OTONOM ARAÇ TASARIMINDA YAPAY ZEKA

ALI OSMAN ÖRS

YAPAY ZEKA STRATEJİ MÜDÜRÜ, OTOMOTİV SEKTÖRÜ

DEEP CON'18 YAPAY ZEKA KONFERANSI
DEEP LEARNING TÜRKİYE
ANKARA, 5 EKİM , 2018

SECURE CONNECTIONS
FOR A SMARTER WORLD

GLOBAL TRENDS

AN INCREDIBLE OPPORTUNITY

CONNECTIVITY

AUTONOMY

ELECTRIFICATION

SAFE AND SECURE MOBILITY

AND AN INCREDIBLE RESPONSIBILITY

1.3 MİLYON

Dünyada trafik kazalarına dayalı olüm sayısı

HIT BY A VEHICLE TRAVELING AT:

35 km/h

9 OUT OF **10**
PEDESTRIANS SURVIVE*

HIT BY A VEHICLE TRAVELING AT:

50 km/h

5 OUT OF **10**
PEDESTRIANS SURVIVE

HIT BY A VEHICLE TRAVELING AT:

70 km/h

ONLY **1** OUT OF **10**
PEDESTRIANS SURVIVES

OUT OF ALL ACCIDENTS GLOBALLY,

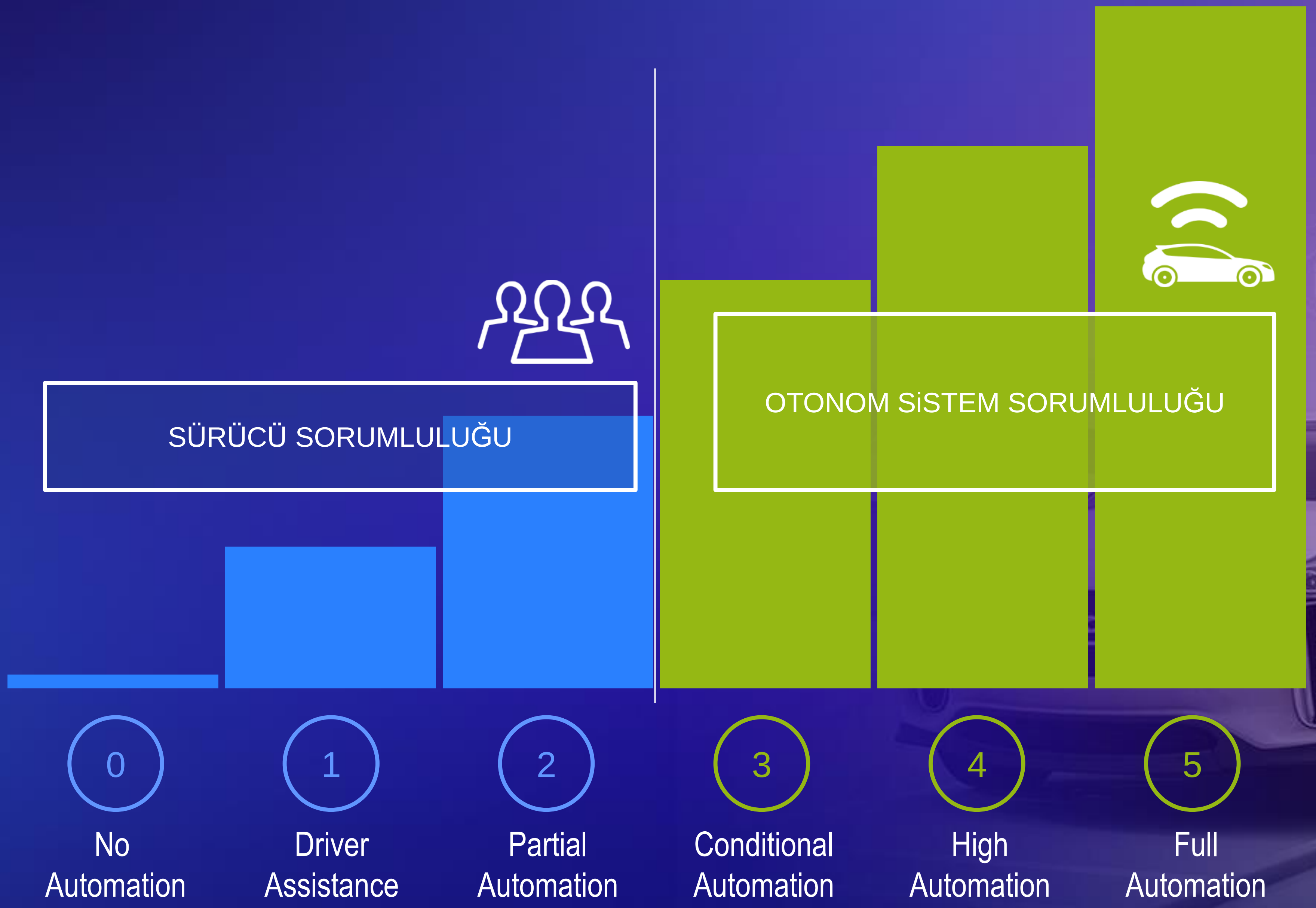
%90

İNSAN HATASI

Source: Seattle's Vision Zero Plan/Documents/Departments/beSuperSafe/VisionZeroPlan, ASIRT.ORG

NXP

SAE Classification



SAE standard J3016

SAE Classification

LEVEL 1
Driver Assistance

Driver

Vehicle or

- Adaptive cruise control
- Automatic braking
- Lane keeping

LEVEL 2
Partial Automation

Driver

Vehicle

- Partial automated parking
- Traffic jam assistance
- Emergency brake with steer

LEVEL 3
Conditional Automation

Driver

Vehicle

- Semi autonomous:
  - Highway chauffeur
  - Self parking
- Human driver can regain control

LEVEL 4
High Automation

Driver

Vehicle

- Autonomous driving in some driving modes
- Human driver may not respond to request to intervene

LEVEL 5
Full Automation

Driver —

Vehicle

- Fully autonomous under all driving modes
- Human driver not expected to respond to request to intervene

ADAS

Self-Driving

Responsibility for safe operation | Control of complete vehicle | Control of steering | Control of vehicle speed

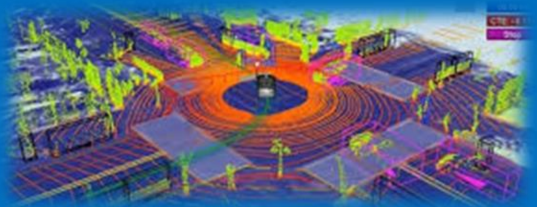
SAE standard J3016

Autonomous Driving at a High Level

Algılama

Sensör bilgilerini inceleme

Model/Haritalama

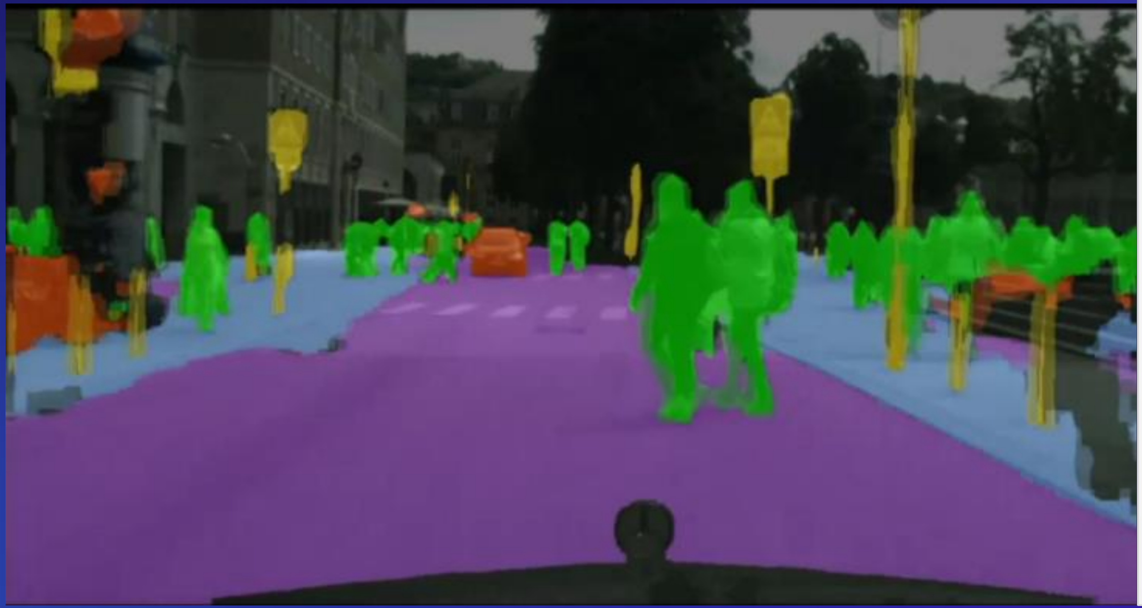


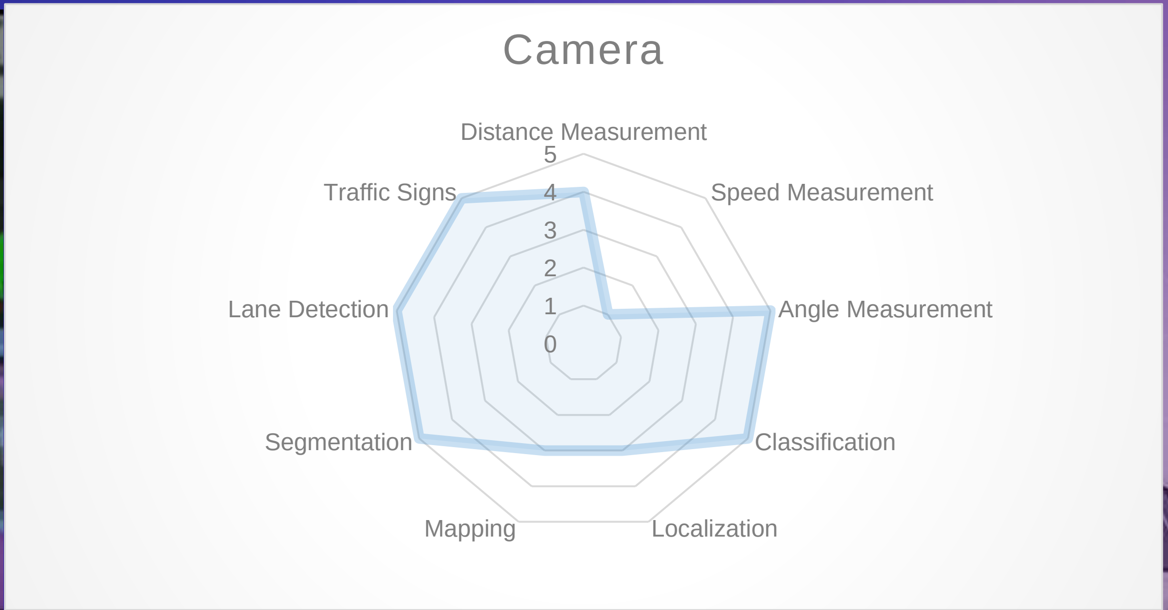
Konum Anlama

Planlama

Hareket Stratejisi

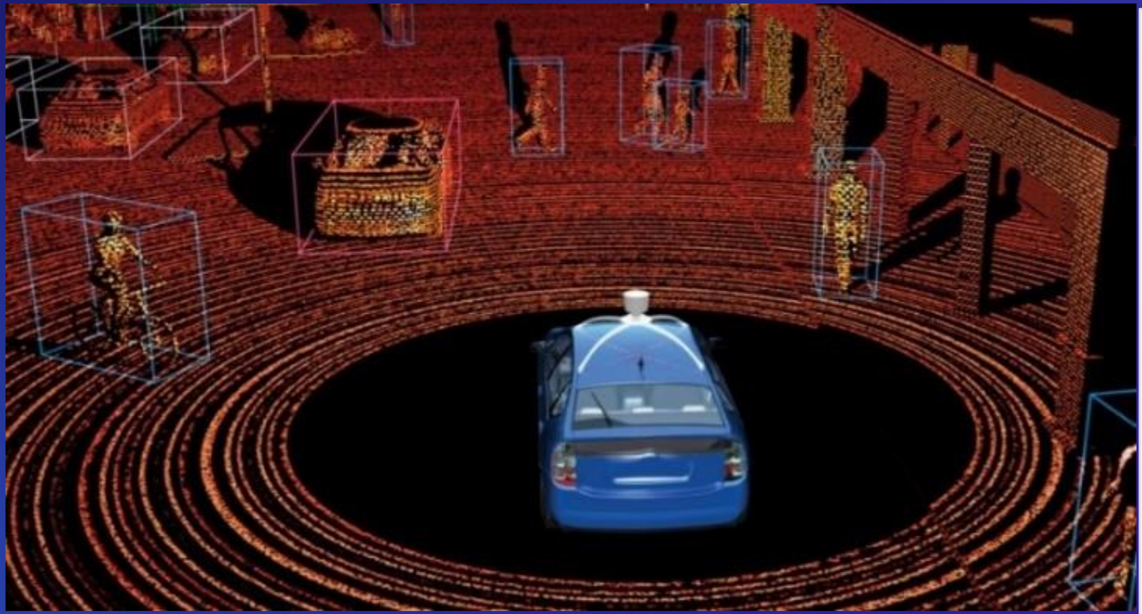
Camera Sensor Capabilities

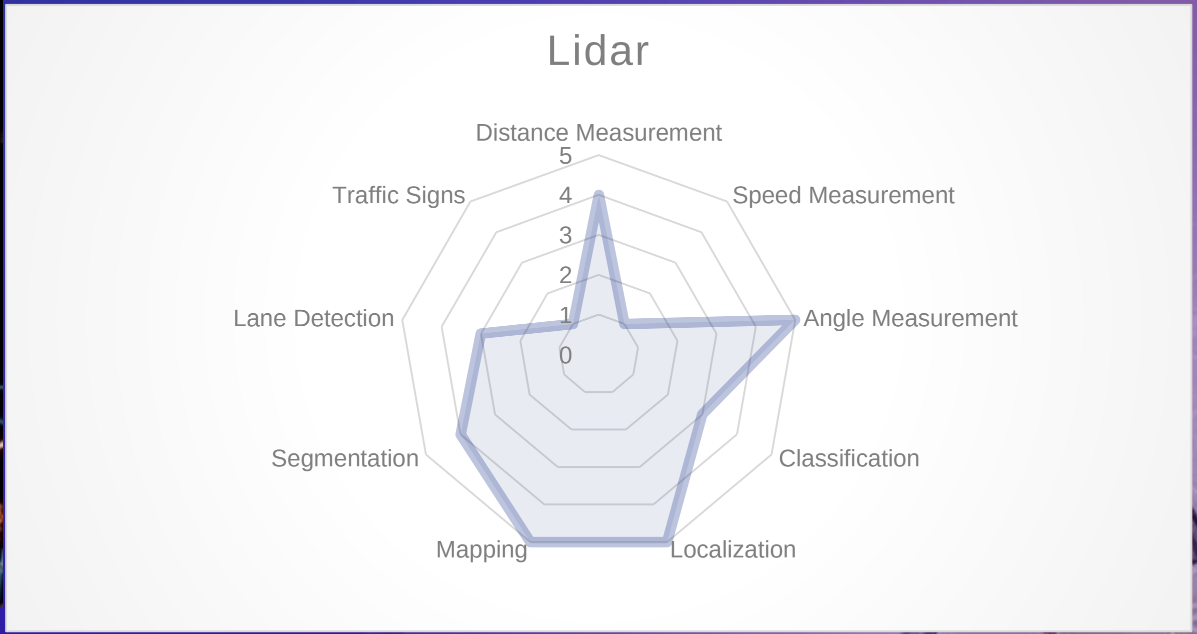




- Dependency from environmental conditions
- Estimation - No direct measurement of range/speed
- Very high computation effort drives power consumption+cost

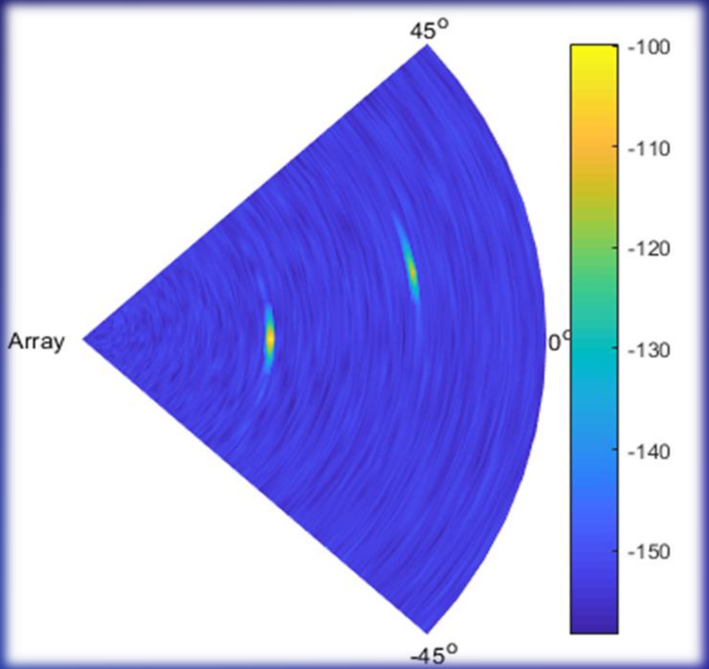
Lidar Sensor Capabilities

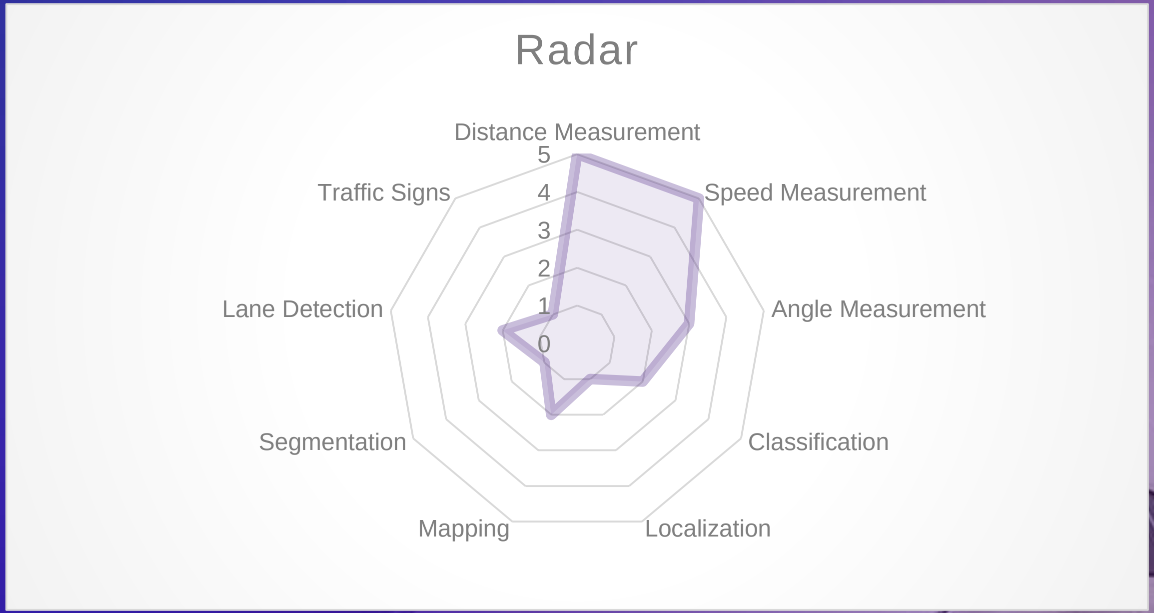




- Dependency from environmental conditions
- Cost and size of sensors too high because of mechanics
- Systems w/o mechanics ~10y behind RADAR

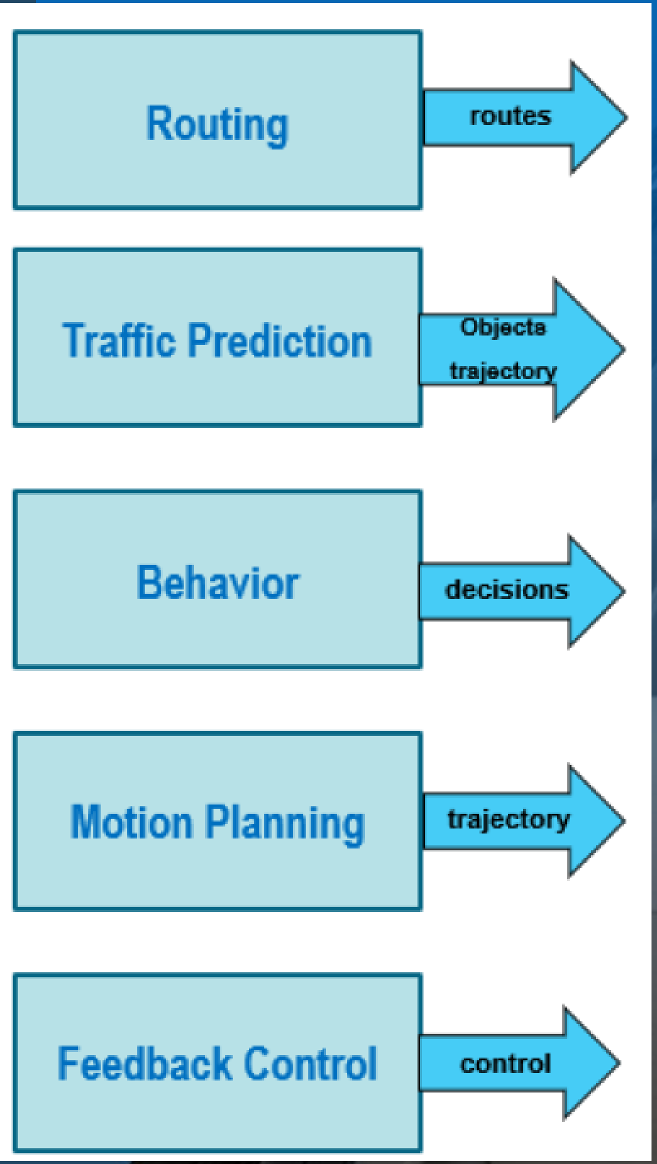
Radar Sensor Capabilities





- Precise measurements but lack of resolution mainly in angular direction
- Current angular resolution imposes heavy limit to classification and mapping capabilities

Autonomous Driving at a High Level



- **Route Planning (navigation)**
  At the highest level a route is planned through the road network.
  Is the strategic target of the drive
- **Traffic Prediction**
  Predict the behavior of the detected perception objects in the near future.
  Output spatial-temporary trajectory points.
- **Behavioral (local planning)**
  decides on a local driving task that progresses the car towards the destination and abides by rules of the road. Output high level semantic decision to be executed
- **Motion planning**
  selects a continuous path through the environment (trajectory) to accomplish a local navigational task.
- **(Feedback Control) Reactive Layer**
  A control system that reactively executes the vehicle planned trajectory.

SENSE

THINK

ACT

ENABLING **SELF-DRIVING** CARS

Autonomous Driving

Solutions Available

Automotive specific training data sets

- A dog is a dog is a dog, the breed is not important

Sensors; higher capability, more robust, less cost

- Imaging radar, smart cameras, solid state lidar

HPC and larger storage

- Increased server compute capacity as well as decreased cost of storage enabling faster training and more training data generation.

Sophisticated Driving Scenario Simulators

- Driving simulation SW with physics based scene and environment rendering built for AD development

Higher Edge Compute performance

- NXP solutions enabling embedded AI at 100x higher power efficiency compared to current deployed test AVs.

Use cases roadmap

203x

Robotaxi

- Driverless
- High Availability
- Increase functionality over time(OTA)

2023-2027

City Pilot & Auto Valet Parking

- Large Urban Road
- Intersection and Traffic Light
- Driverless Auto Park on Public Roads
- Increase functionality over time(OTA)

2021-2023

Highway Pilot & Auto Valet Parking

- Driverless in park areas
- On Highway (<130km/h)
- With/Without Driver Monitor Camera
- Increase functionality over time(OTA)
- Fail Operational Architecture

2020

Traffic Jam Pilot

- Unsupervised
- Boxed-in (<60km/h)
- Driver Monitor Camera
- Redundant Architecture

2019

Next Generation ADAS Driver Support

- NCAP 2018 -2020
- Supervised

NXP

ENABLING L3,L4,L5 VEHICLES

Ulusların Otonom Araç Stratejisi

Uluslararası Otonom Araç Hazırlılık Endeksi (KPMG)

		Yönetmelik	Teknoloji İnovasyon	Altyapı	Kullanıcı
1	Hollanda	3	4	1	2
2	Singapur	1	8	2	1
3	ABD	10	1	7	4
4	İsveç	8	2	6	6
5	İngiltere (BK)	4	5	10	3
6	Almanya	5	3	12	12

Ülkeler Arası Otonom Araç Yayılım Evreleri

	Çin (16)	Fransa (13)	Almanya (6)	Japonya (11)	Singapur (2)	G. Kore (10)	BK (5)	ABD (3)
Sürücülü bölgesel deneme	2015	2015	2010	2013	2015	2016	2015	2010
Sürücüsüz bölgesel deneme								2017
Sürücülü ulusal deneme	2018		2017		2017			
Sürücüsüz ulusal deneme		2019					2019	
L3 ticari kullanım	2020		2017			2020		
L4 ticari kullanım	2025	2022		2025		2030	2021	
L5 ticari kullanım				2025		2030		

Gelecekte Uluslararası Sıralama

1	ABD	(3)
2	Almanya	(6)
3	Çin	(16)
4	Japonya	(11)
5	İngiltere	(5)

ENABLING L3,L4,L5 VEHICLES

The Task Ahead

Autonomous Vehicles

Autonomous Driving Challenges

Where does Sensor Fusion take place

- How does this impact connectivity and BW across the vehicle

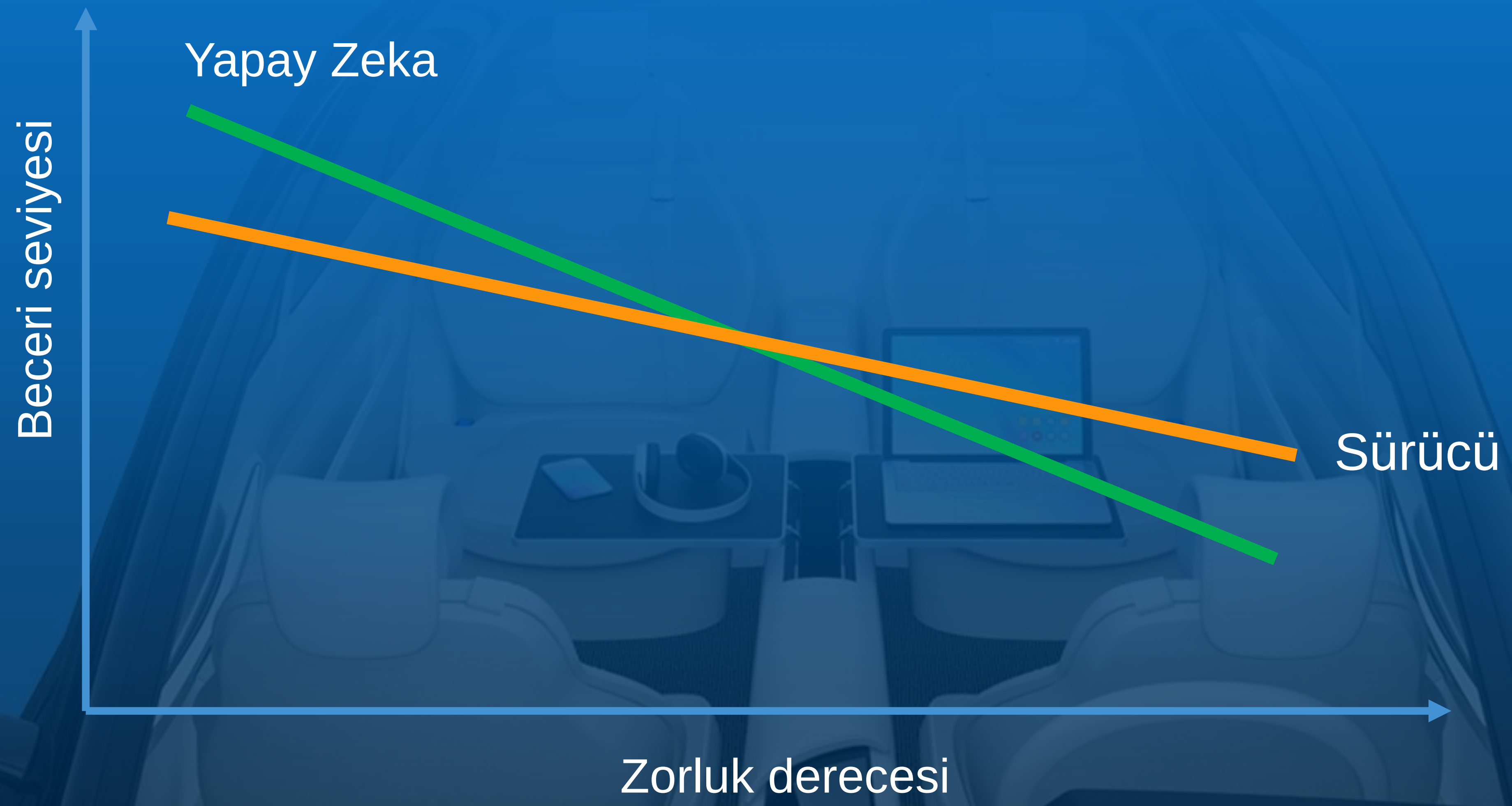
Is AI based path planning safe?

- Can AI be guaranteed to detect free space and safe trajectory planning (yet?)

How much test time/distance is necessary to ensure automated driving is safe?

- 1 Million/Billion/Trillion km/miles driven, how much of real driven miles, how much simulated

Yapay Zeka vs. Sürücü



Yapay Zeka vs. Sürücü

Yapay zekanın amacı verilerden anlam çıkartmak, otonom arac teknolojilerinin amacı bu anlayış sayesinde daha emniyetli bir sürüş tecrübesi sağlamak.

Otonom araçların geniş çaplı kullanılması icin büyük teknoloji ilerlemeleri gerekiyor bu da ekonomik büyüme fırsatı sağlıyor.


Teşekkürler!