Role of AI in Automotive
30th October 2018
We asked a question...

Future of AI or Machine Learning in automobiles (Passenger, commercial and recreation)?

- Driver Assistance
- Risk Assessment
- Convenience Features

- Self Driven Automobiles: 35 (85.4%)
- Connected Cars: 19 (46.3%)
- Self Diagnostics: -22 (53.7%)
- Predictive Maintenance: -13 (31.7%)
- Almost zero accidental risks: -6 (14.6%)
- Security, Secure on Board communication: -1 (2.4%)
Artificial Intelligence in Vehicle Technology
Using Artificial Intelligence (AI) and Machine Learning (ML)

- Self-Driving Technologies
  - AI based wireless communication
- Setting up infotainment systems and preferences
- Driver Fatigue and State tracking
- Realtime safety issues due to usage fatigue
- Product recall management
- Predictive maintenance
- Warranty Management

<table>
<thead>
<tr>
<th>Driver State</th>
<th>Wife State</th>
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Driver State: Distracted 10, Tired 5, Confused ~
Child State: Don’t care 10, Happy 5
Wife State: Just Drive 10, Anger 10
Driver State: Distracted 0, Tired -
Wife State: Just Drive 10, Smiley 10, Alert 8
Autonomous Driving (Self Driven Cars)
Are we there yet? No, but...

Autowakers are now talking about how to make money with the technology in ‘Autonomous cars’ and not just demonstrations – *This is a good sign!*

Human driven cars cost around $2.50 per mile, compared to about $1.20 per mile to a self driven car of which 60% is driver cost.

20,000 (50% usage) self driven cars can replace 200,000 (5% usage) individual cars. That of coarse comes with safety. ~36000 people died in US

By 2030 the car sharing economy for self driven cars is expected to be ~$2.3 trillion
What is the basis of this topic?
Data and more Data!

Artificial Intelligence and Machine Learning cannot work without data
– A lot of it – and the right data

Modern cars are packed with electronics which generate a lot of data

Basically Cars are becoming computers on Wheels
How much data?
Its unclear...

According to a McKinsey & Company estimate, connected cars create up to 25GB of data per hour, which equates to dozens of movies stored in HD every 60 minutes.

How do we transfer all this data? – 5G

Do we need to transfer all the data? - Edge computing

*Twitter’s 270 million users produce about 100 GB of data per day. A single autonomous test vehicle produces about 30 TB per day, which is 3,000 times the scope of Twitter’s daily data.
How much is this data worth?

$1 billion today to $28 billion by 2035

Data from autonomous vehicles will be prized commodity for mobility-service operators such as Uber to learn about transportation consumption habits. Insurance companies and retail advertisers also would covet the information.

“Data is really the lifeblood of your business going forward,” he says. “There is a tendency to want to keep this data in-house. It is the crown jewels.” – Chhabra, Dell

“Data is the new oil” for Daimler CIO, Jan Brecht
Fundamental change
Rethinking Architecture

ECU Consolidation using Hypervisor

Domain controller to replace multiple dedicated ECU

5G technology in car production

End-to-end architectures that connect wirelessly from the vehicle’s onboard electronics to the carmaker’s back end
Look at where we are now

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<th>ELECTRICAL ARCHITECTURE</th>
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**ELECTRICAL ARCHITECTURE 2020s**

- Hi Voltage: 1000W/bar
- Low Voltage: 50W/bar
- Signal/Data: (B/S) 25MB/bar
- Connectors: 10/bar
- Cut Leads: 50/bar

Images: aptive.com
What are we doing with data?
Challenges

Cost Of sensors (e.g. LIDAR)

Data Security, Data Management (including transmission) & Synthetic Data

Simulation, Testing and Validation of AI

Ethical & legal Requirements: Societal Acceptance, Ethical Framework & Regulations for future AI Applications in the Car
I leave you with a thought

“Even though we do not know how the human brain works, we know that, somehow, it does work. Thus, if we build an electronic brain that sort-of looks like an organic brain, perhaps it will operate similar to a human brain and learn complex things, even if we still do not know how.”