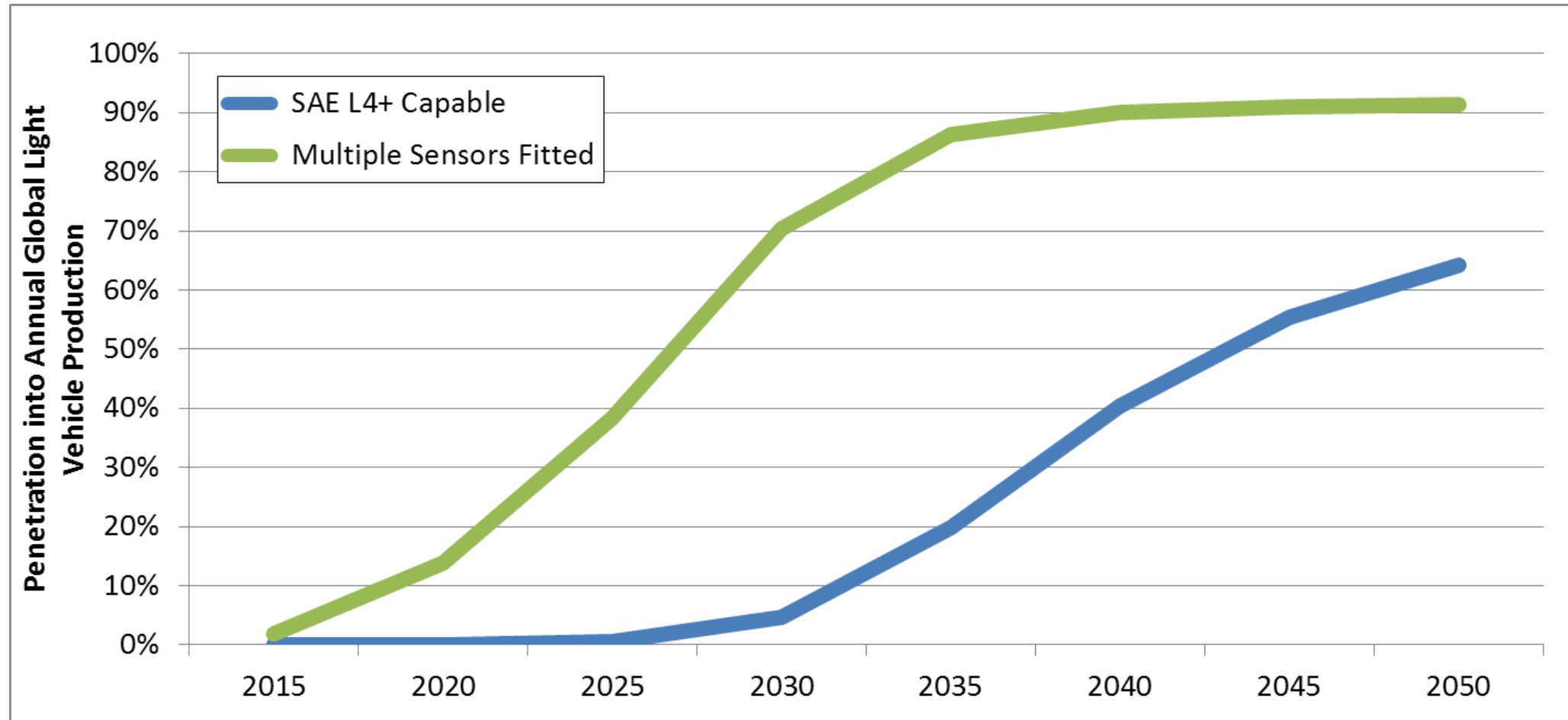
## Announcements – When do we get autonomous cars?

- **NVIDIA to introduce level-4 enabling system by 2018**
- Audi to introduce a self-driving car by 2020
- NuTonomy to provide self-driving taxi services in Singapore by 2018, expand to 10 cities around the world by 2020
- Delphi and MobilEye to provide off-the-shelf self-driving system by 2019
- Ford CEO announces fully autonomous vehicles for mobility services by 2021
- Volkswagen expects first self driving cars on the market by 2019
- GM: Autonomous cars could be deployed by 2020 or sooner
- **BMW to launch autonomous iNext in 2021**
- Ford's head of product development: autonomous vehicle on the market by 2020
- Baidu's Chief Scientist expects large number of self-driving cars on the road by 2019
- First autonomous Toyota to be available in 2020
- **Elon Musk now expects first fully autonomous Tesla by 2018, approved by 2021**
- Driverless cars will be in use all over the world by 2025
- Uber fleet to be driverless by 2030
- Ford CEO expects fully autonomous cars by 2020
- Next generation Audi A8 capable of fully autonomous driving in 2017
- Jaguar and Land-Rover to provide fully autonomous cars by 2024 says Director of Research and Technology
- **Fully autonomous vehicles could be ready by 2025, predicts Daimler chairman**
- Truly autonomous cars to populate roads by 2028-2032 estimates insurance think tank executive
- Driverless cars coming to showrooms by 2020 says Nissan's CEO
- Continental to make fully autonomous driving a reality by 2025
- Intel CTO predicts that autonomous car will arrive by 2022
- Sergey Brin plans to have Google driverless car in the market by 2018
- **IEEE predicts up to 75% of vehicles will be autonomous in 2040**



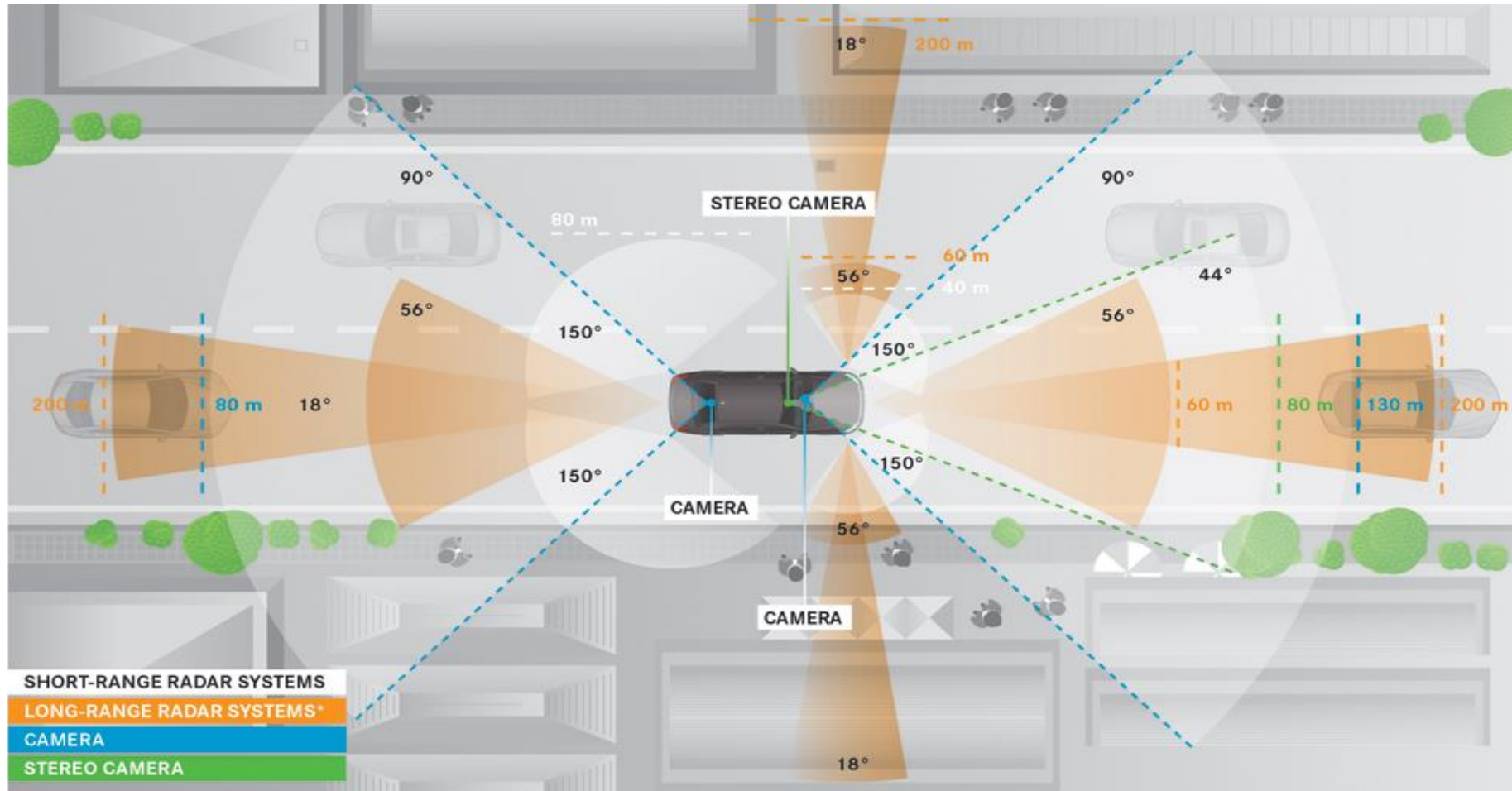
Source: [http://www.driverless-future.com/?page\\_id=384](http://www.driverless-future.com/?page_id=384)

## What is a Realistic autonomous deployment scenario ?

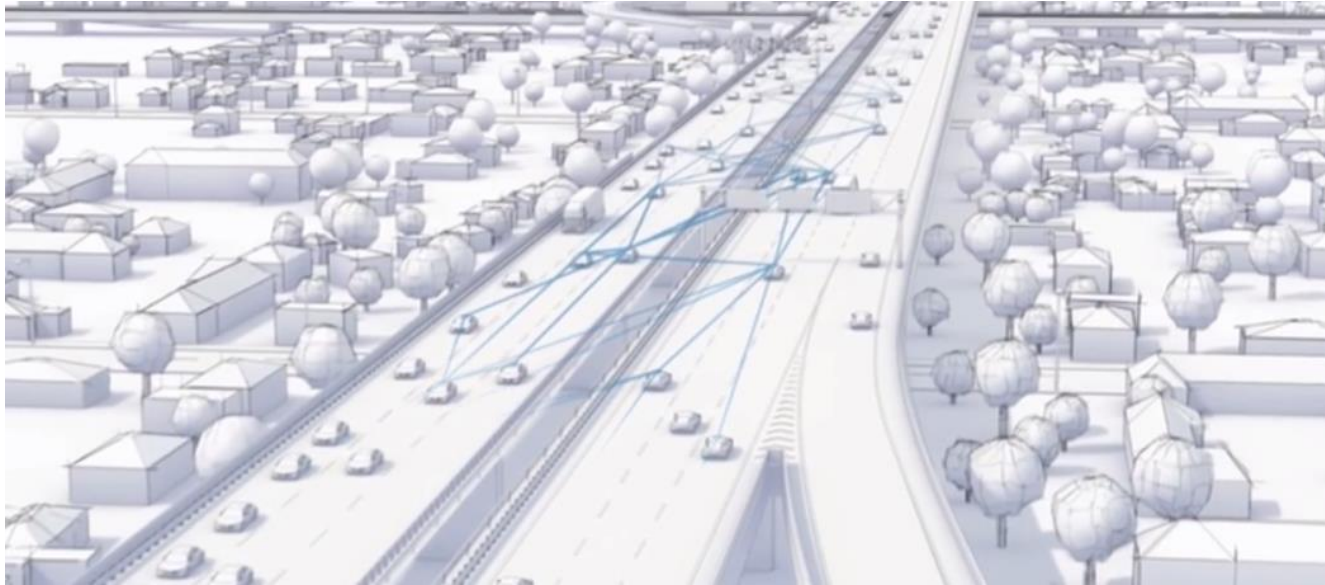


Source: Strategy Analytics Autonomous Vehicles Service

# Bertha's Sensors



## Car2X - Connected cars will produce a lot of data

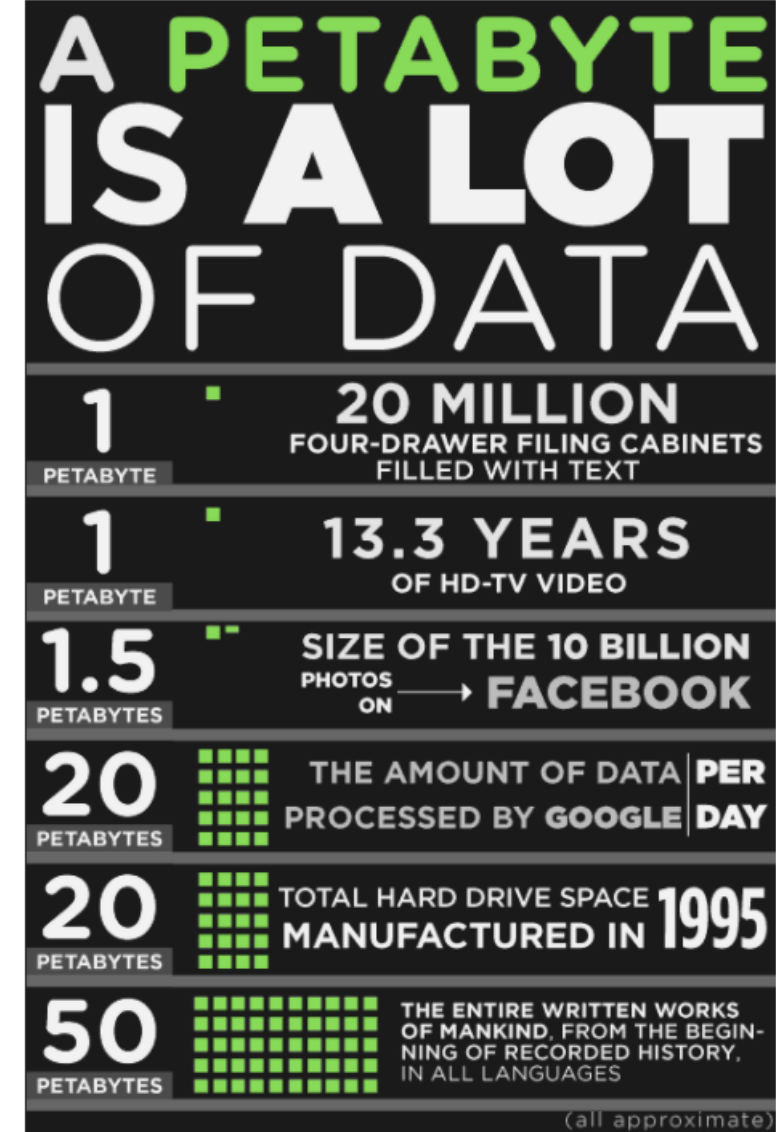


152 million actively connected cars on global roads by 2020

**545 PETABYTE** of data generated by connected cars in 2020  
(~ up to 30 terabytes of data each day per car)

1'580 x more than in 2013

Source: HERE / [https://www.sas.com/content/dam/SAS/en\\_us/doc/whitepaper1/connected-vehicle-107832.pdf](https://www.sas.com/content/dam/SAS/en_us/doc/whitepaper1/connected-vehicle-107832.pdf)



Source: <https://articles.mercola.com/sites/articles/archive/2009/08/01/How-Large-Is-a-Petabyte.aspx>

## Example use of smart data in automotive

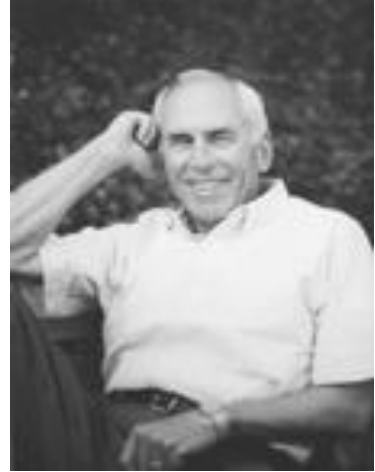
- Accident warning
  - Broken down vehicle warning
  - Slippery road warning
  - Reduced visibility warning
  - Heavy rain warning
  - Fog warning
- 
- On-Street Parking
  - Road Signs
  - EV Charge Points
  - Fuel price



Source: Daimler



## Amara's Law



*“We tend to **overestimate** the effect of a technology in the short run and **underestimate** the effect in the long run”*

Roy Amara (1925-2007), researcher, scientist, forecaster and long-term president of the Institute for the Future



## What do you need to remember

- **Autonomous cars will soon be available** - Legislation in Switzerland?
- **Cars will use many smart sensors and produce Petabytes of data**
- **Smart data allows new services and business models**
  
- **Level 2 Autopilot does NOT mean you are not responsible!** – Always drive safe!



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