DOES DEEP LEARNING PAVE THE WAY TO FULL AUTONOMY?

cortica

Karina Odinaev | Co-founder & COO | Cortica

THE BILLION DOLLAR QUESTION: WHEN WILL CARS DRIVE THEMSELVES?

TRUCKS

“Fully unstructured driving by go-anywhere cars is a long time away,”

– Reilly Brennan, a general partner at Trucks Venture Capital is cautious about how quickly a commercial market will develop for new companies.

THE VERGE

“Self-Driving Cars are Headed Toward an AI Roadblock”

– The Verge [Show headline of this article

TOYOTA RESEARCH INSTITUTE

“…none of us in the automobile or IT industries are close to achieving true Level 5 autonomy, we are not even close.”

– Gill Pratt, the CEO of the Toyota Research

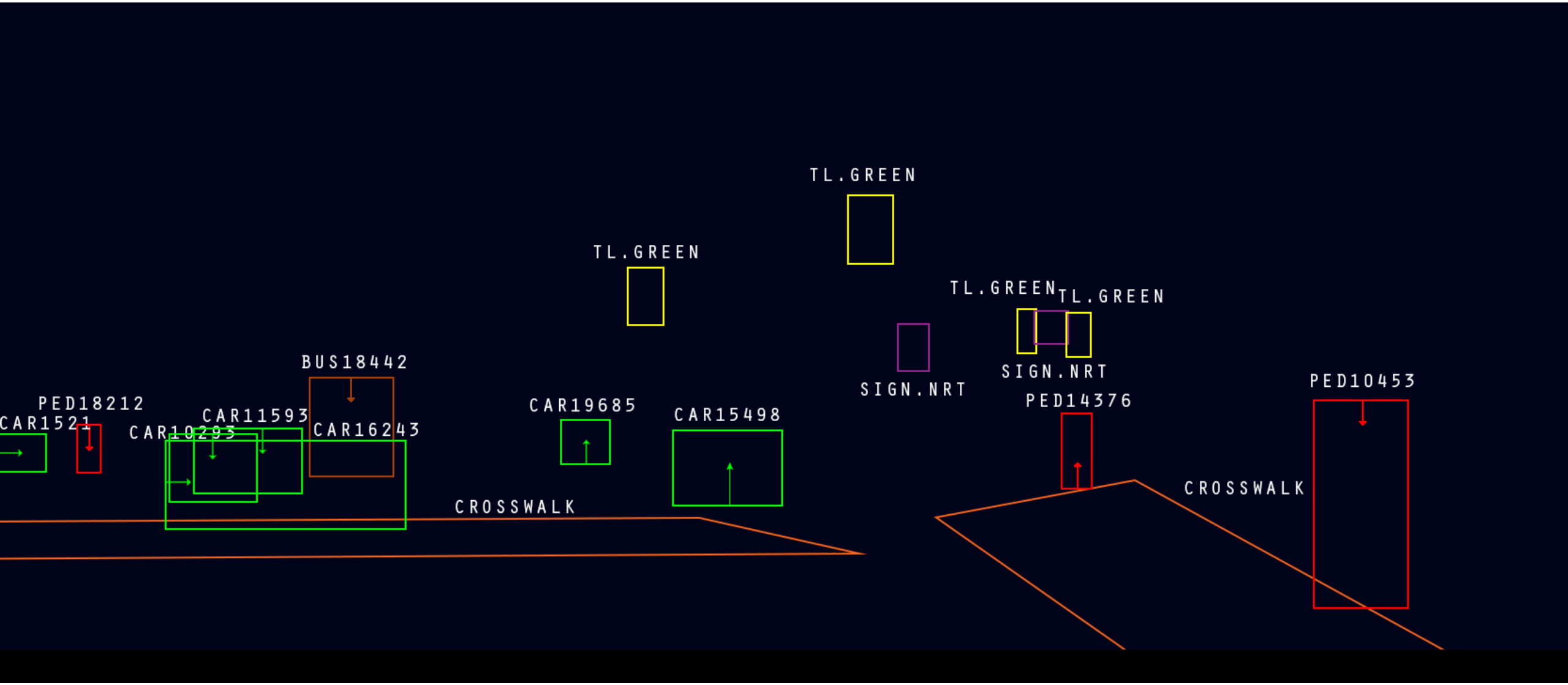
Automotive News

“Full Autonomy is a Long Way Off”

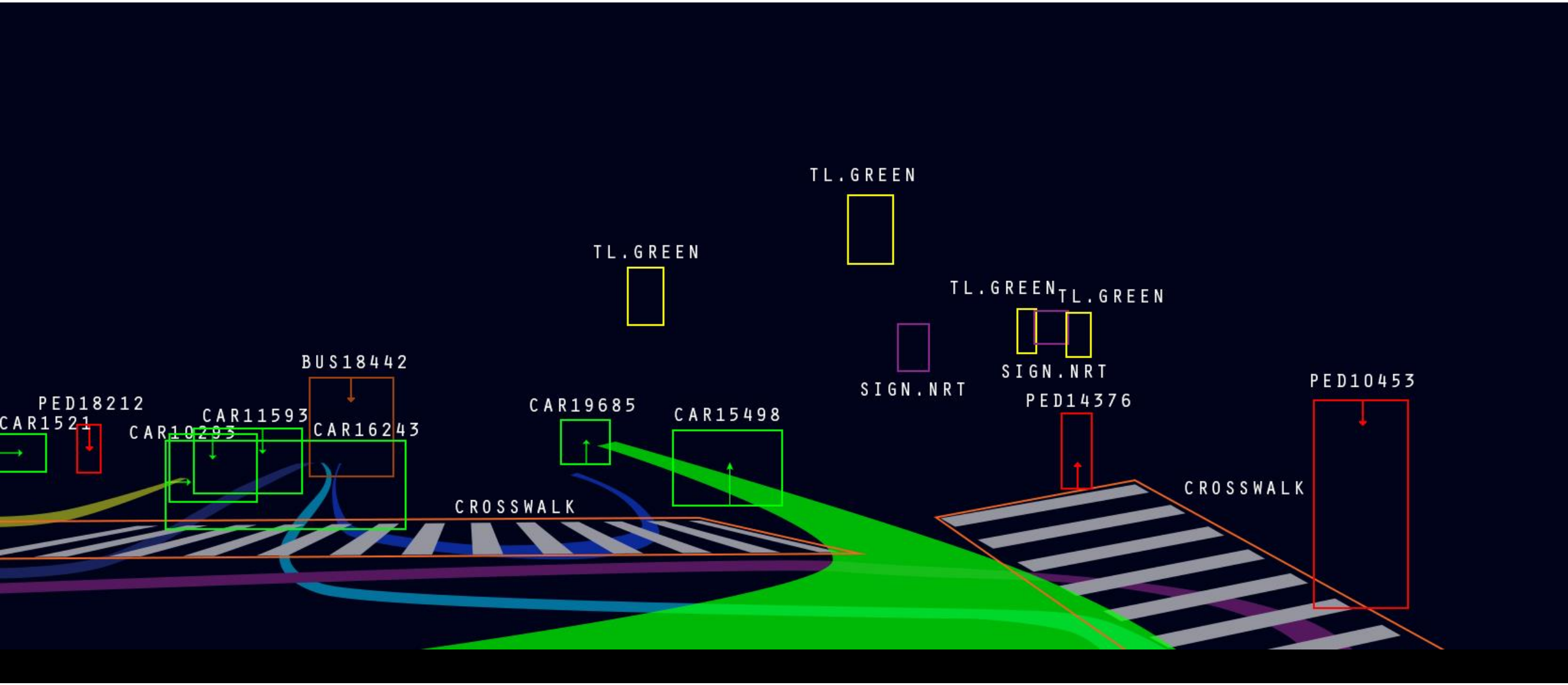
– Automotive News

WHAT IS TAKING SO LONG?

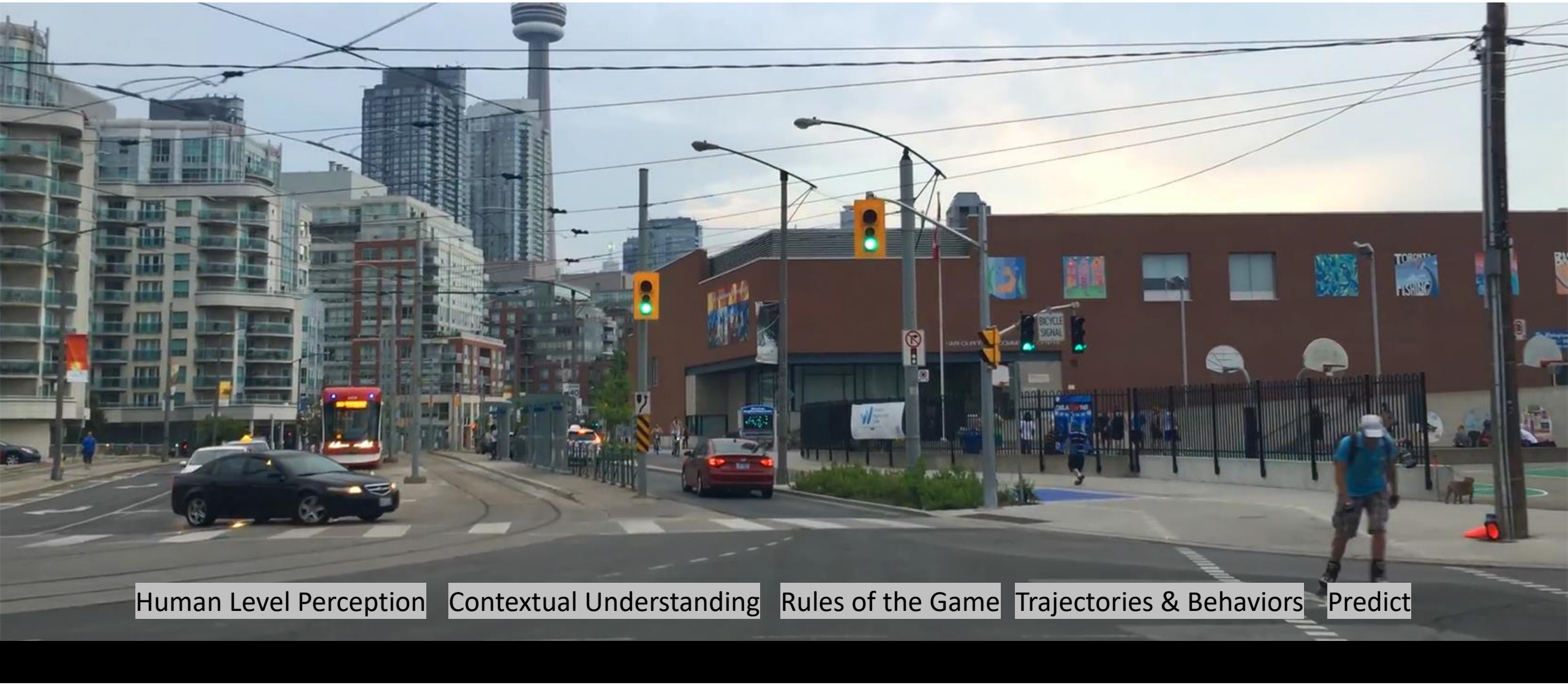
HUMAN LEVEL PERCEPTION



HUMAN LEVEL PERCEPTION



HUMAN LEVEL PERCEPTION



ROBUSTNESS TO WEATHER CONDITIONS

Difficult to ”complete the missing pixels”

Arizona Uber Accident

Better than human sensors

Testing in nice weather areas

Tempe, Arizona Uber Accident

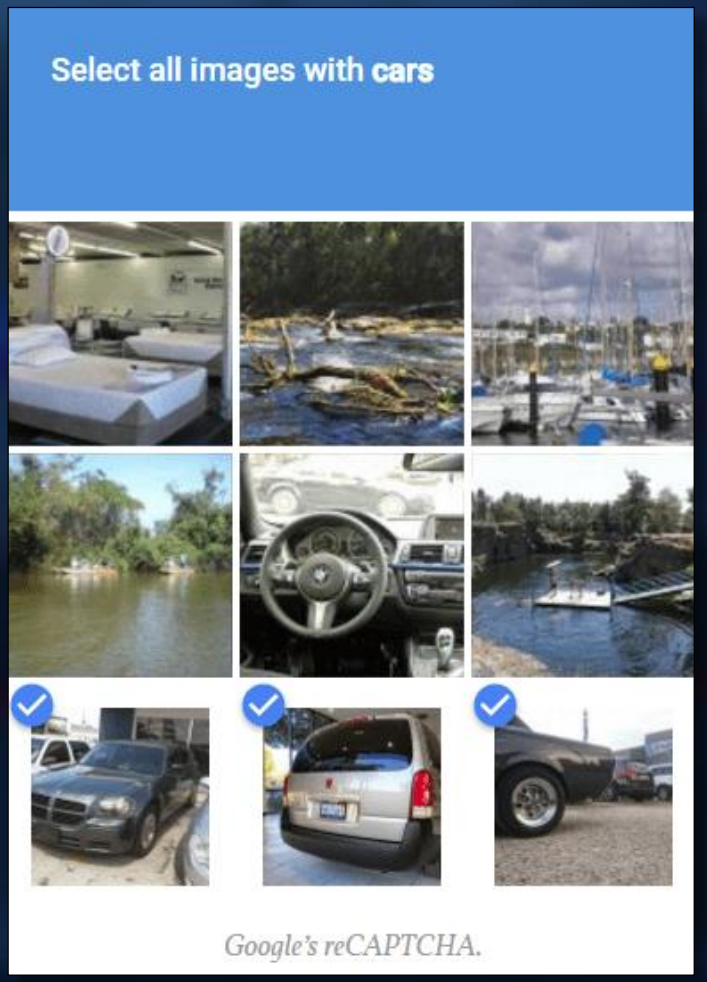
SUPERVISED: REQUIRES TAGGED TRAINING SETS

Deep Learning is highly supervised approach

Requires massive amounts of clean, structured, annotated data.

Quality of results similar to quality of the training set

Pedestrian recognition of Waymo is based on millions of manually tagged images



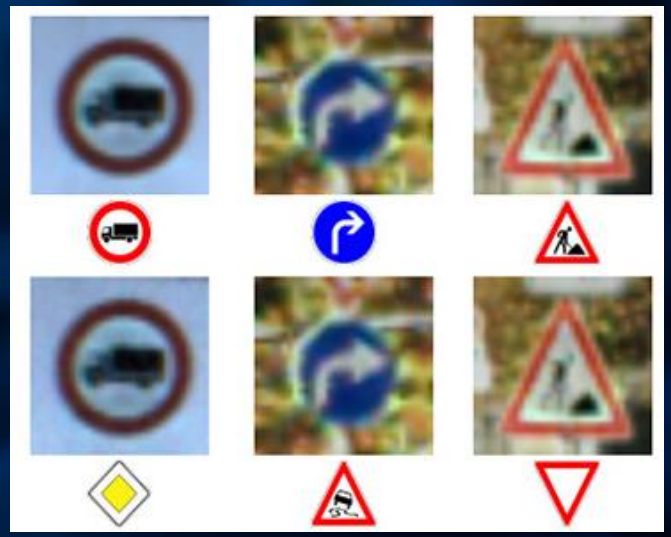
TRANSPARENCY & TRUST

Huge Multilayered Network outputs the commands that operate the vehicles

What if something unexpected happens?

The existing DL technology is a **black box**

Manufacturers and Public Trust



MISDETECTED

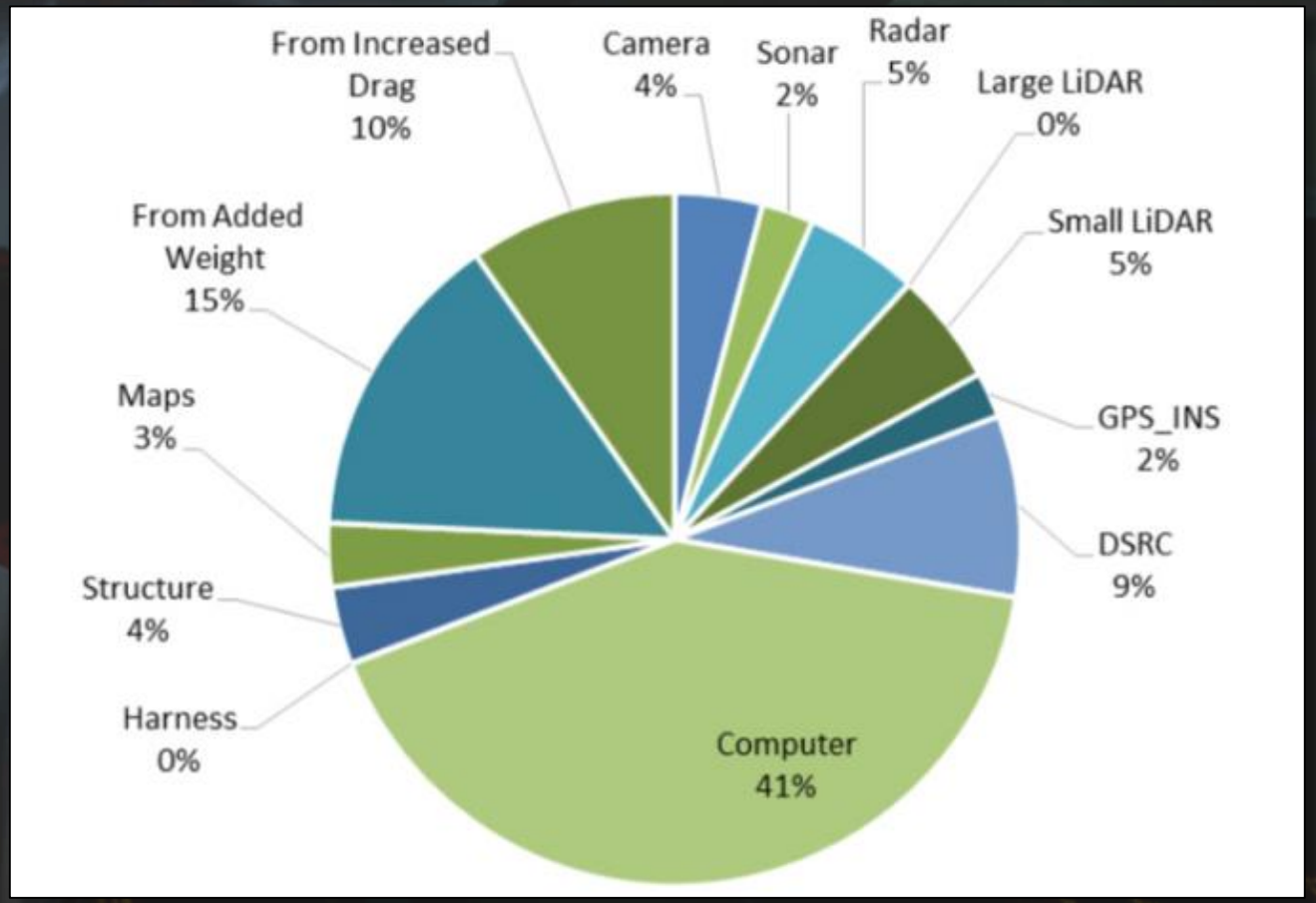
POWER COMSUMPTION

Electric Vehicles are the next wave of transportation

Small power plant required to operate the self driving car

Computer running the algorithms, hoggs more than 40% of the power

Getting to mass production is not possible



STATE OF THE ART AI ACHIEVEMENTS ARE STUNNING

HOWEVER IT IS CLEAR THAT IT IS STILL LIMITED

To bring about a fully autonomous vehicle we need an AI system that:

Is capable of human level perception

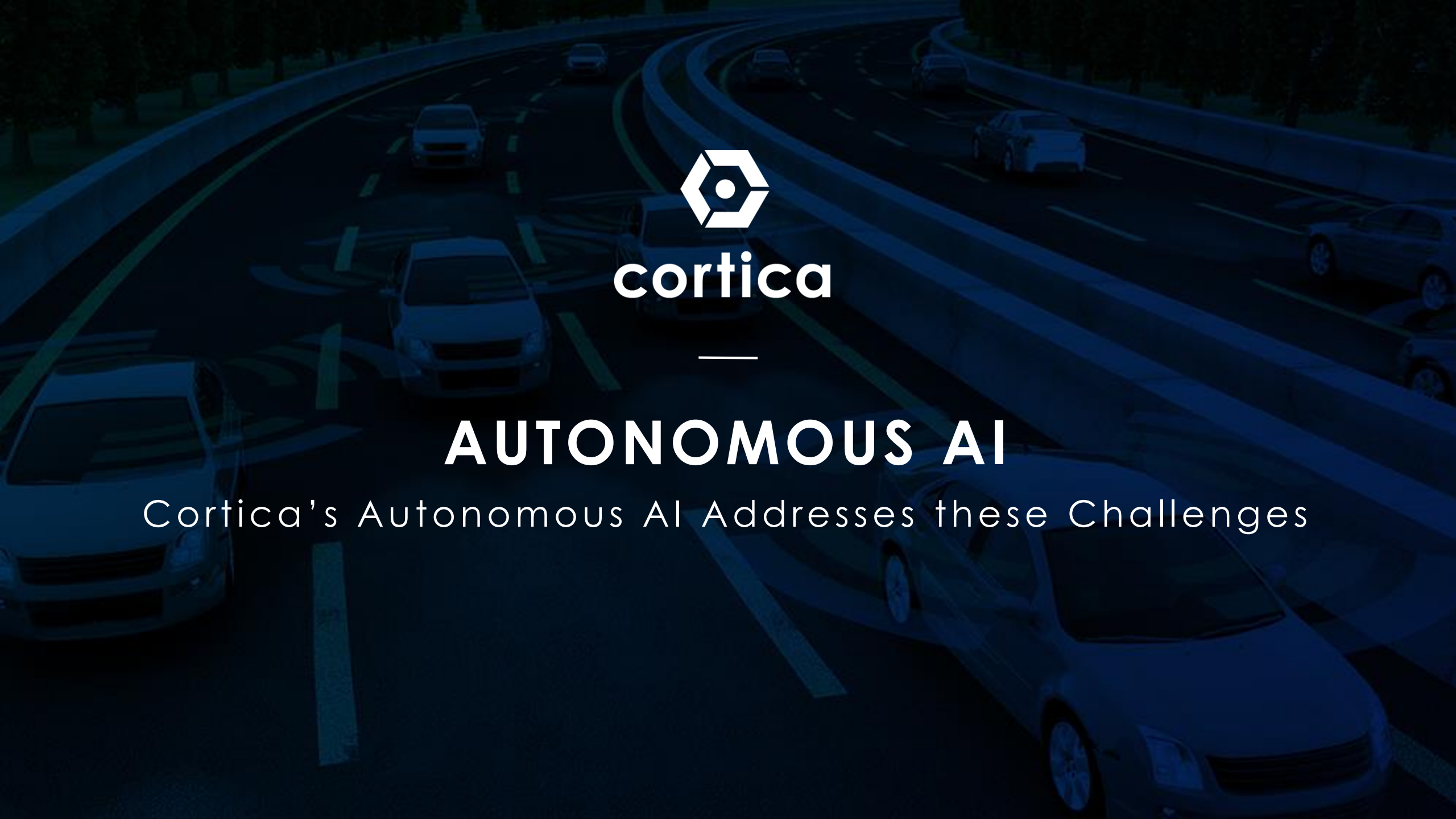
Doesn’t require tagged training sets

Works in any conditions

Doesn’t require specialized, constantly updated 3D maps

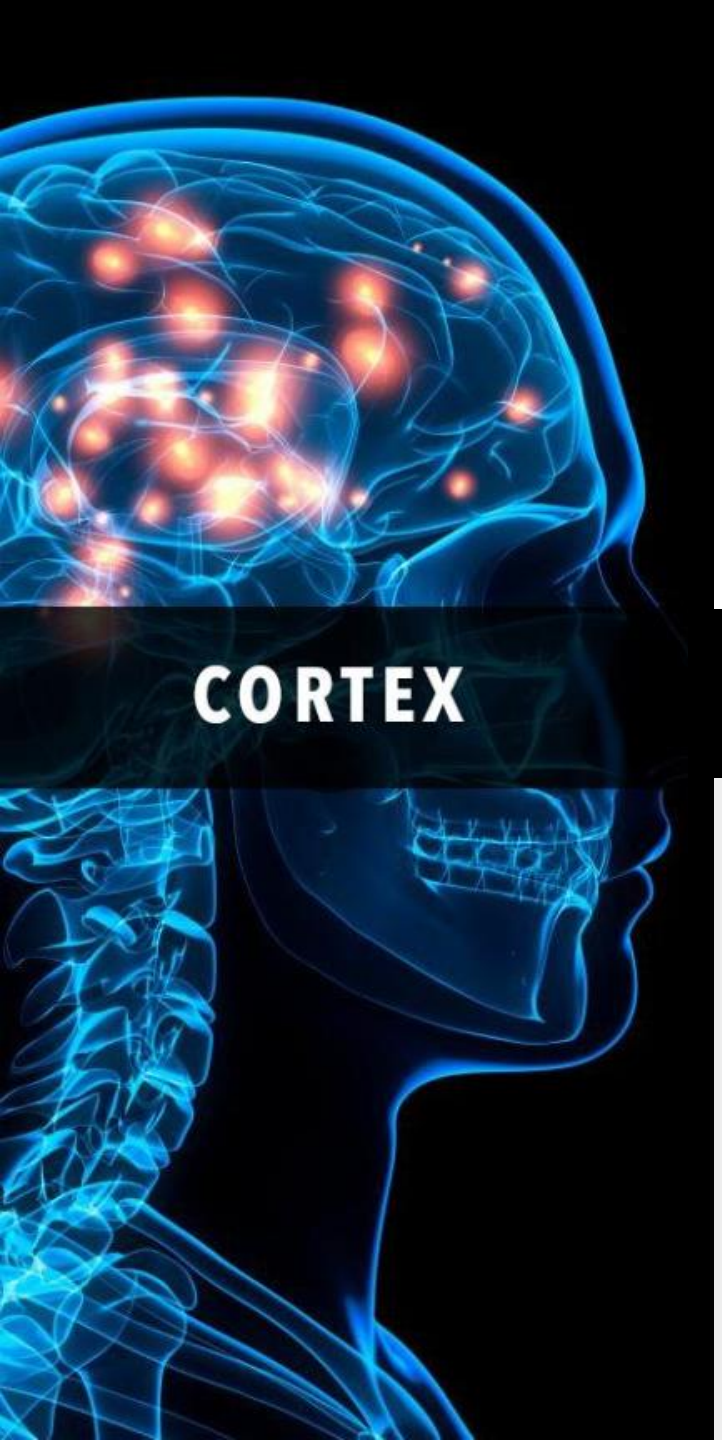
Is transparent and explainable

Works with low power consumption



AUTONOMOUS AI

Cortica's Autonomous AI Addresses these Challenges



AUTONOMOUS AI

The brain’s perception is still more powerful than the most advanced machine learning.

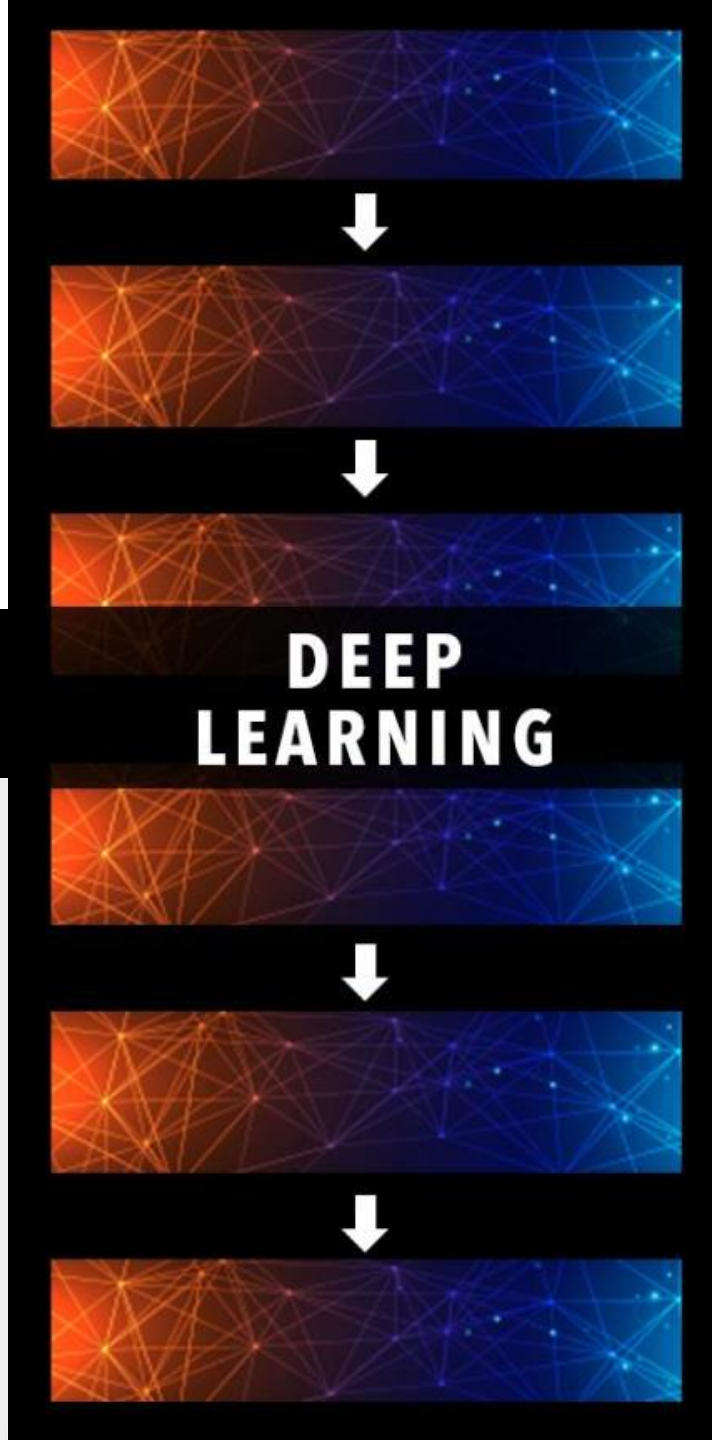
Cortica’s Autonomous AI leverages the power of Cortex and mimics the way it processes information and learns.

Autonomous AI is bridging the gap between Deep Learning and the Cortex to enable human-level perception

Based on over 15 years of R&D

Protected by IP of 200+ inventions

Cortica’s autonomous AI enables human-level perception



AUTONOMOUS AI PERCEPTION TECHNOLOGY EDGE

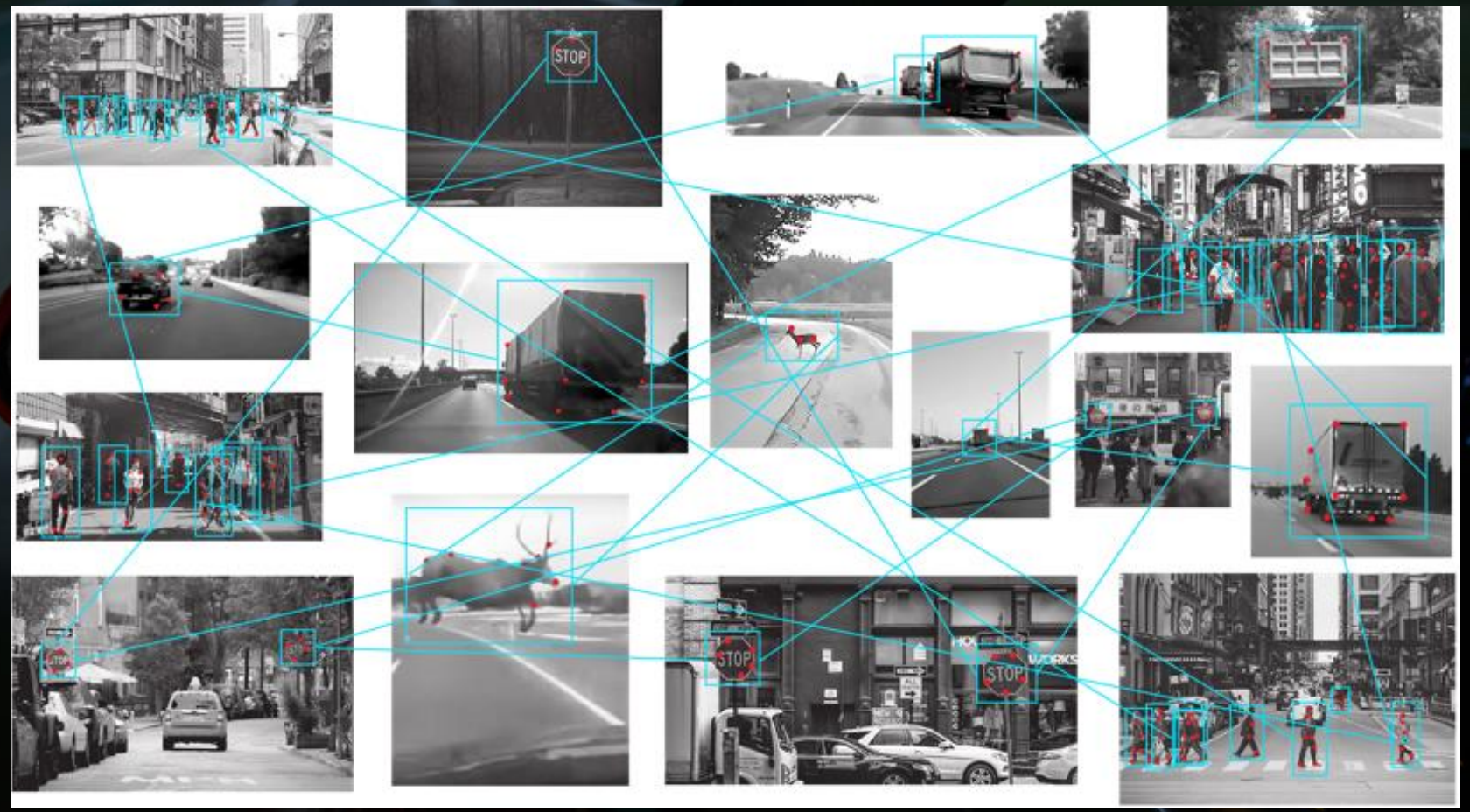
SELF LEARNING

Living creatures, generate representations in their brain

Cortica's signatures – high dimensional representations of our sensory input

A baby does not require a tagged training set to learn

Cortica autonomous AI learns in an unsupervised manner, similar to us



PERCEPTION TECHNOLOGY EDGE

ADVANCED PERCEPTION

Cortica Robust Signatures and Unsupervised Concept Creation yield

- **Nearly perfect object recognition**
- **Coverage of Edge cases**

Situation Understanding & Big Data

- **Learn behaviors**
- **Similar Situations**
- **Prediction**

PERCEPTION TECHNOLOGY EDGE

LOW COMPUTE

Flat architecture is HW agnostic

Generic Signatures

Collaboration with Renesas

Production ready solution with power consumption of less than 0.5Watt.

10 times faster than the most optimized CNN
Consuming less than 0.5 Watt

PERCEPTION TECHNOLOGY EDGE

TRANSPARENT

Concept structure and architecture are fully transparent and explainable

Cortica CDK allows the developer to track back to which signature ID contributed to a specific result.

Concept Update – additive approach

PERCEPTION TECHNOLOGY EDGE

SENSOR FUSION

Fuse multiple sensor inputs into a single lightweight representation space.

No need for building probabilistic algorithms for sensor fusion

Unsupervised Learning based on single signature from multiple sources

cortica

PAVING THE WAY TO FULL AUTONOMY