Software Engineering Conference Russia

November 14-15, 2019. Saint-Petersburg

Autonomous driving

Why don’t we still have it?

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EPAM

Vadim Vashkelis

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PhD in Computer Vision

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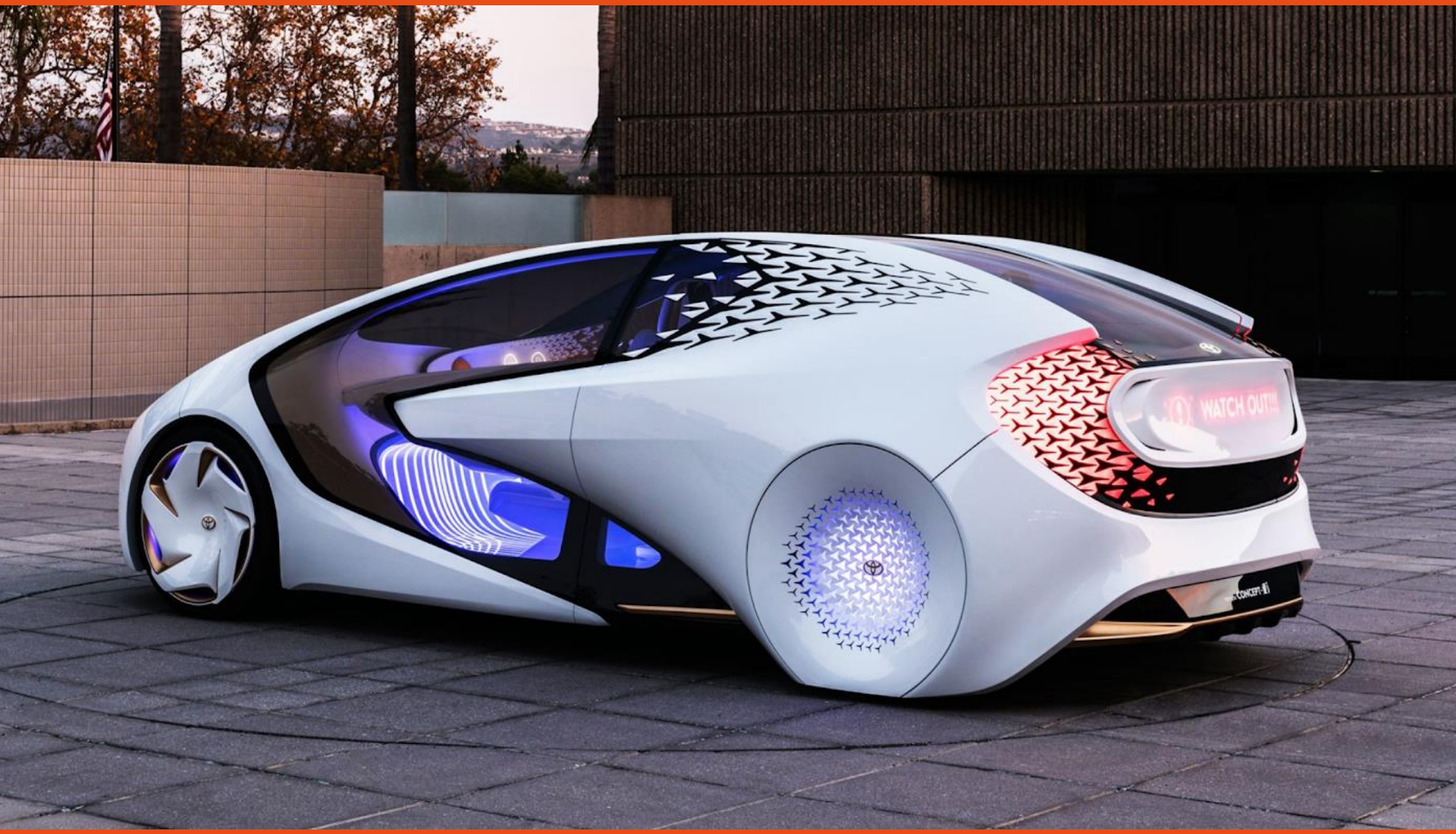
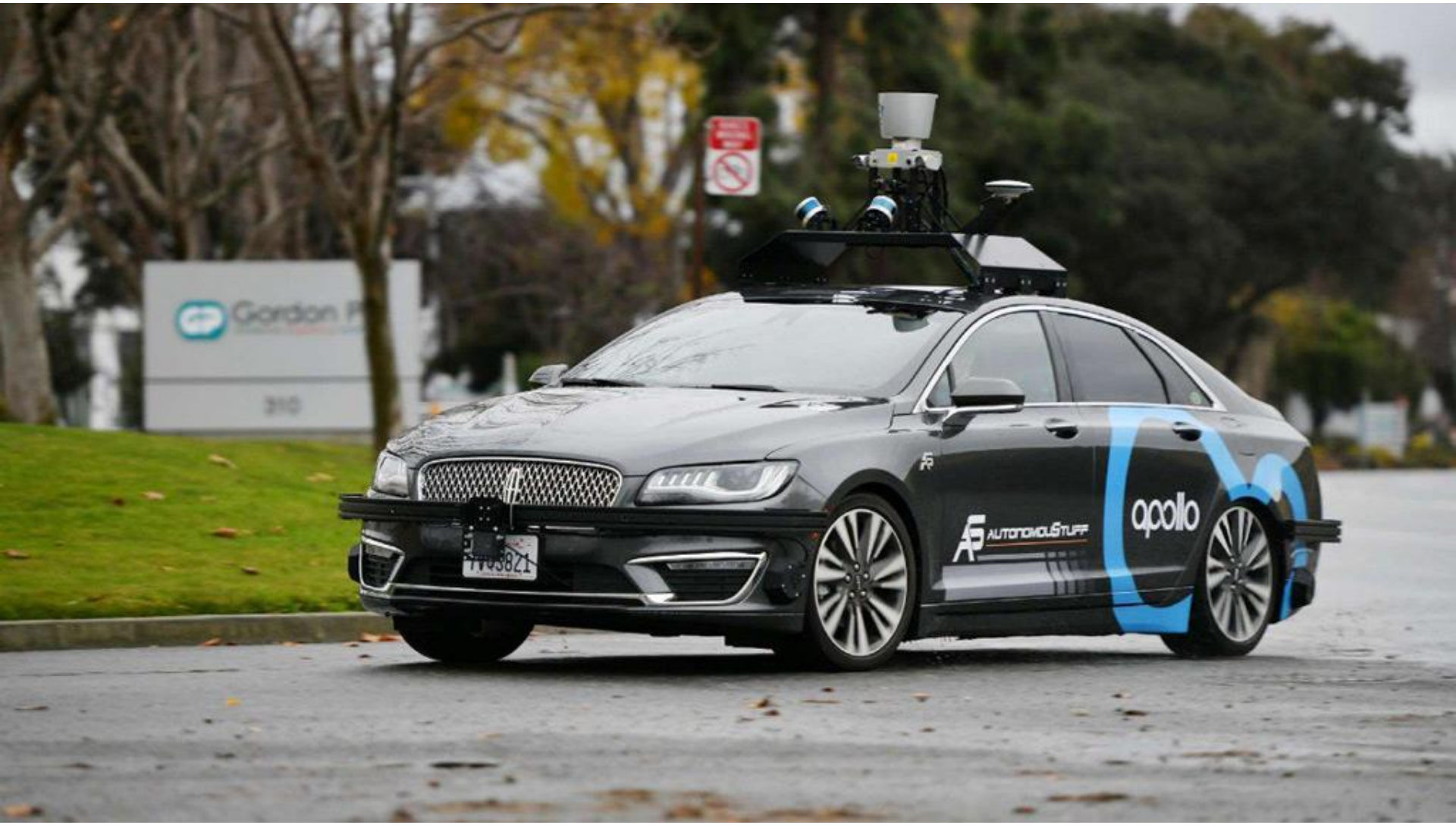
What did we expect



What do we have

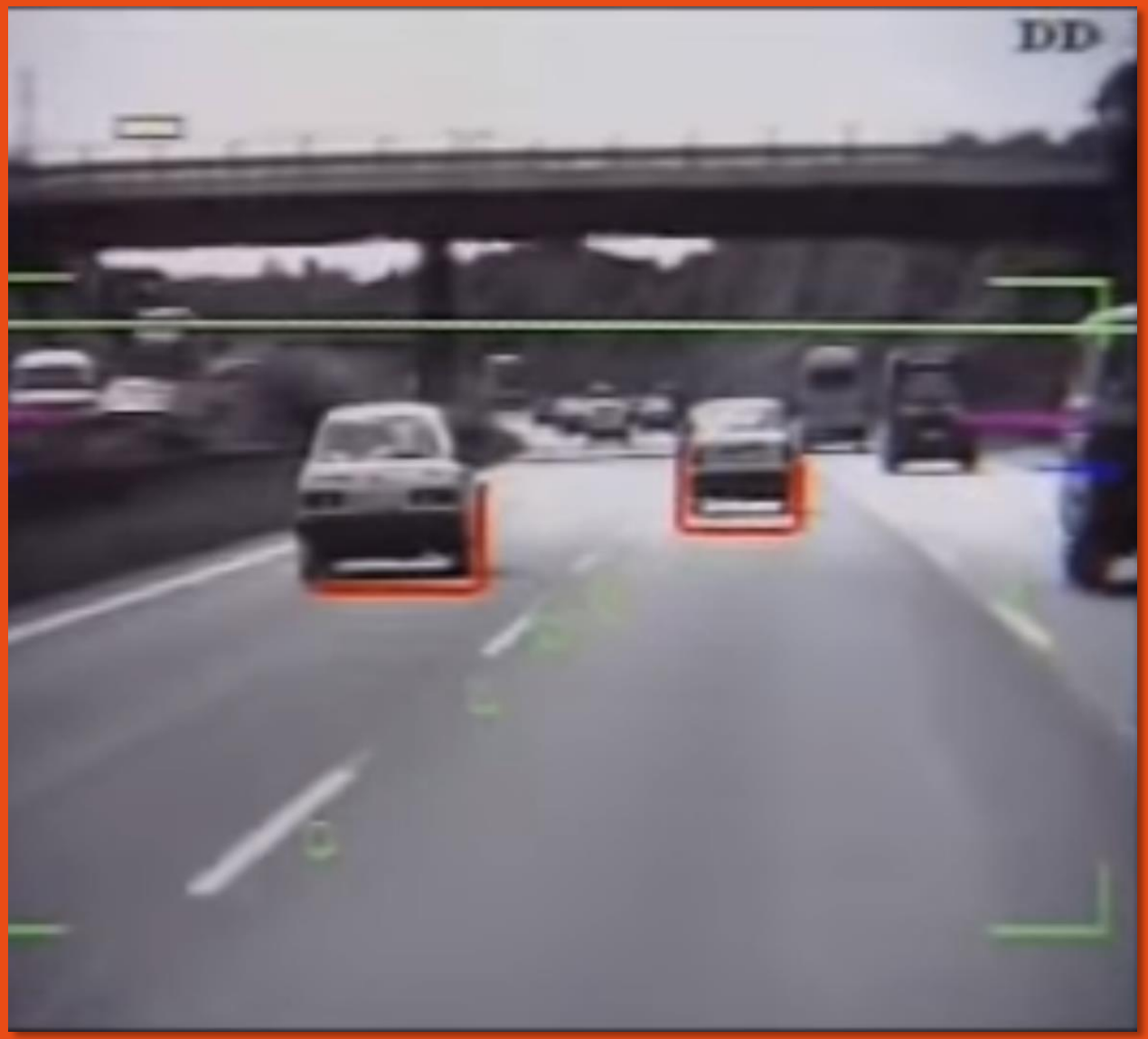


1994

Ernst Dickmann

Universität der Bundeswehr München

- Up to 130 km/h
- Up to 1600 km
- Lane tracking
- Lane change
- Obstacles tracking



DDR4

HD
cameras

GPS

Broadband
connection

7nm

IMU

GPU

HD
Maps

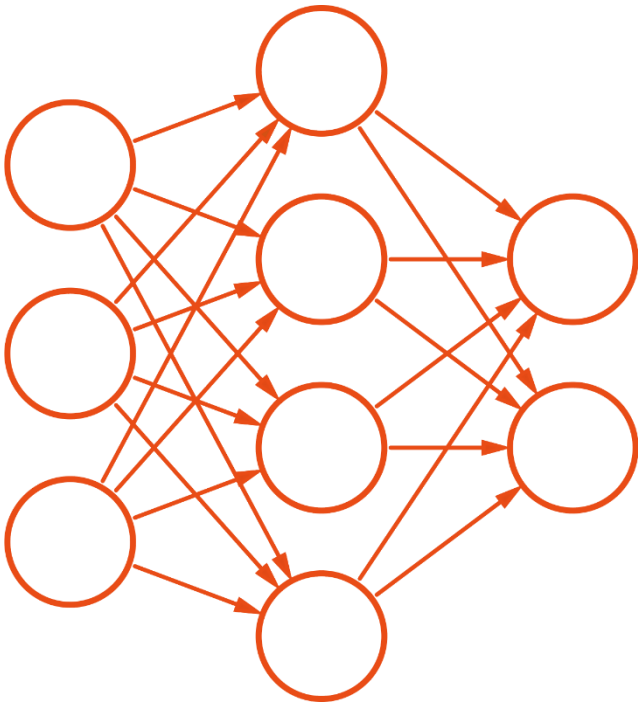
LIDAR
Radar / Infrared

Cloud
computing

DDR4

HD
cameras

GPS



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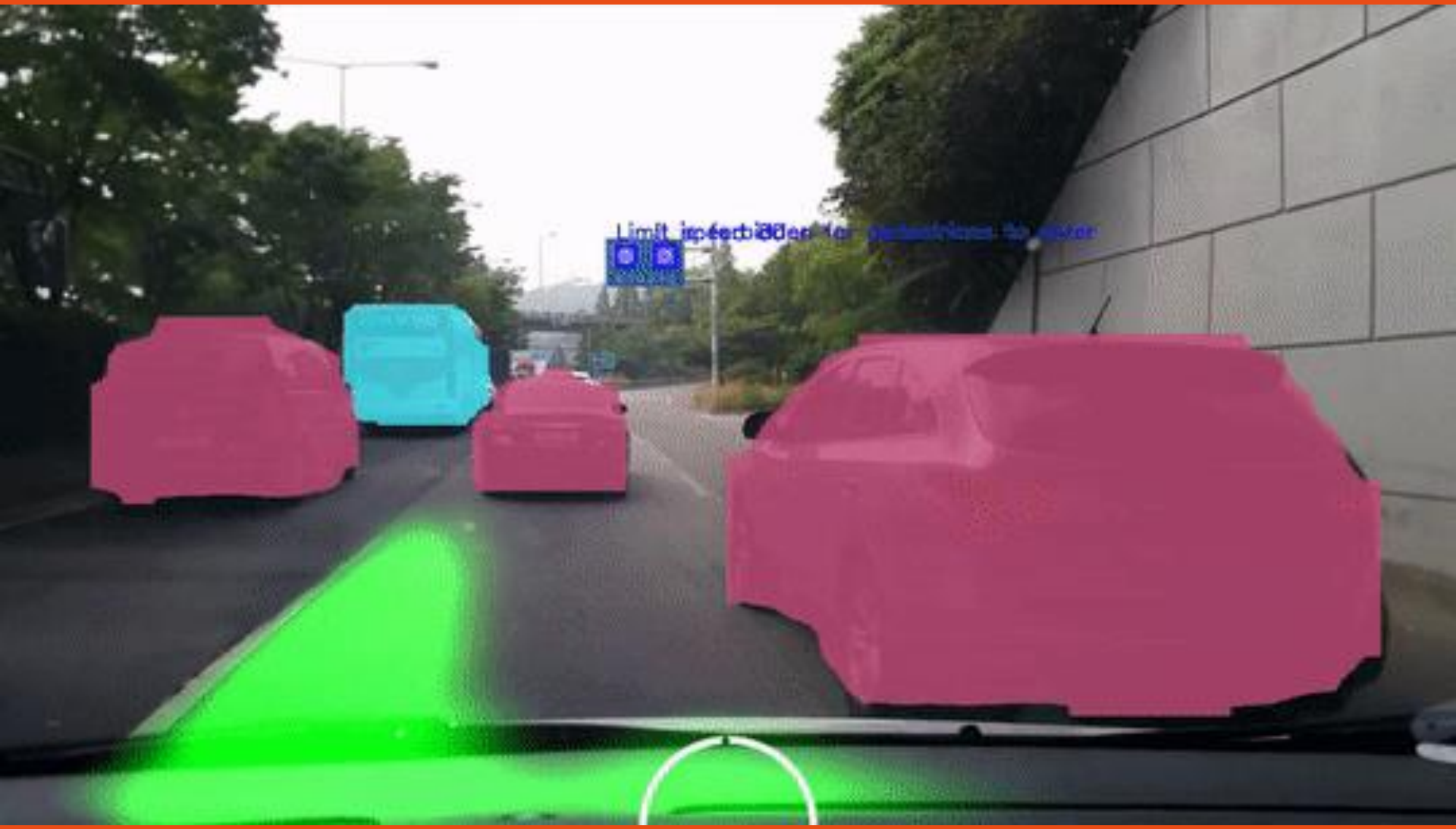


Eye vs Camera

~256 Mp

Effective **500-600** Mp

Dynamic range 2^{24}

Full HD / 4K / 8K

Dynamic range 2^{10}

UBER

Top mounted lidar units provide a 360° 3-dimensional scan of the environment.

Side and rear facing stereo camera pairs work in collaboration to construct a continuous view of the vehicle's surroundings

Forward facing camera array focus both close and far field, watching for breaking vehicles, crossing pedestrians, traffic lights, and signage.

Roof and trunk mounted antennae provide GPS positioning and wireless data capabilities.

360° radar coverage

Front, rear, and wing mounted lidar modules aide in the detection of obstacles in close proximity to the vehicle as well as smaller ones that can get lost in blind spots.

Custom designed compute and storage allow for real-time processing of data. A fully integrated cooling solution keeps components running optimally.

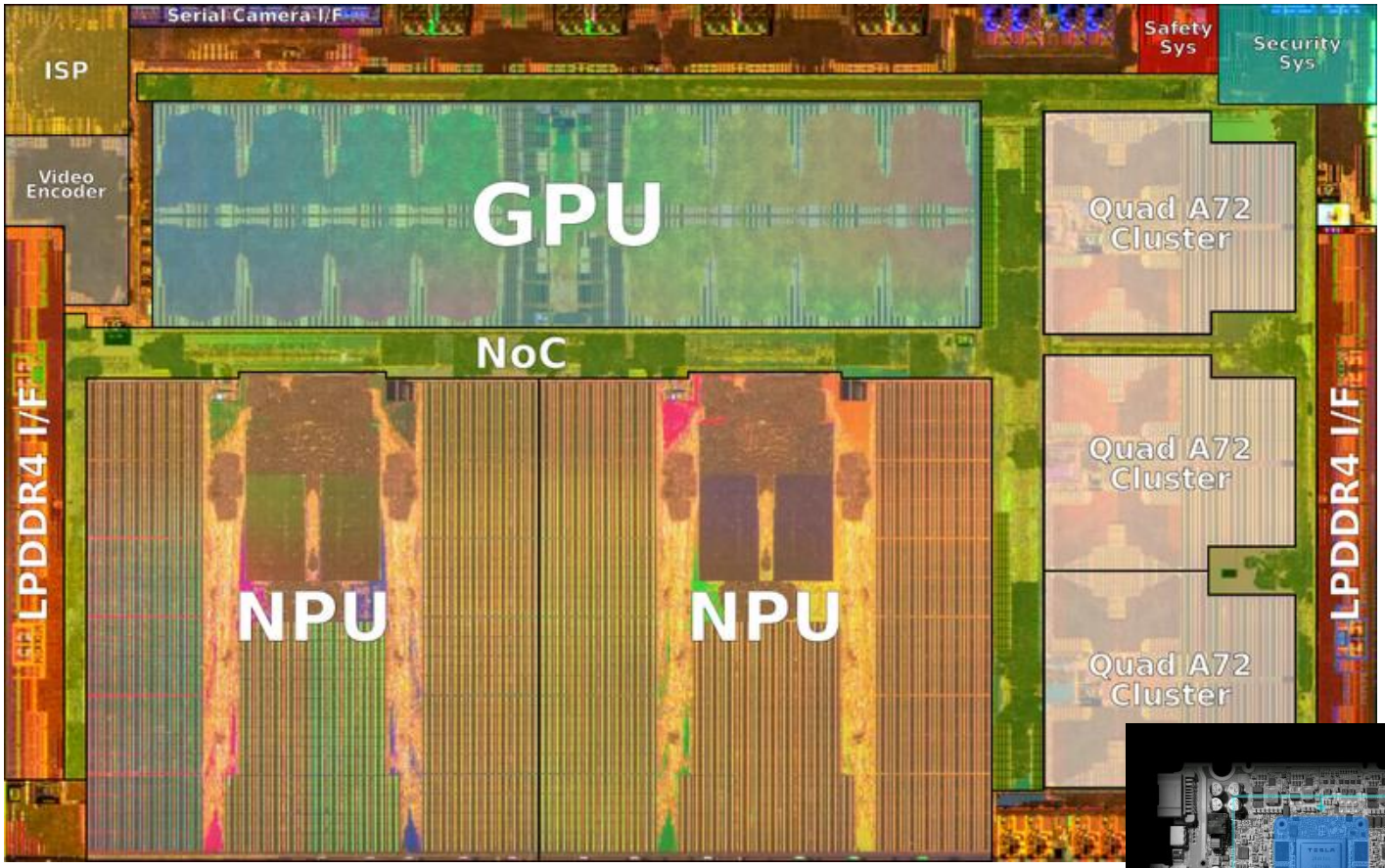

60

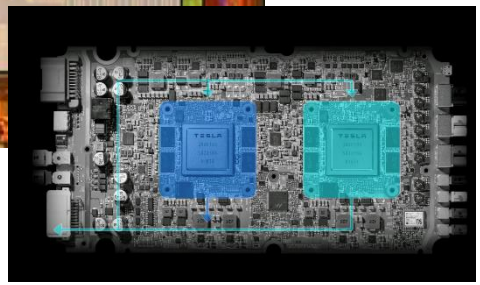

60
ДЕТИ
17471
Т 850 АС 97 RUS
Т 850 АС 97


SALE
RUBY


SALE
RUBY

Custom HW is Key

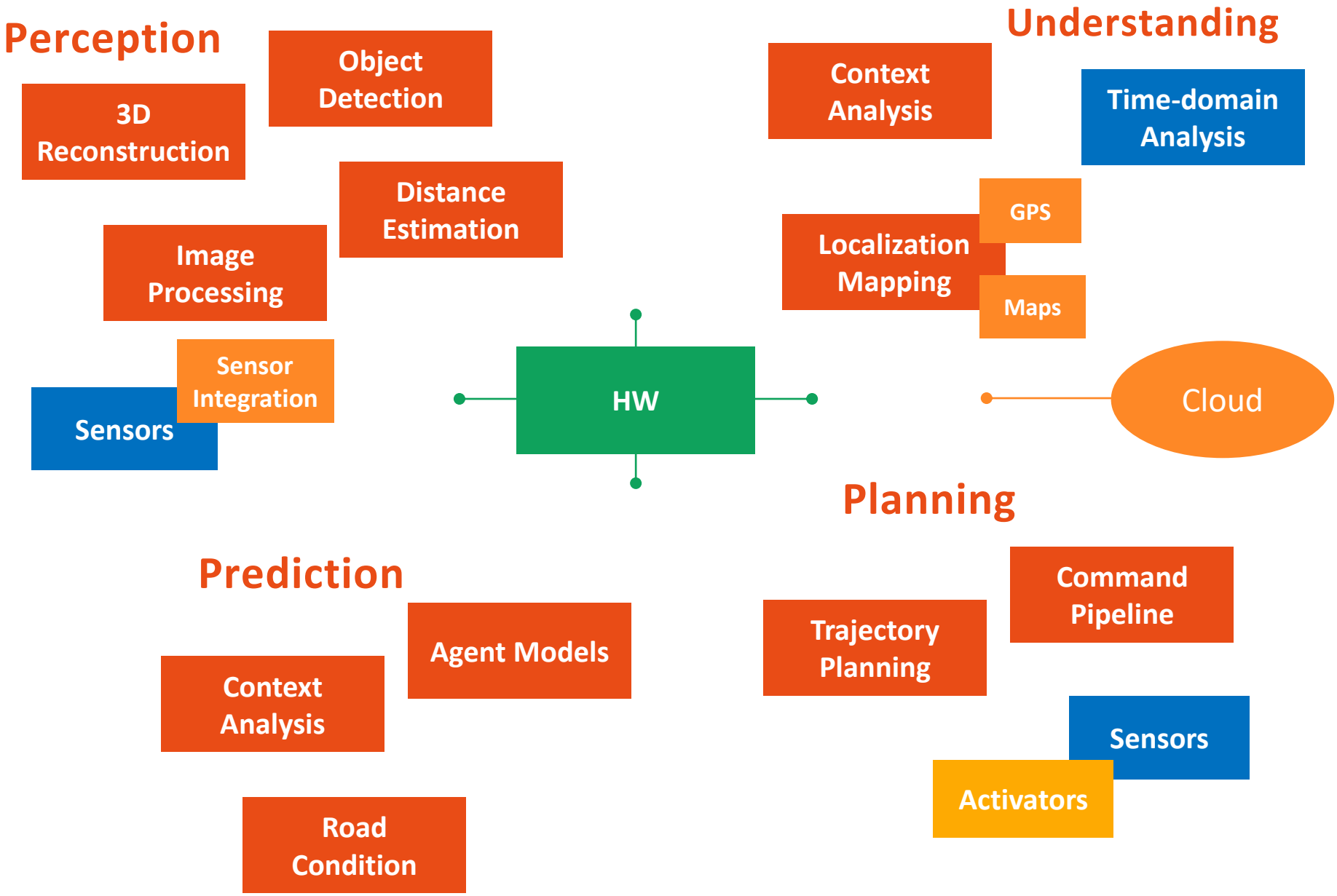




TESLA NXP ARM NVIDIA HUAWEI

Performance ● Power consumption ● Latency ● Heat ● Size

Architecture



Two ways

Full Autonomy

TESLA

Cadillac

Ford

Audi

TOYOTA

VOLVO

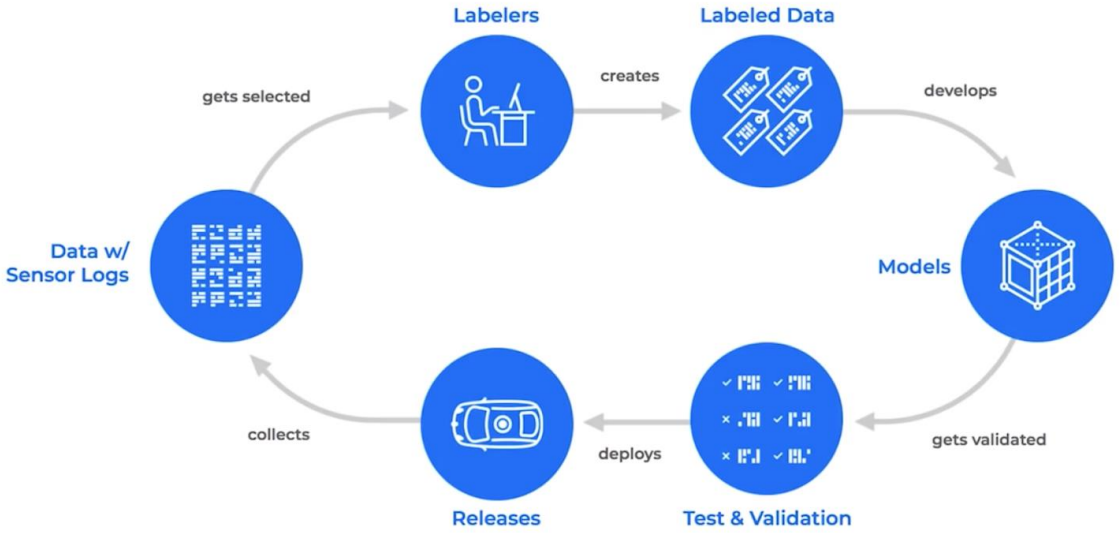
WAYMO

nuTonomy

lyft

Yandex

Machine Learning Cycle

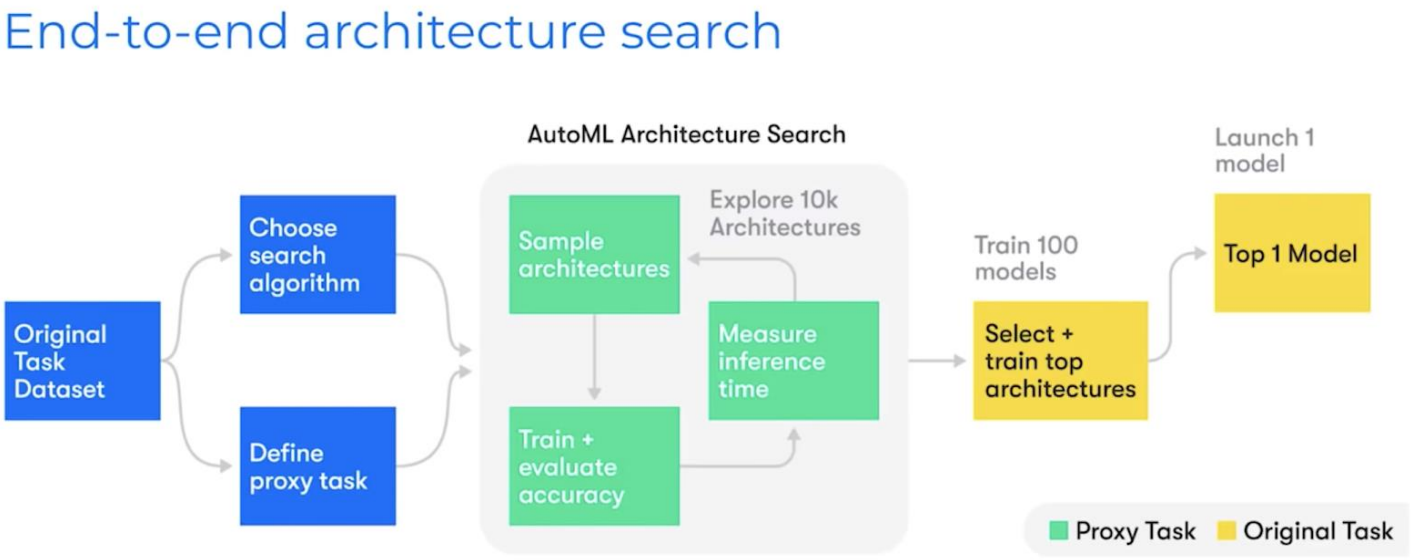


Source: Waymo

- 1,5B Real Self-Driving Miles Driven
- 500K AD Capable Cars on Public Roads

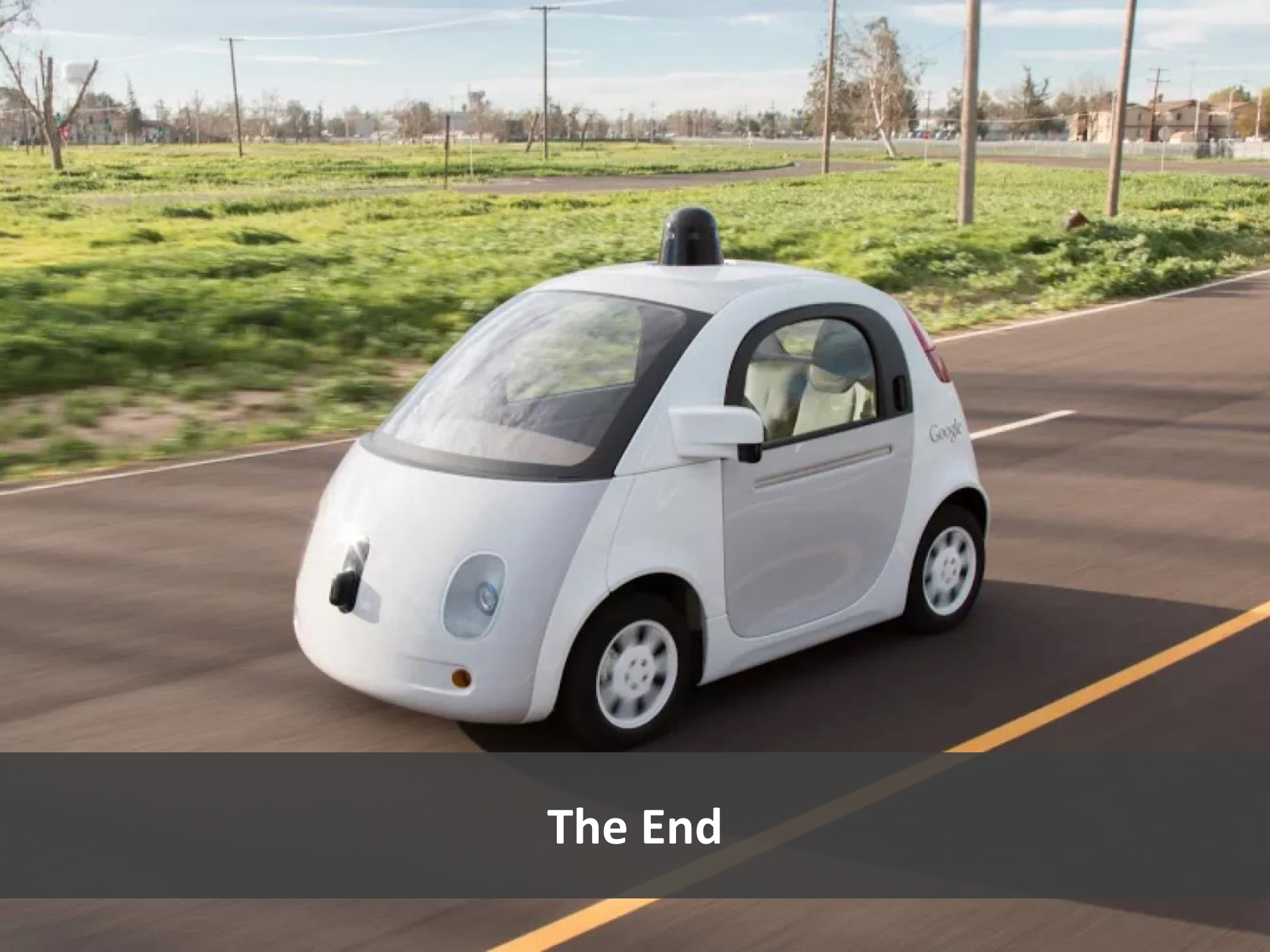
- 25K Simulated Cars 24/7
- 7B+ Simulated Miles
- 100M Real Self-Driving Miles

Auto ML



Source: Waymo


TESLA
VOLVO
ARGO AI
CARLA
WAYMO
TOYOTA
autonomous
intelligent
driving
nuTonomy
ARRIVAL
Yandex
Cadillac
Ford
lyft
cruise
MOBILEYE
An Intel
Company
Audi
drive.ai
TORC
ROBOTICS
Cognitive
Technologies
LUCID



The End

The ~~End~~ Beginning