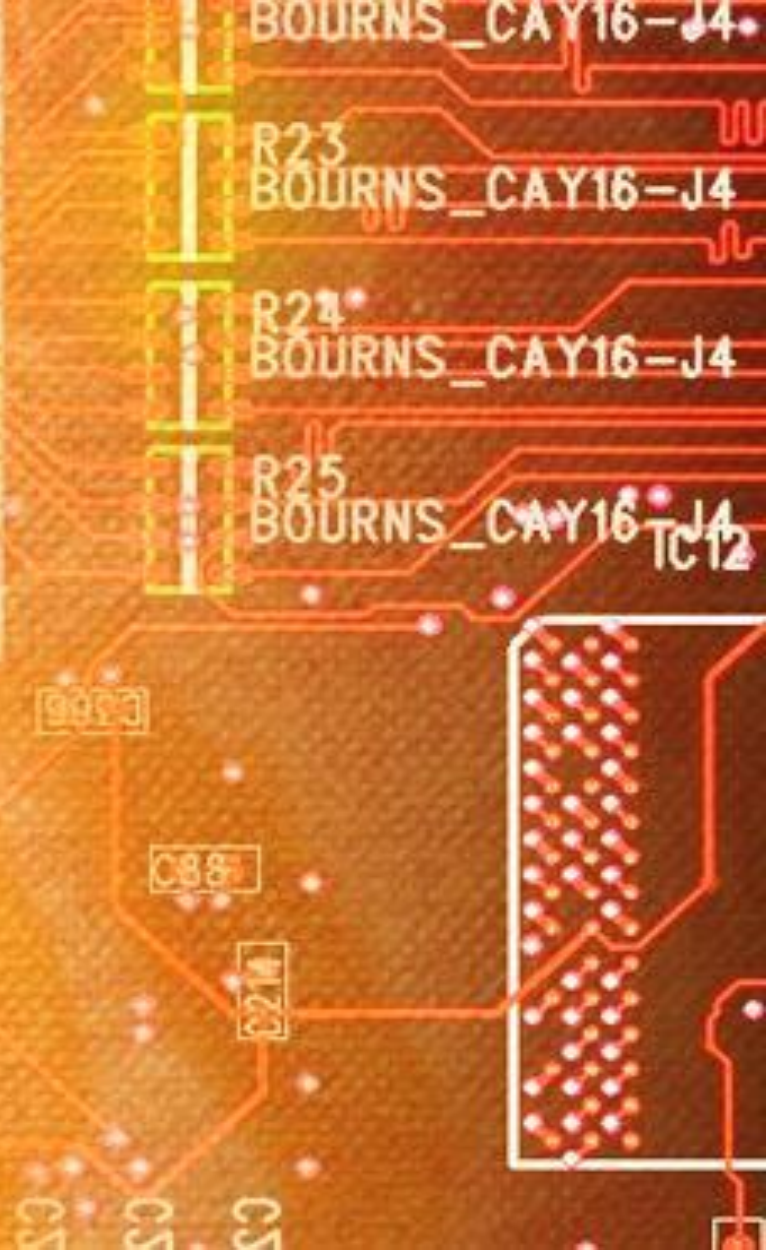
Will robots drive our cars soon?
Smart sensors – smart data



asut-Kolloquium, 22. November 2017, Bern

Felix Eberli, Department Head, SCS

Vision trifft Realität.

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Futuristic ideas already 1956

Source: Youtube

Driverless car in the 1980’s

Source: Youtube

DARPA Grande Challenge 2004

Source: Youtube

Winner car after 11.9km after start (5%)

DARPA Urban Challenge 2007

Source: Youtube

Mercedes Benz Bertha prototype 2013

Source: Daimler

1888: Bertha Benz

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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

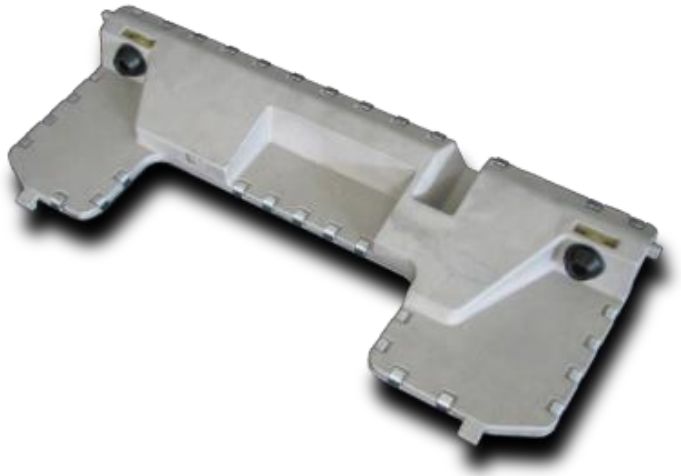
NVIDIA BB8 (2016)

Source: NVIDIA

Will robots drive our cars soon?

Source: WWW

But already in series as many driver assistant systems

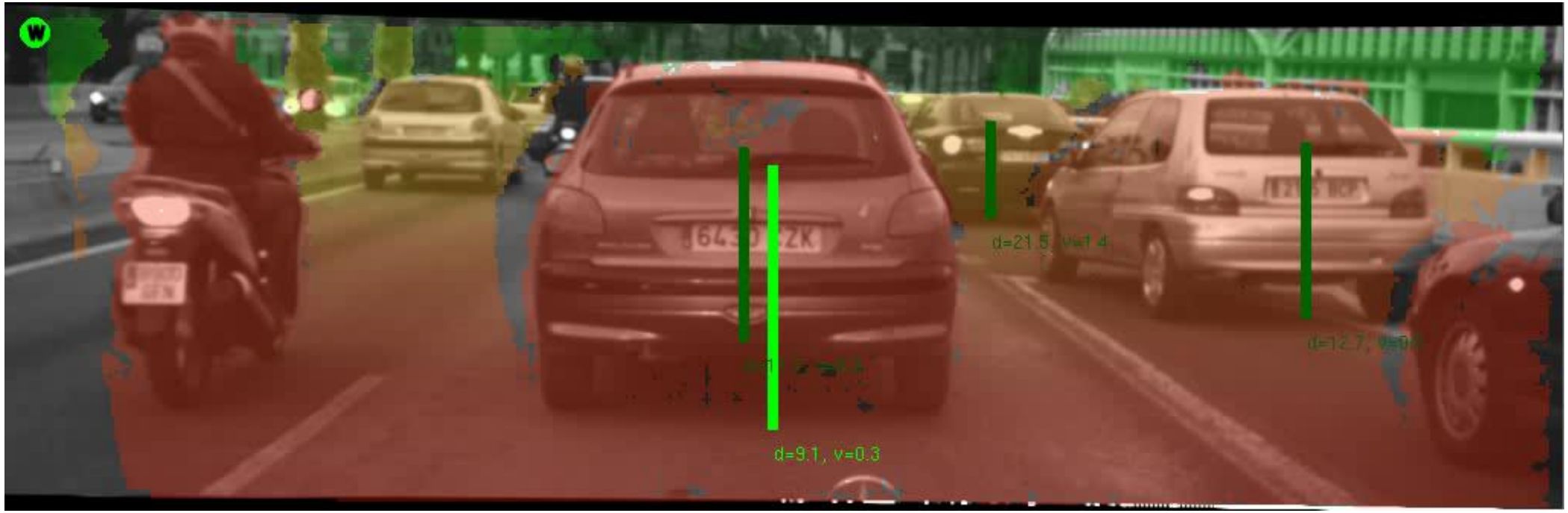


- ADC (Distronic)
- Blind spot detection
- Break assist
- Pedestrian detection
- Park pilot
- Stop & Go Pilot
- Highway Pilot (steering assist)
- ….

- 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

DEUTSCHER ZUKUNFTSPREIS
Preis des Bundespräsidenten
für Technik und Innovation

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

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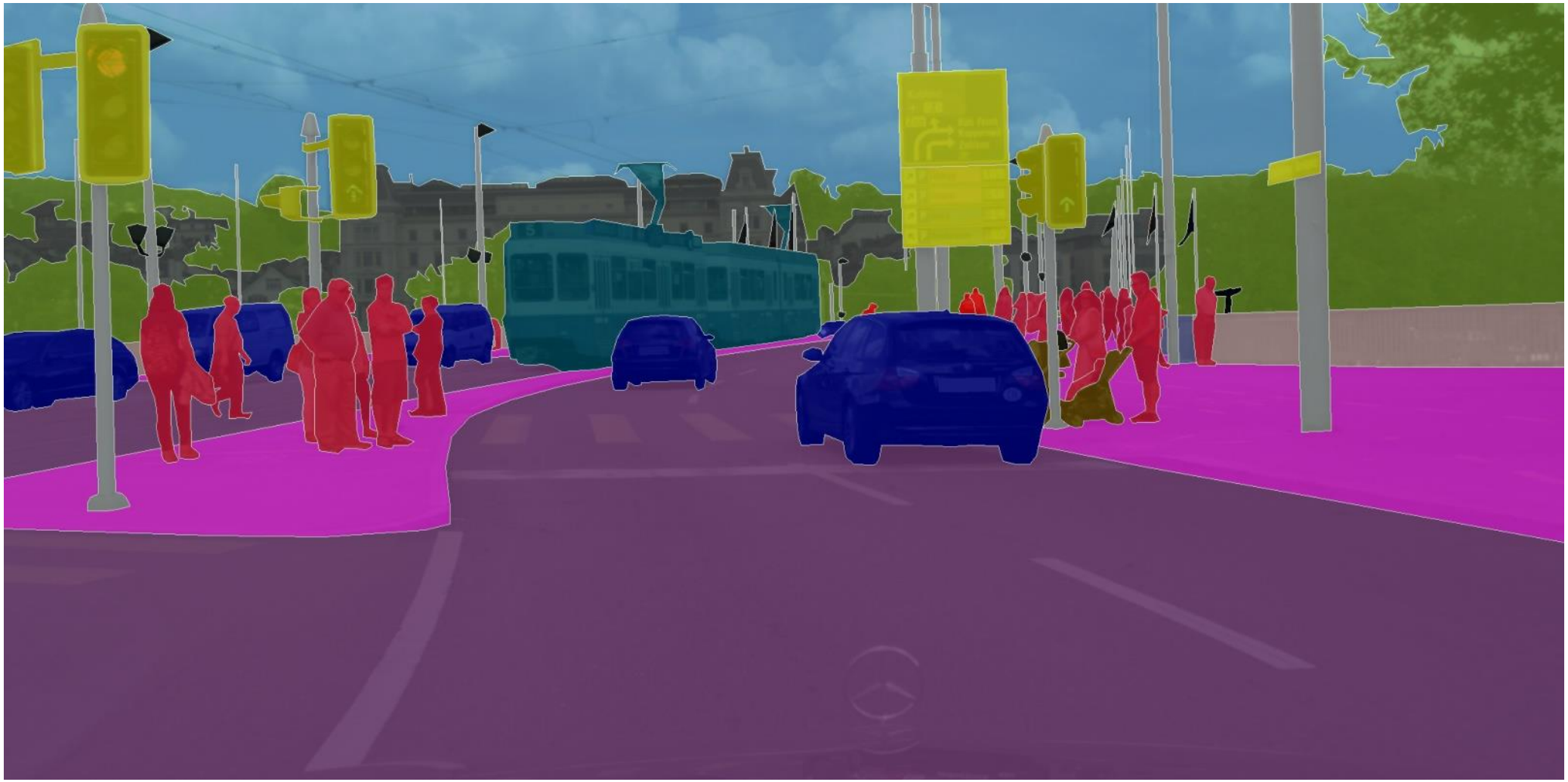
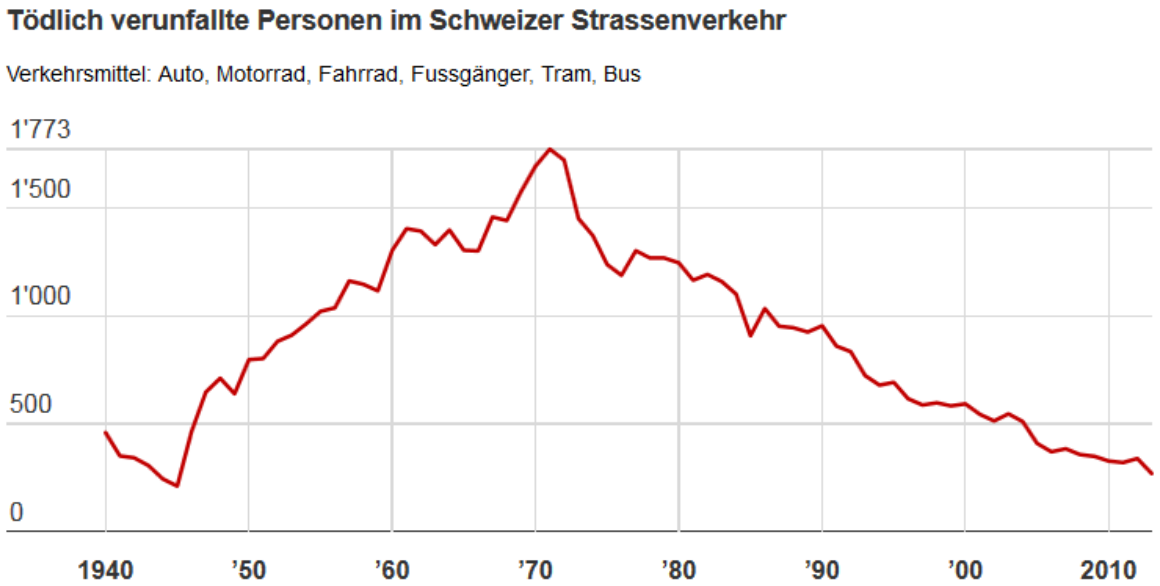
Current research focuses is a deeper understanding of the scene



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

Why autonomous driving?



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 …

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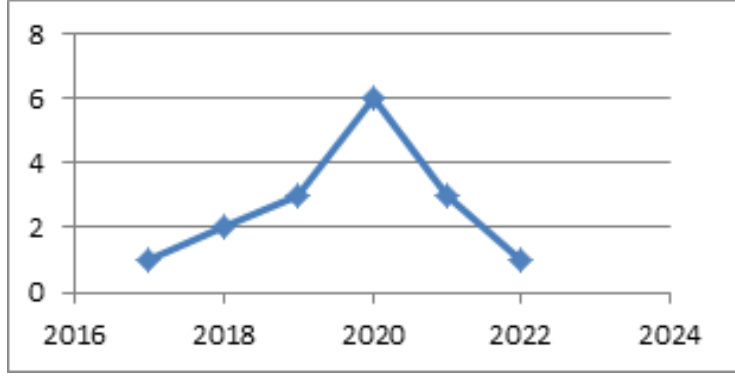
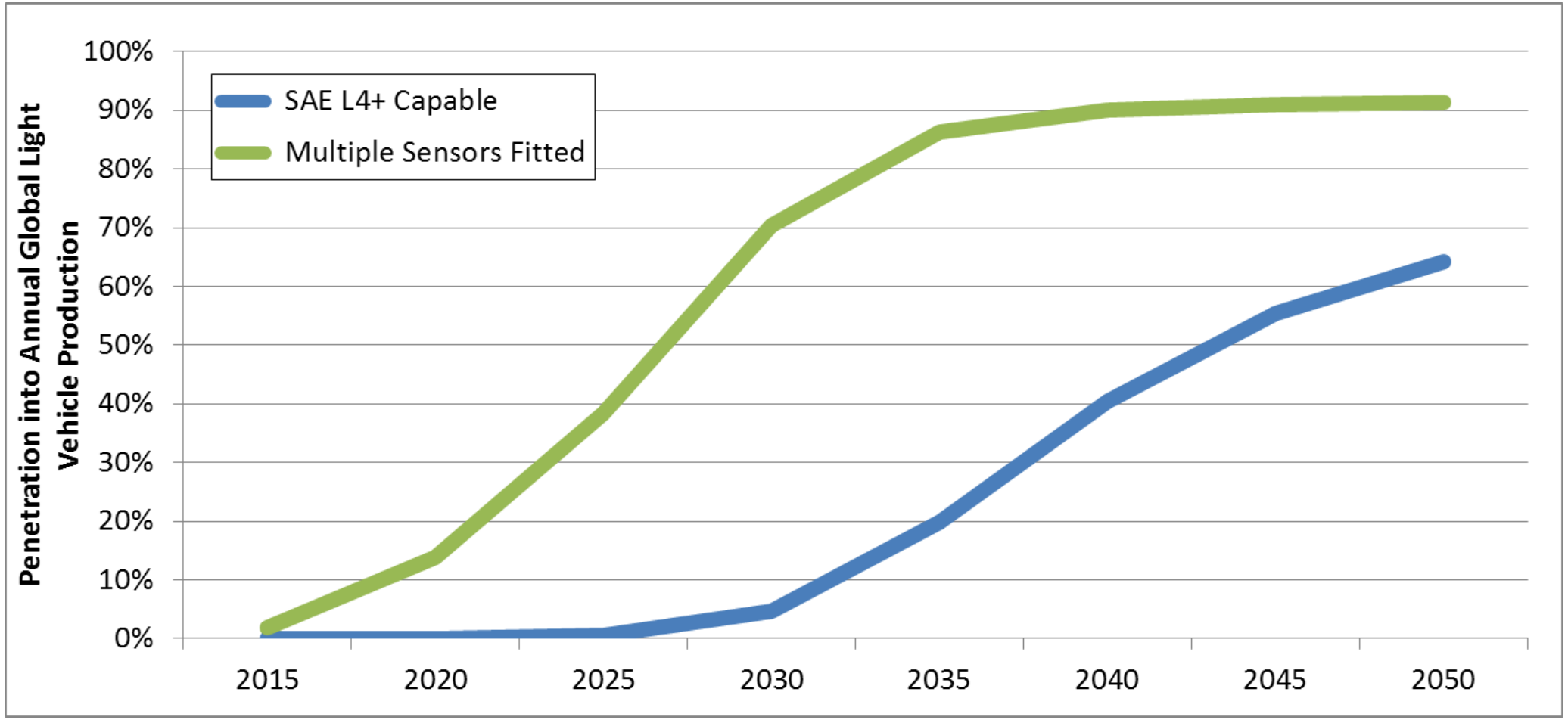
Announcements – When do we get autonomous cars?



- **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: Autononomous 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 Technlogy
- **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**

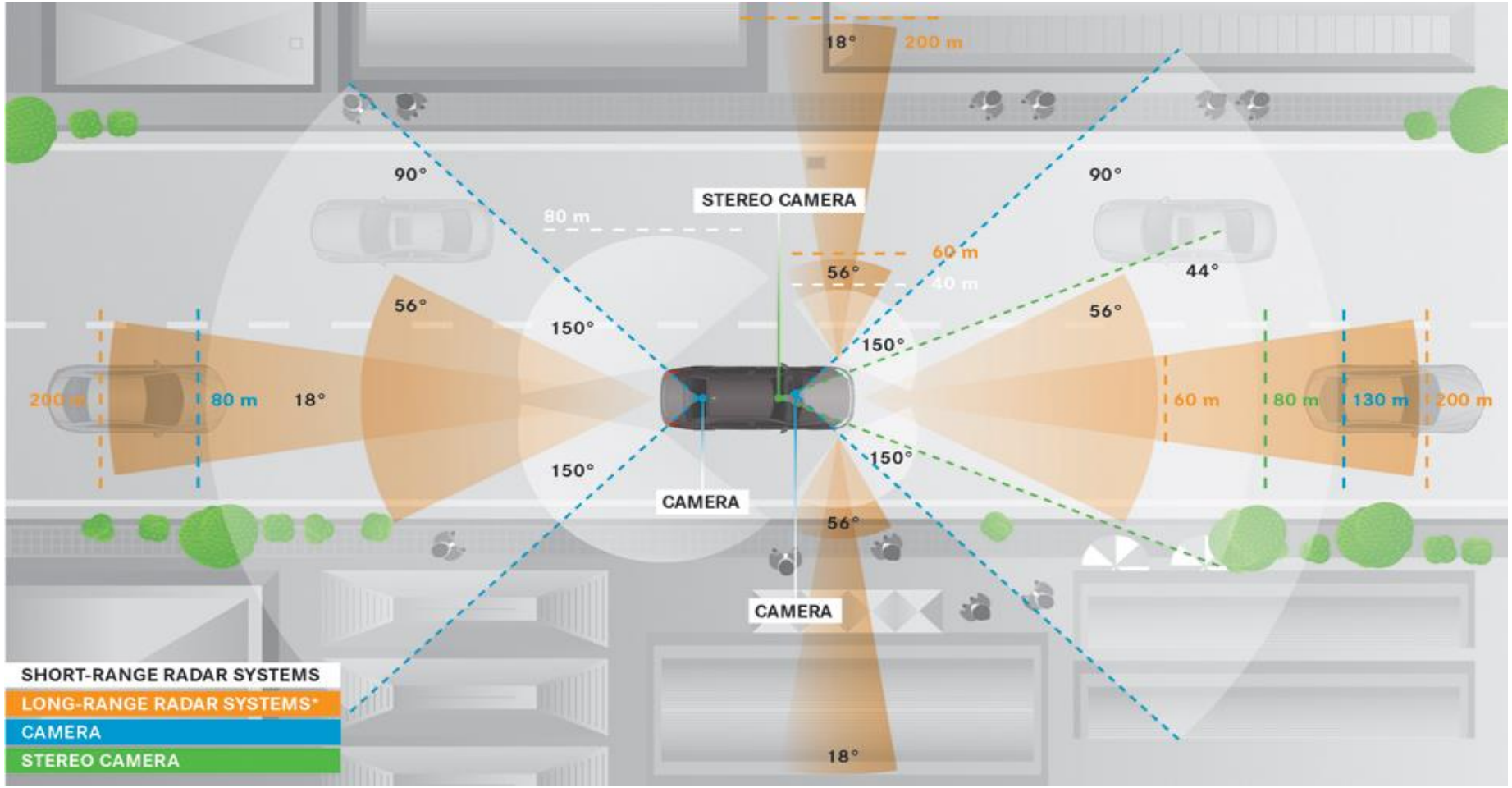
Source: http://www.driverless-future.com/?page_id=384

What is a Realistic autonomous deployment scenario ?

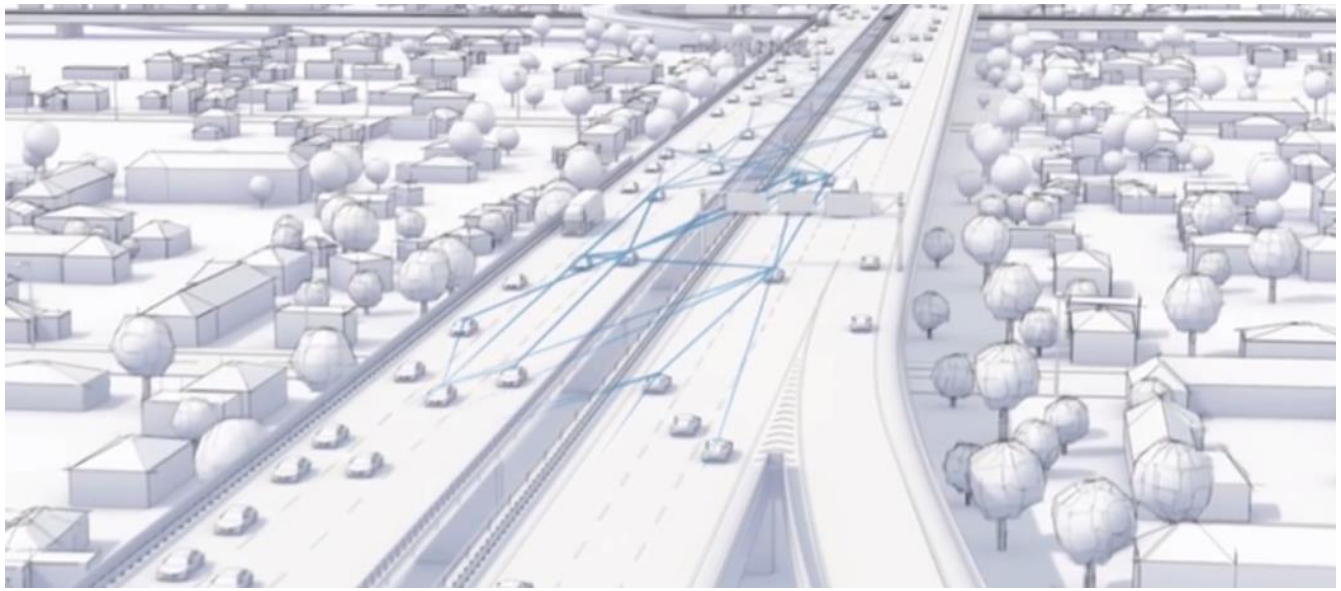


Source: Strategy Analytics Autonomous Vehicles Service

Bertha's Sensors



Car2X - Connected cars will produce a lot of data

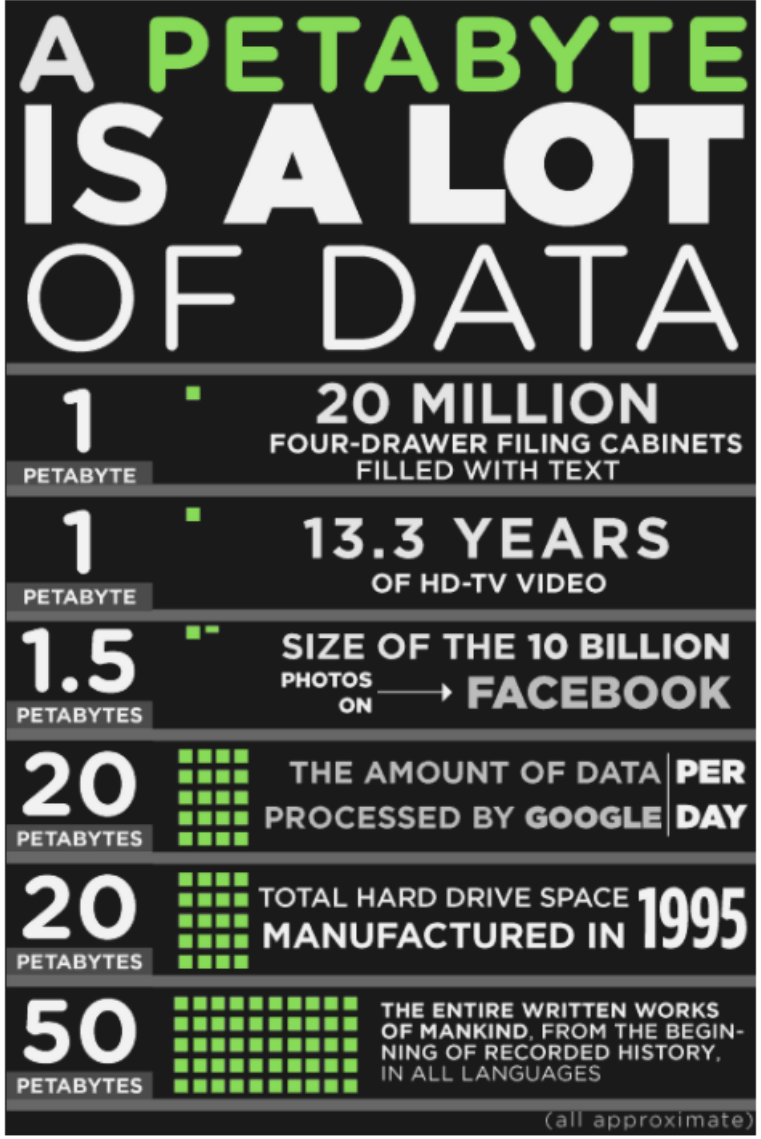


152 million actively connected cars on global roads by 2020

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

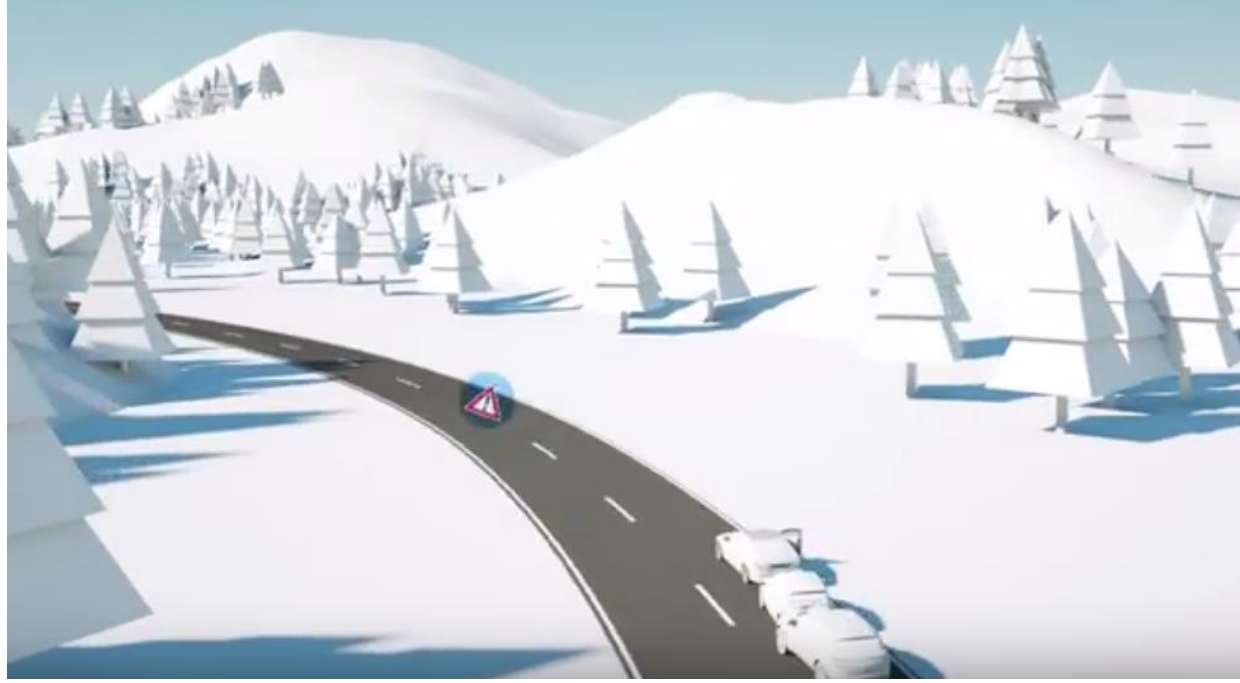
Source: HERE / https://www.sas.com/content/dam/SAS/en_us/doc/whitepaper1/connected-vehicle-107832.pdf



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



Source: Daimler

- On-Street Parking
- Road Signs
- EV Charge Points
- Fuel price

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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 alows new services and business models**
- Level 2 Autopilot does NOT mean you are not responsible! – Always drive save!

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