



1ª CONFERÊNCIA

Veículos inteligentes

Como eles irão afetar a nossa vida, os negócios e o transporte público?

New Standard Data Recording Device for Intelligent Vehicles

Arthur de Miranda Neto

APOIO:



Por meio de:



REALIZAÇÃO:





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**Veículos
inteligentes**

Arthur de Miranda Neto

arthur.miranda.neto@gmail.com





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2014 – Professor at Federal University of Lavras (UFLA), Brazil.



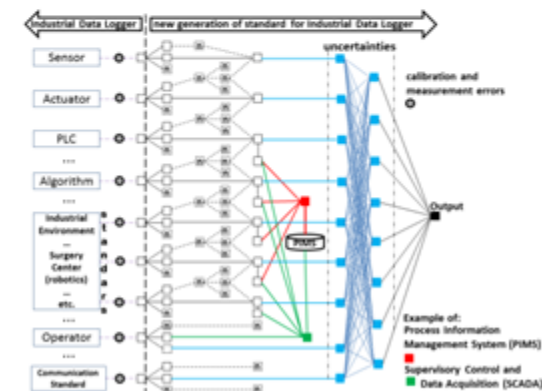
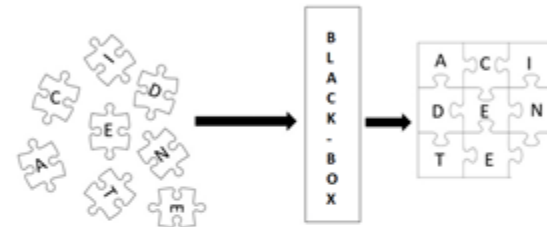
2017 – 2018 The new generation of standard data recording device for automated driving system



Berkeley
UNIVERSITY OF CALIFORNIA

**2017 Fulbright Faculty Member Award
Institute for Transportation Studies,
University of California, Berkeley, U.S.**

- to support regulatory standards for future vehicles, helping to determine what is in the origin of incidents and failure causes.
- to avoid potential liability (manufacturers), to open new opportunities for expertise analysis.
- there is no standard data recording device developed specifically for intelligent vehicles.





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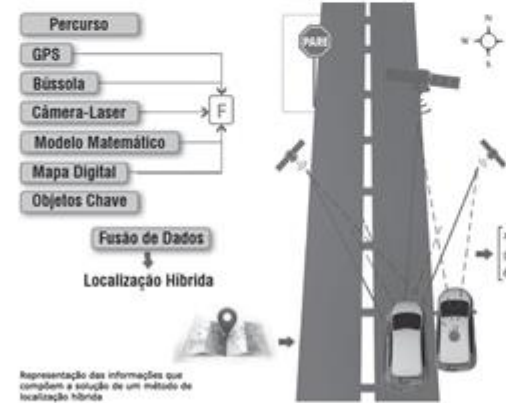
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2012 – 2014
Visitor Assistant Professor
State University of Campinas (UNICAMP)
Co-founder: Autonomous Mobility Lab. (2009)



- **Project: Robot Platform Development for Studies of the (Semi) Autonomous Terrestrial Mobility – Ministry of Defense, CAPES/Brazil.**



(in portuguese)

<http://www.cruesp.sp.gov.br/?p=7878>

<http://www.ufla.br/ascom/2015/11/12/ufla-e-unicamp-avancam-na-colaboracao-para-pesquisas-com-veiculos-inteligentes/>

<https://youtu.be/WvhZfUMzQBw>

C++ ; real time ; experimental validation



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https://www.youtube.com/watch?v=jOy_oMPVnyg

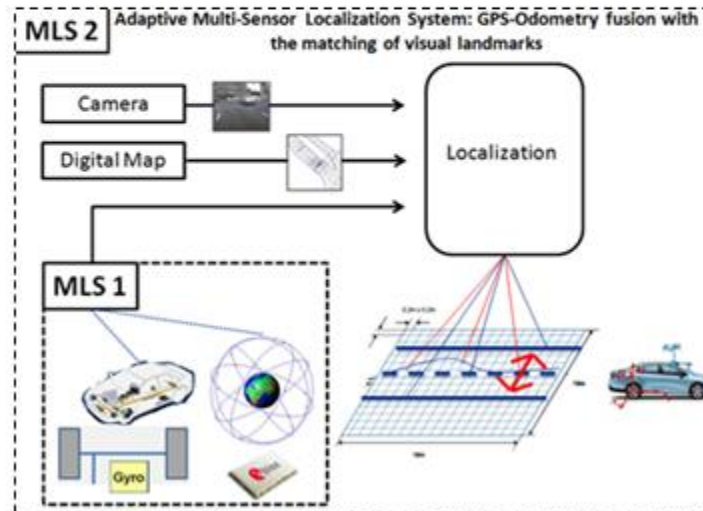


2010 – 2012

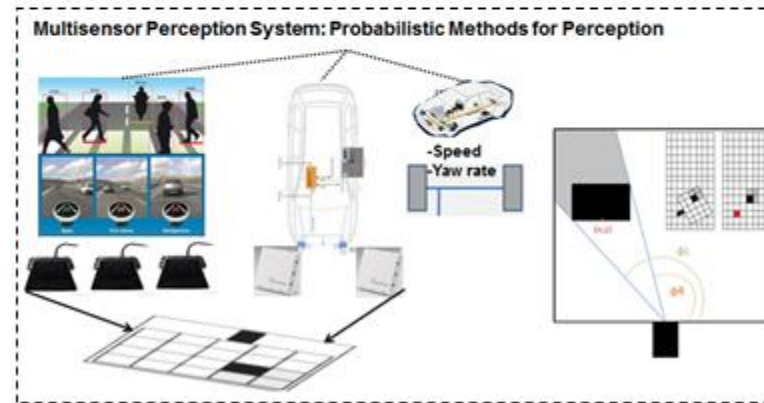
Post-doctoral and Research Engineer at National Center for Scientific Research (CNRS), Heudiasyc Lab. and Renault, France.



RENAULT



Urban Mobility Advanced Platform (PAMU)



C++ ; real time ; experimental validation; patent.

Device for signaling objects to a navigation module of a vehicle equipped with this device

<https://patents.google.com/patent/US20170043771A1/en>

(WO2015166156 A1), Javier IBANEZ-GUZMAN, Vincent FREMONT, Stéphane BONNET, **MIRANDA NETO, A.** Renault S.A.S.



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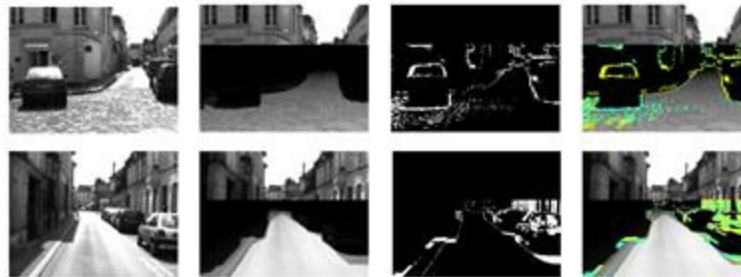


2007 – 2011 Ph.D. in Information Technology and Systems (UTC and UNICAMP)

Embedded Visual Perception System applied to Safe Navigation of Vehicles

2005 – 2007 M.Sc. in Mechanical Engineering (UNICAMP)

Autonomous Robots' Navigation based on Monocular Vision



**C++
real time
experimental validation**

- Nomination for Ph.D. Thesis Prize, 2012: Prix de thèse du GdR Robotique, Heudiasyc Lab., UTC, France.
- Thesis Prize Marechal do Ar Casimiro Montenegro Filho, 2011, ISSN 1677-7042 N° 4, January, 5th 2012, Secretariat for Strategic Affairs (SAE) of the Presidency, Brazil.
- Region 9 Student Paper Contest (Placing Second), 2007, IEEE Región 9 Latinoamérica y El Caribe.

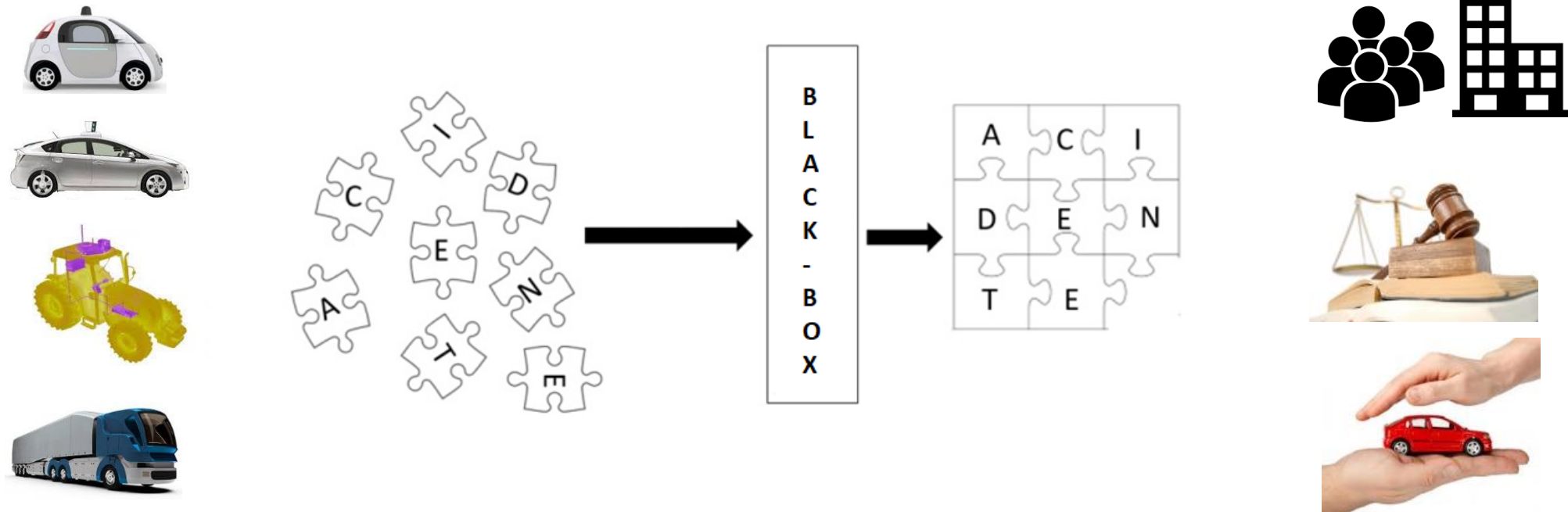




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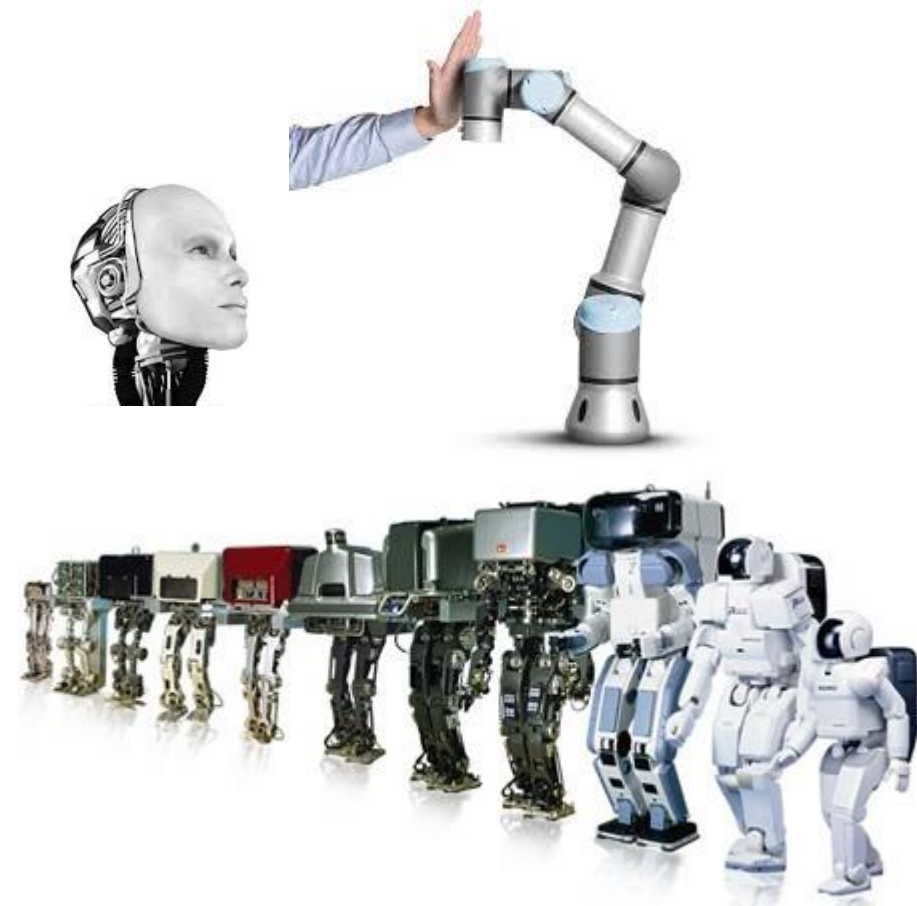




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Our focus is on vehicles, but they are robots....



Outline



Society's motivation and opportunities



Intelligent Vehicles / Automated Driving Systems

(Federal, State, Academics, and Industry actions...)



Problems N and Proposal

(black-box for intelligent vehicles / automated driving systems)



Conclusion



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disabilities



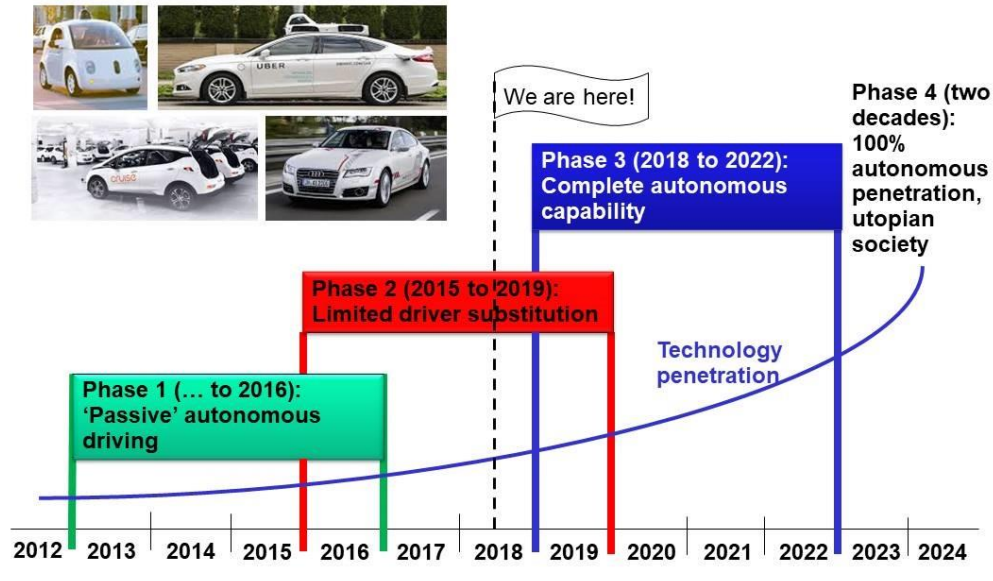
accidents



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“a \$7 trillion self-driving future”

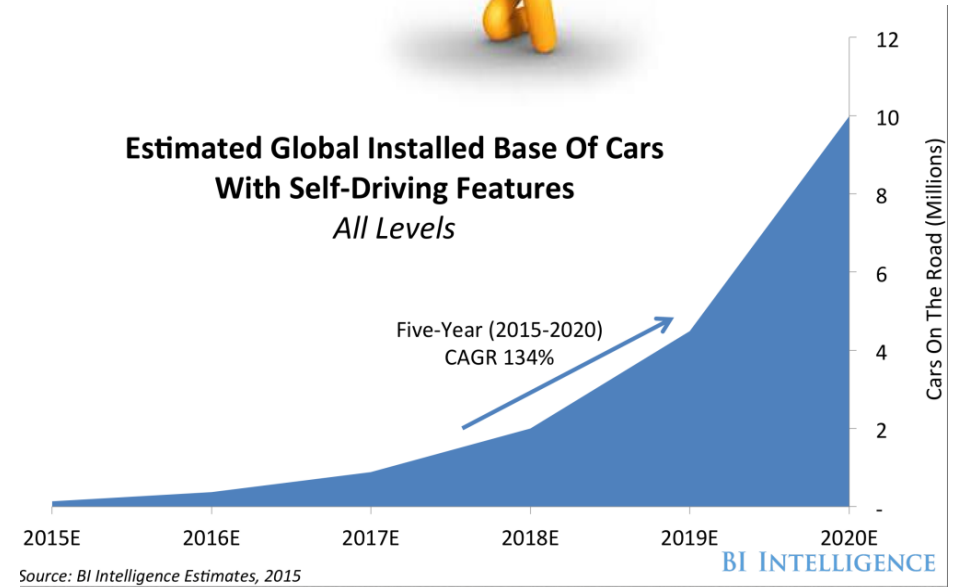


MORGAN STANLEY RESEARCH
November 6, 2013
Autonomous Cars: Self-Driving the New Auto Industry Paradigm

Morgan Stanley



**Estimated Global Installed Base Of Cars
With Self-Driving Features**
All Levels





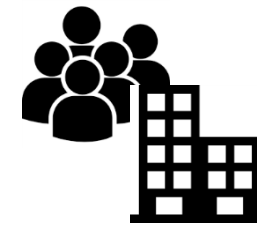
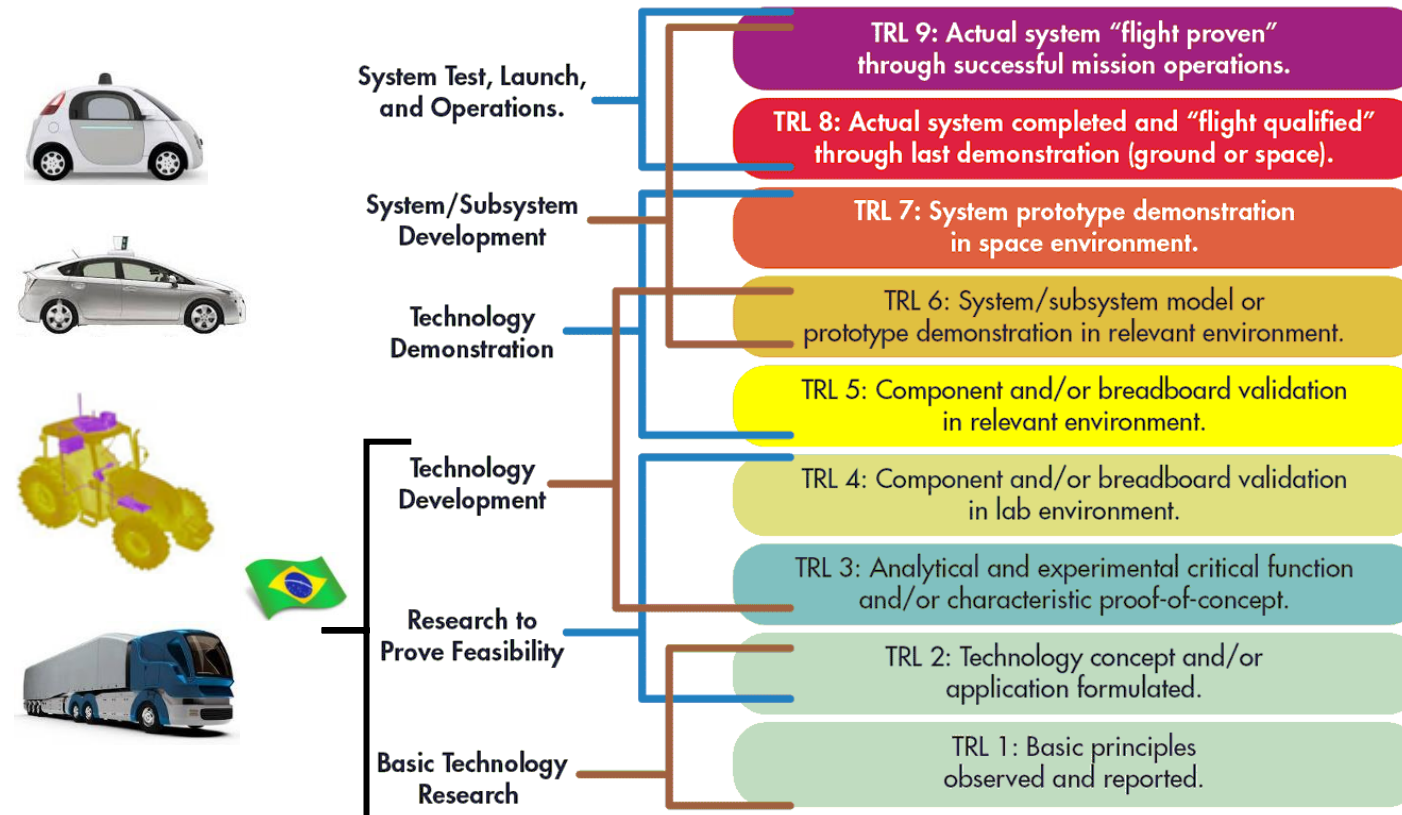
LMT: www.lmt.ufla.br



CentraleSupélec



ECE PARIS
ÉCOLE D'INGÉNIEURS



Technology Readiness Levels - TRL



Autonomous

Waymo has covered eight million miles driving autonomously

July 24, 2018

25



Waymo is has reached another milestone of covering eight million miles driving autonomously. It took the company six years to reach the first million.



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25°



Serviço Público Federal

MINISTÉRIO DA INDÚSTRIA, COMÉRCIO EXTERIOR E SERVIÇOS
INSTITUTO NACIONAL DE METROLOGIA, QUALIDADE E TECNOLOGIA-INMETRO

Portaria n.º 326, de 21 de novembro de 2017

O PRESIDENTE DO INSTITUTO NACIONAL DE METROLOGIA, QUALIDADE E TECNOLOGIA – INMETRO, no uso de suas atribuições que lhe confere o § 3º do artigo 4º da Lei 5.966, de 11 de dezembro de 1973, tendo em vista o inciso VII, do art. 18 da Estrutura Regimental da Autarquia, aprovada pelo Decreto nº 6.275, de 28 de novembro de 2007, com a redação alterada pelos Decretos n.ºs 7.938, de 19 de fevereiro de 2013, 8.671, de 16 de fevereiro de 2016, e 8.848, de 12 de setembro de 2016, resolve:

Art. 1º. Instituir, no âmbito do Gabinete da Presidência do Inmetro, Grupo de Trabalho (GT) objetivando realizar seminário técnico sobre o tema “A segurança jurídica e tecnológica para utilização e inserção de veículos Inteligentes no Brasil”.



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INMETRO
Ministério da Indústria, Comércio Exterior e Serviços

1ª CONFERÊNCIA SOBRE VEÍCULOS INTELIGENTES
SEGURANÇA JURÍDICA E TECNOLÓGICA PARA INSERÇÃO NO BRASIL

1ª Conferência sobre Veículos Inteligentes
A conferência reunirá representantes de diversos setores da sociedade para discutir a criação de regras claras que permitam viabilizar e impulsionar a adoção segura dos veículos inteligentes no Brasil.

Realização
INMETRO Instituto Nacional de Metrologia, Qualidade e Tecnologia
UFPA UNIVERSIDADE FEDERAL DO PARÁ



Inside Waymo's Secret World for Training Self-Driving Cars
An exclusive look at how Alphabet understands its most ambitious artificial intelligence project

Waymo is has reached another milestone of covering eight million miles driving autonomously. It took the company six years to reach the first million.



Autonomous

Waymo Self-Driving Cars Have Driven 16 Million Kilometres

The Ride-Hailing Company Is Steadily Achieving Near-Perfect Autonomy.

OCTOBER 24, 2018 | IN LATEST NEWS | BY MARTIN ALVA

QUALIDADE
do artigo 4º
Estrutura
2007, com
de fevereiro de 2016, e 8.848, de 12 de setembro de 2016, resolve:

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INMETRO
Instituto Nacional de Metrologia,
Qualidade e Tecnologia

UFPA
UNIVERSIDADE FEDERAL DO PARÁ

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10/13/2018

U.S. to Allow Cars Without Steering Wheels - IEEE Spectrum

5 Oct 2018 | 15:30 GMT

U.S. to Allow Cars Without Steering Wheels

New voluntary guidelines from NHTSA will allow cars specifically designed for Level 4 autonomous driving on the road

By Philip E. Ross (/author/ross-philip-e)



Cars without steering wheels will be allowed under certain conditions, the U.S. National Highway Traffic Safety Administration (NHTSA) said today in an 80-page report (<https://WWW.NHTSA.GOV/DOCUMENT/ROAD-AHEAD>).

The report gives guidelines, which are voluntary. Precise rules, which are binding, have yet to be spelled out. But the policy clearly is to cut rules whenever possible while reserving the



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BUSINESS NEWS FEBRUARY 9, 2016 / 10:14 PM / 3 YEARS AGO

Exclusive: In boost to self-driving cars, U.S. tells Google computers can qualify as drivers

≡ **FORTUNE**

Waymo Could Launch Its First Driverless Ride Service in Dece...



BRIEFING • GOOGLE WAYMO

Waymo Could Launch Its First Driverless Ride Service in December



By [ERIN CORBETT](#) November 13, 2018



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Self-Driving Tech Likely to Roll Out in Stages

Level	0 No Driving Automation	1 Driver Assistance	2 Partial Driving Automation	3 Conditional Driving Automation	4 High Driving Automation	5 Full Driving Automation
Who's steering and controlling speed?						
Who's monitoring the environment?						
Who must be able to take control in case something goes wrong?						
Automation systems limited to certain roadways or conditions	N/A	YES	YES	YES	YES	NO
Examples of tech	No assistant features	Cruise control, anti-lock brakes	Sensors monitoring driver awareness, lane keeping and traffic jam assist	Parking jam pilot, driverless valet parking	Highway driving pilot, closed- circuit shuttles	No steering wheel or driver controls

Source: SAE International

a Bloomberg BNA graphic

**Tesla's Autopilot with Hardware version
1 can be classified as somewhere
between levels 2 and 3 under the U.S.
DoT / NHTSA**



Audi A8 is the first Level 3 autonomous car





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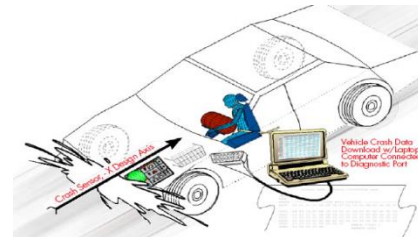
Arthur de Miranda Neto / arthur.miranda.neto@gmail.com

Opportunities





Black-box devices



Event Data Recorders (EDR)



2017

the institute The IEEE news source

TECH TOPICS TECH HISTORY BLOG SPECIAL REPORTS MEMBERS CA

HOME / BLOG / **BLOG**

United States, Germany Take the Lead in Requiring Black Boxes for Self-Driving Vehicles

The devices will determine which manufacturer was at fault in an accident

By RON SCHNEIDERMAN 11 April 2017



2

Nearly all late-model cars are equipped with event data recorders (EDRs), also known as *black boxes*, to capture information such as the speed of the vehicle and the location and time when an accident occurred. Chances are self-driving cars will, too —only in this case, the manufacturer and not the driver might be at fault.



The next big step toward developing EDRs for self-driving vehicles is determining what data to collect.



June 2017

2017

Expert Testimony and the Black Box in Autonomous Cars: Will It Pass Daubert and Frye Scrutiny?

Who's Who Legal

By [Sheila S. Boston](#), [David A. Kerschner](#), [Diana Sterk](#)

Airplane's famed "black box" – the electronic recording device that captures flight data to facilitate investigations into aviation incidents – has an automotive counterpart that is emerging as a product liability "hot spot" as vehicles become less reliant on drivers and more dependent on automated technologies.

An event data recorder (EDR), also known as a sensing diagnostic module (SDM) or

The use of data from EDRs in the courtroom may be subject to additional judicial scrutiny, and attorneys should be prepared for challenges to EDR data and expert analysis of such data.



The distribution of responsibilities...





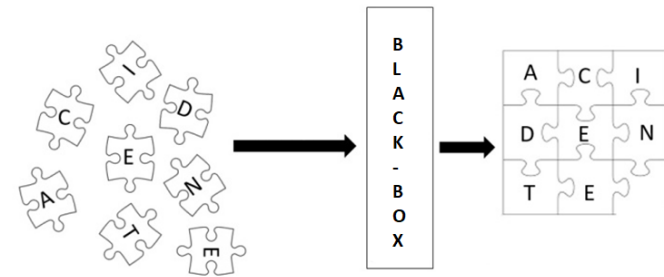
Hypothetical Situation in a self-driving car or IV.....



Let's say you were injured in an accident, but no one got a plate number and the person/car who caused the accident is gone.

You may go to jail. You have to pay the loss.

What is your hope of recovery?



Whose data is it?

How long have they been stored? Where were they stored?

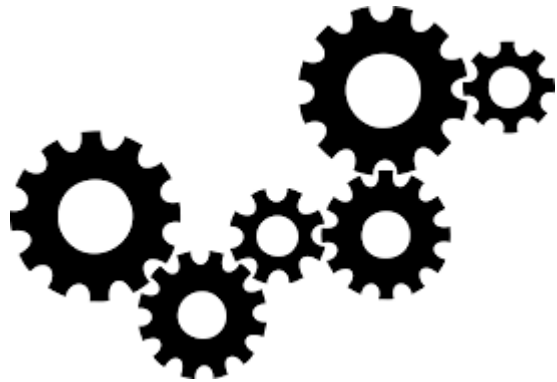
Who shall ask for the technical expertise?



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Federal, State, Academics, and Industry actions...





Washington University Law Review

Volume 92 | Issue 5

2015

The Black Box Solution to Autonomous Liability

Ujjayini Bose

Autonomous vehicles will raise a myriad of new issues ...

The difficulty in separating the fault of the manufacturer from the fault of the driver lies in the difficulty of assessing the cause of an accident.

EDRs should be required in autonomous vehicles.



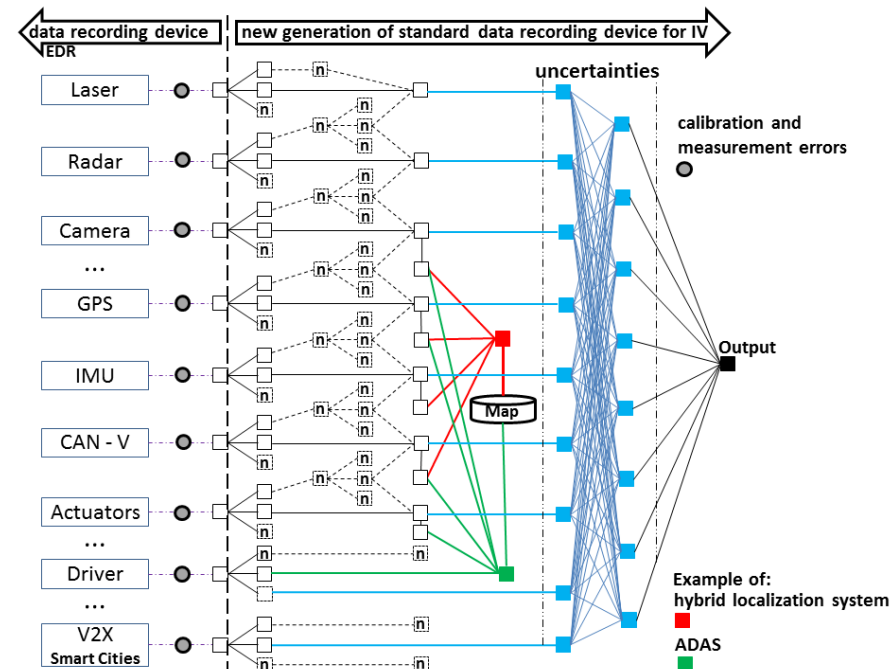
2016 IEEE 19th International Conference on Intelligent Transportation Systems (ITSC 2016)

Convention Center, Windsor Oceanico Hotel, Rio de Janeiro, Brazil, November 1-4, 2016

"Intelligent Transportation for Smarter Societies"

Regular Paper Submission: June 16, 2016

The new generation of standard data recording device for intelligent vehicles





U.S. Department of Transportation: September, 2016 Federal Automated Vehicles Policy:



The U.S. NHTSA called for enhanced features in self-driving cars' **EDRs** (Event Data Recorders).

Sensors
monitoring
driver
awareness,
lane keeping
and traffic
jam assist

Table 1: Applicability of Guidance Areas to SAE Level 2-5 Automated Vehicle Systems

Levels of Automation	SAE Levels 3, 4, 5 (HAVs)	SAE Level 2
<i>Safety Assessment Letter to NHTSA</i>	Yes	Yes
<i>C. Cross-Cutting Areas</i>	<i>Fully</i>	<i>Partially</i>
<i>C.1.Data Recording and Sharing</i>	Yes	Yes

Self-Driving Tech Likely to Roll Out in Stages

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Source: SAE International

a Bloomberg BNA graphic



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L'automatisation des véhicules

INSPECTION GÉNÉRALE
DE L'ADMINISTRATION
N° 16040-R



CONSEIL GÉNÉRAL
DE L'ENVIRONNEMENT
ET DU DÉVELOPPEMENT DURABLE
010629-01



- Février 2017 -

February, 2017

Afin que ces nouvelles ressources soient pleinement utilisées, il est nécessaire de travailler sur la capacité des véhicules à produire une information qui permette l'investigation dans le cadre des enquêtes de police judiciaire.

Il faut donc que les services de police puissent obtenir des données utiles de la part des constructeurs ou avoir accès directement aux données du véhicule lui-même, et pour cela harmoniser les pratiques et les cadres juridiques.

Un standard européen de données (boîtes noires) est en cours d'émergence. Il faut que les forces de l'ordre disposent des moyens de l'exploiter.



The Federal Government

The Ethics Commission on Automated Driving: June, 2017

- (1) In every driving situation, it must be clearly regulated and apparent who is responsible for the driving task: the human or the computer.
- (2) It must be documented and stored who is driving (to resolve possible issues of liability, among other things).



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PARLIAMENT of AUSTRALIA

House of Representatives Standing Committee on
Industry, Innovation, Science and Resources: August
2017

Social issues relating to land-based automated vehicles

**“... when a collision occurs there is a lot of reliance on human testimony.
Experts are used to understand or potentially reconstruct a collision....**

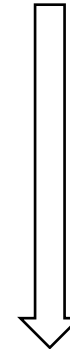
**... there will be a need to determine, when something going wrong, who
needs to recompense and where liability needs to fall...”**



JANUARY 19

NHTSA is closing investigation of fatal accident on Tesla Autopilot without finding any defect [confirmed] **Jan. 19, 2017**

Fred Lambert - Jan. 19th 2017 11:15 am ET [@FredericLambert](#)



**it's evident mistakes
shall happen**



BUSINESS

CULTURE

GADGETS

FUTURE

STARTUPS

Federal probe finds Tesla's Autopilot contributed to fatal crash

by [Matt McFarland](#) [@mattmcfarland](#)

🕒 September 12, 2017: 2:16 PM ET

Sep. 12, 2017



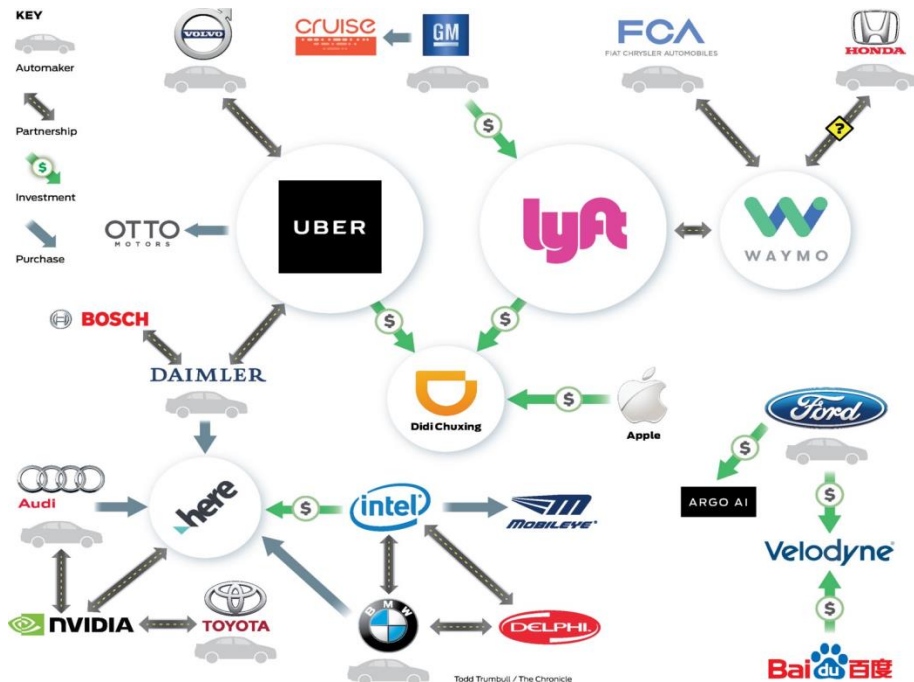
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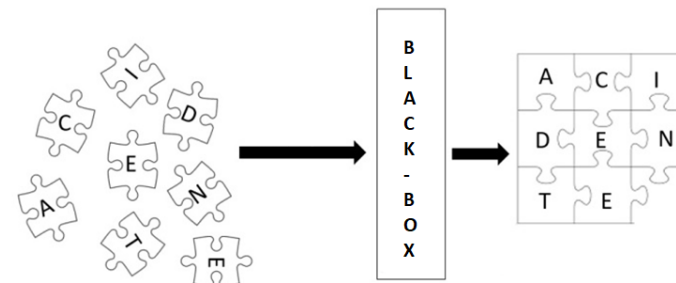


The
Federal Government



How shall we arrive at the fullest and most correct
standard (EDR or black box) among the various
manufacturers?

... independently and transparently?





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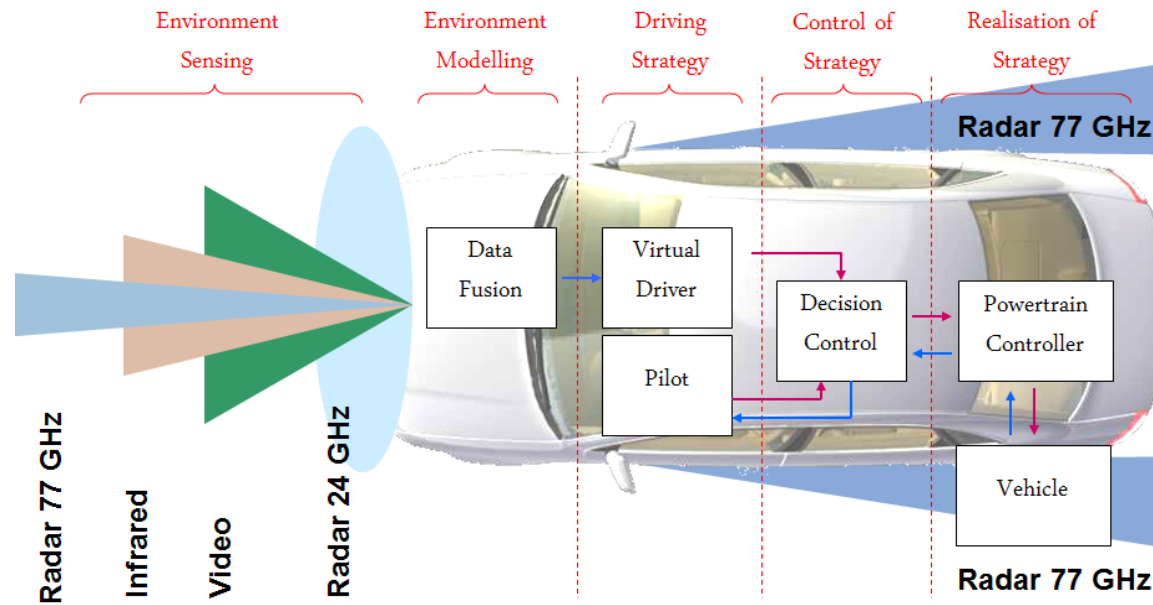
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Proposal

(black-box for IVs)

Problems 1, 2, ..., N

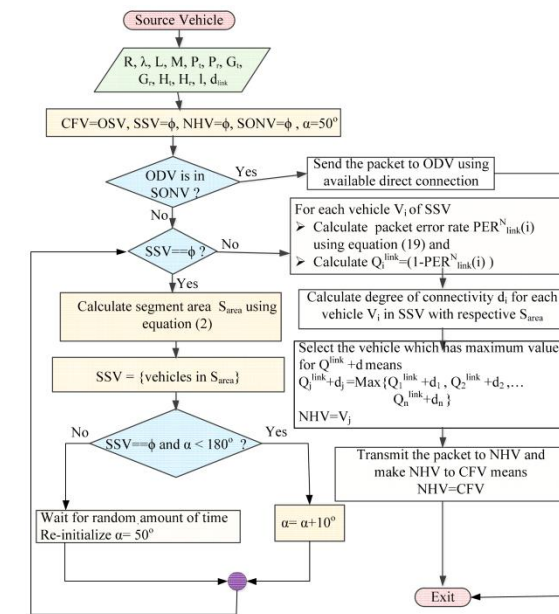
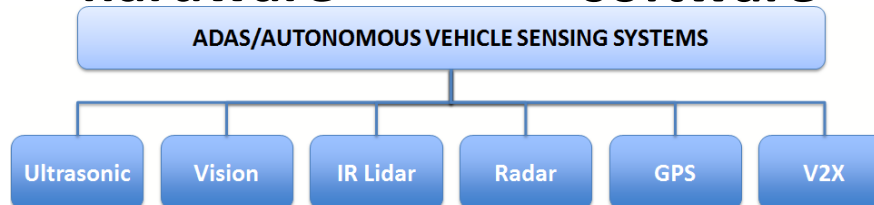
(calibration, uncertainties, amount of data, homologation, expertise)



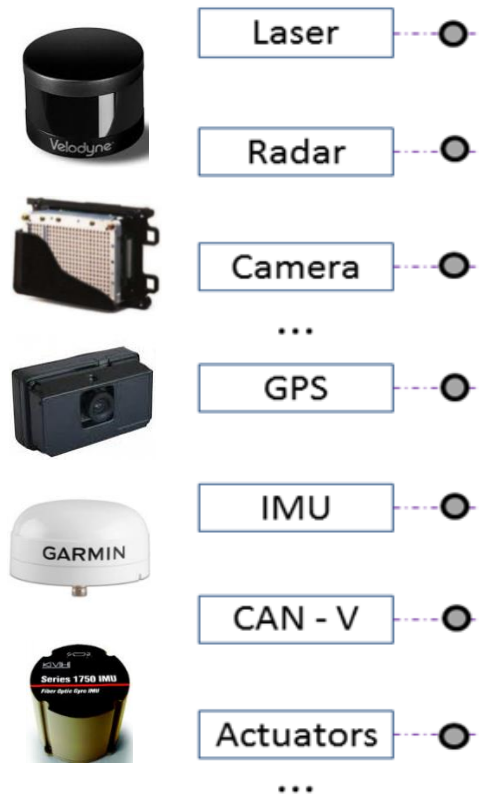
multi-sensors

hardware

software



algorithms



Problem 1

hardware / calibration



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... in the hardware level....



Cameras may suffer with light reflections, low-texture variations, shadow areas, etc.

Lasers have problems to estimate the distance to a metallic obstacle.

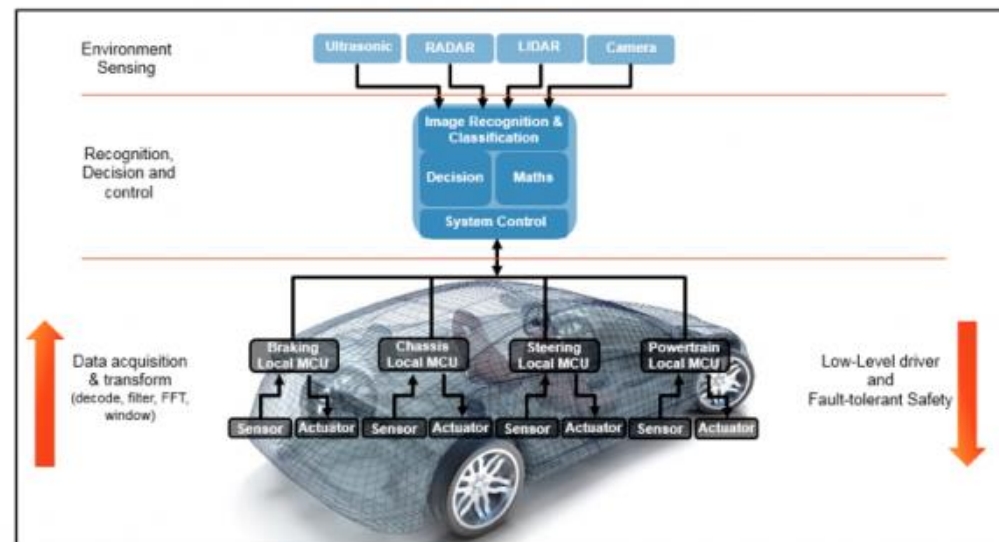
Radars and sonars have no precision about the obstacle dimension.

GPS and Inertial Measurement Unit: in urban environments, there are high buildings, trees, electromagnetic fields, etc., which **may fail and insert uncertainties on the final vehicle localization.**



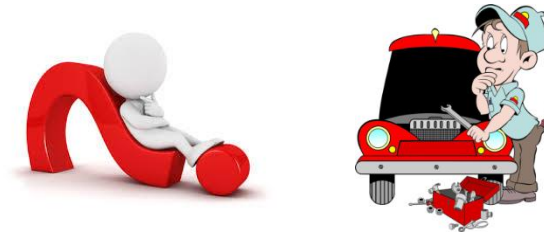
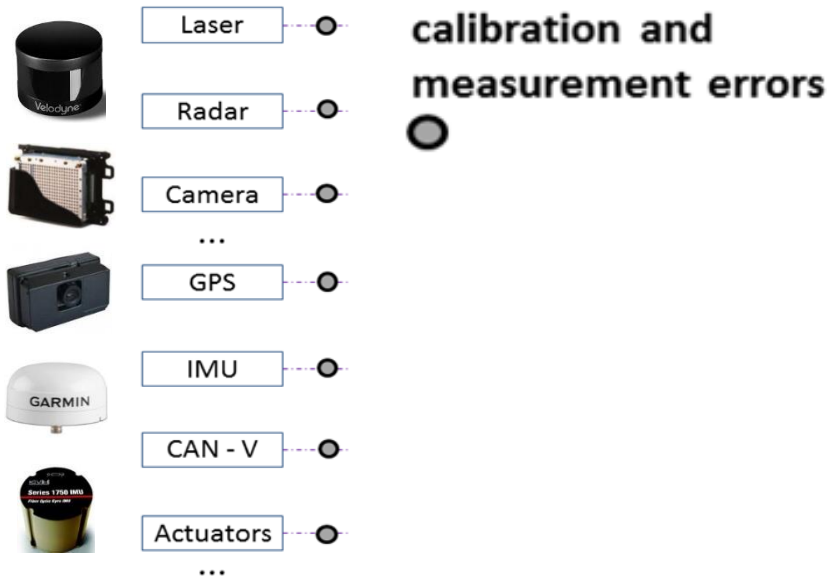
... in the hardware level....

The sensors data come from the hardware sensors, **passing by cables**, and the final command **is applied by actuators** on the steering, acceleration, and brake systems.





... in the hardware level....



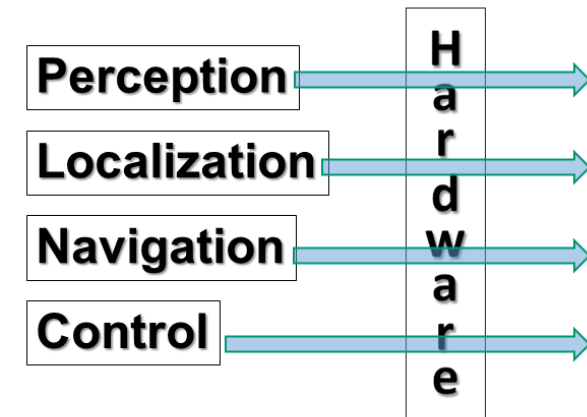
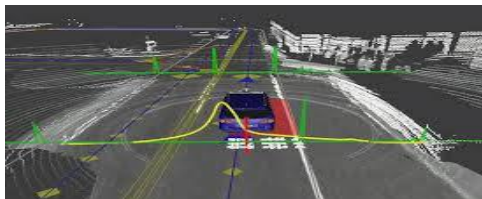
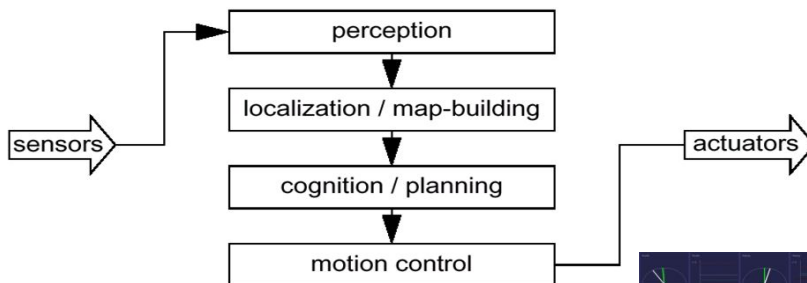
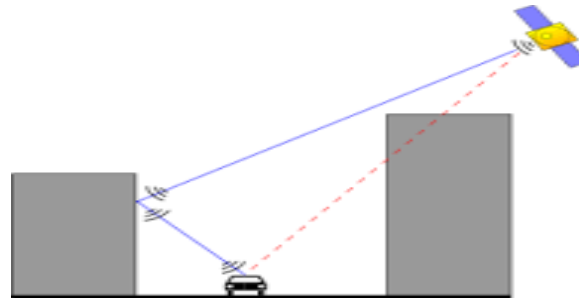
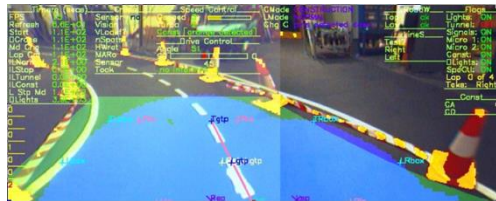
How often will the sensors be calibrated?





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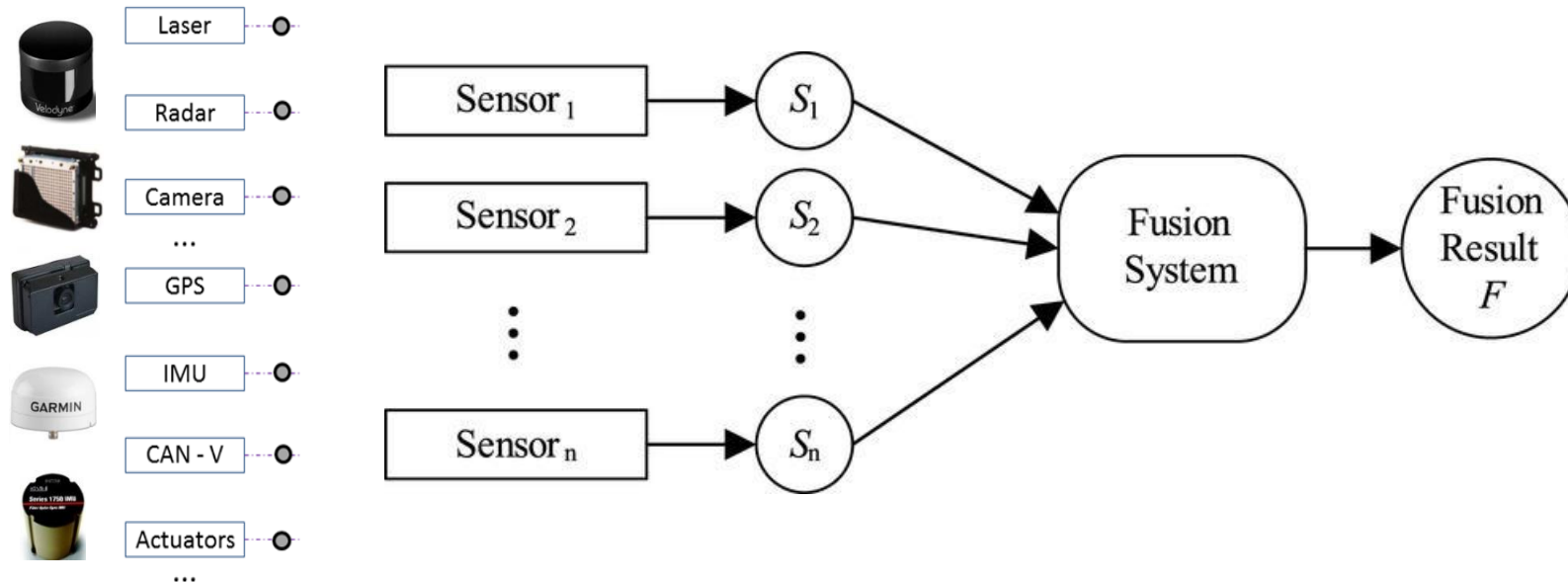


Problem 2 uncertainties



... in the software level....

In the face of problems... we can use data fusion, very common use today.....
it shall lead to an accumulation of uncertainties.

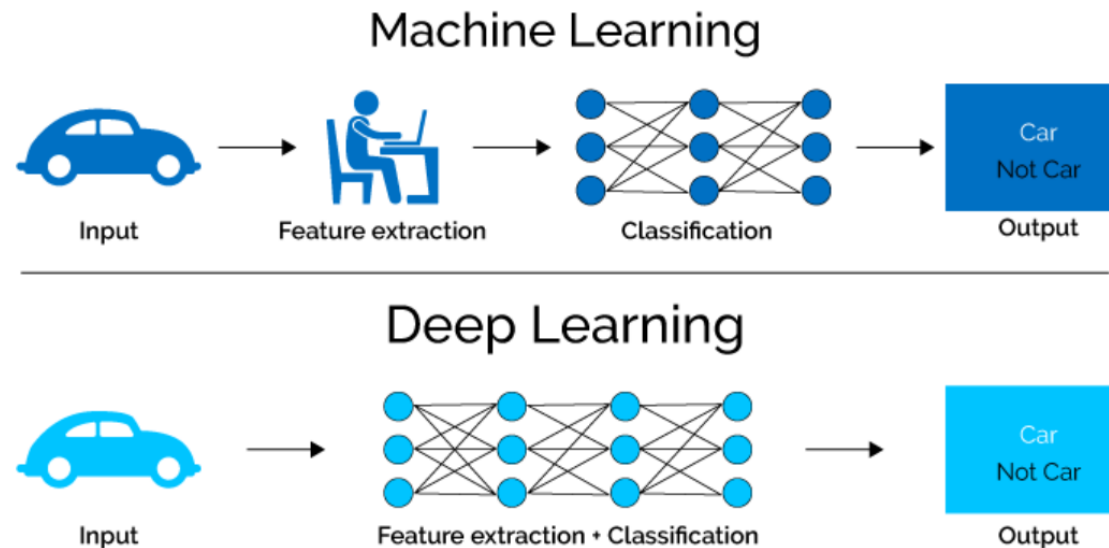




... in the software level....

... **the machine/deep learning**, very common use today, ... introducing new data processing models and knowledge-sharing between vehicles...

and **all you get are statistical numbers.**





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Uncertainties



Based on:

Richard Bradley, "Decision Making under Model Uncertainty", "Coping with Uncertainty: Normative Approaches, Current Practice", Workshop, 22-24 May 2017 at ENS (Paris).



Modeling

Theories,
Observations,
Assumptions

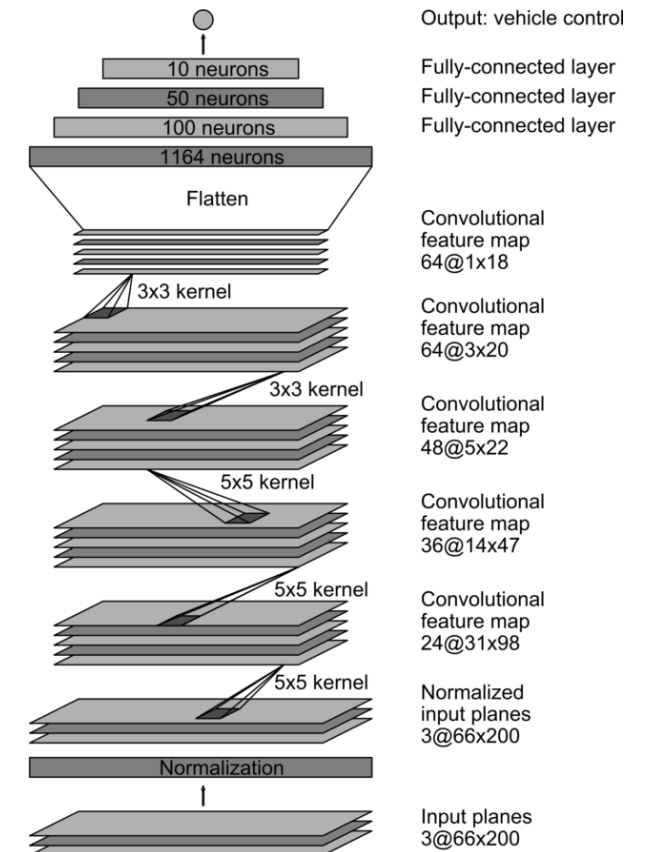
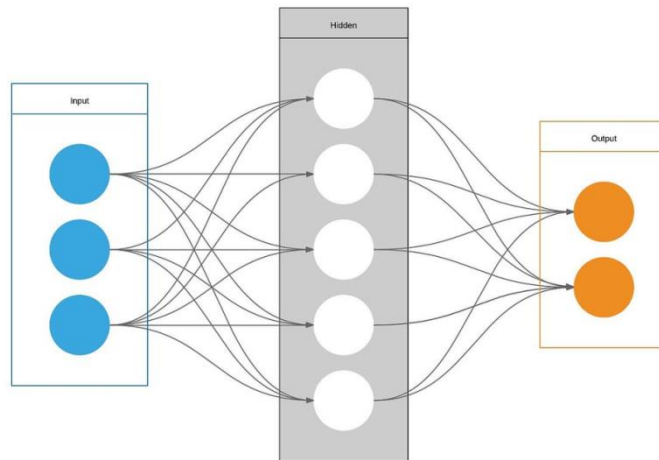
Forecasting

Judgements

Policy Evaluation

Values

Predictive models specify values for a set of target variables as a function of the other variables.





Policy models specify values of target variables as a function of both policy interventions on target variables –



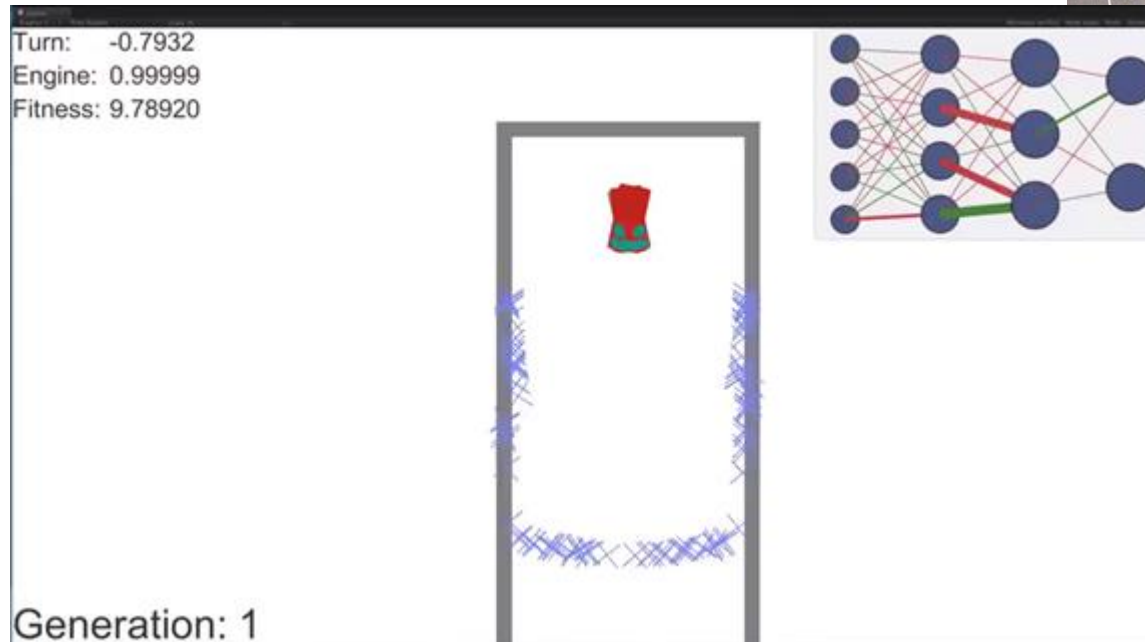
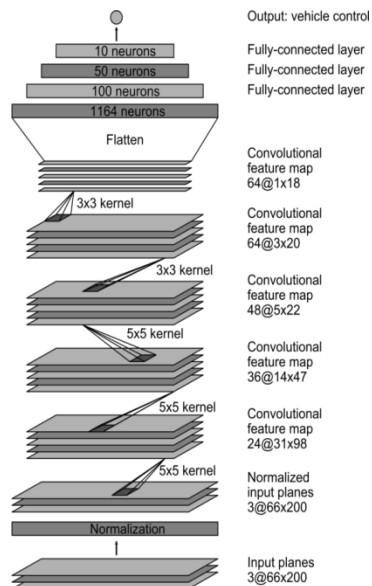
Correct identification of causal structure is essential to predictions about the effects of interventions.

But hard to achieve...

Counter-facts are not observable!



Policy models specify values of target variables as a function of both policy interventions
on **target variables** –



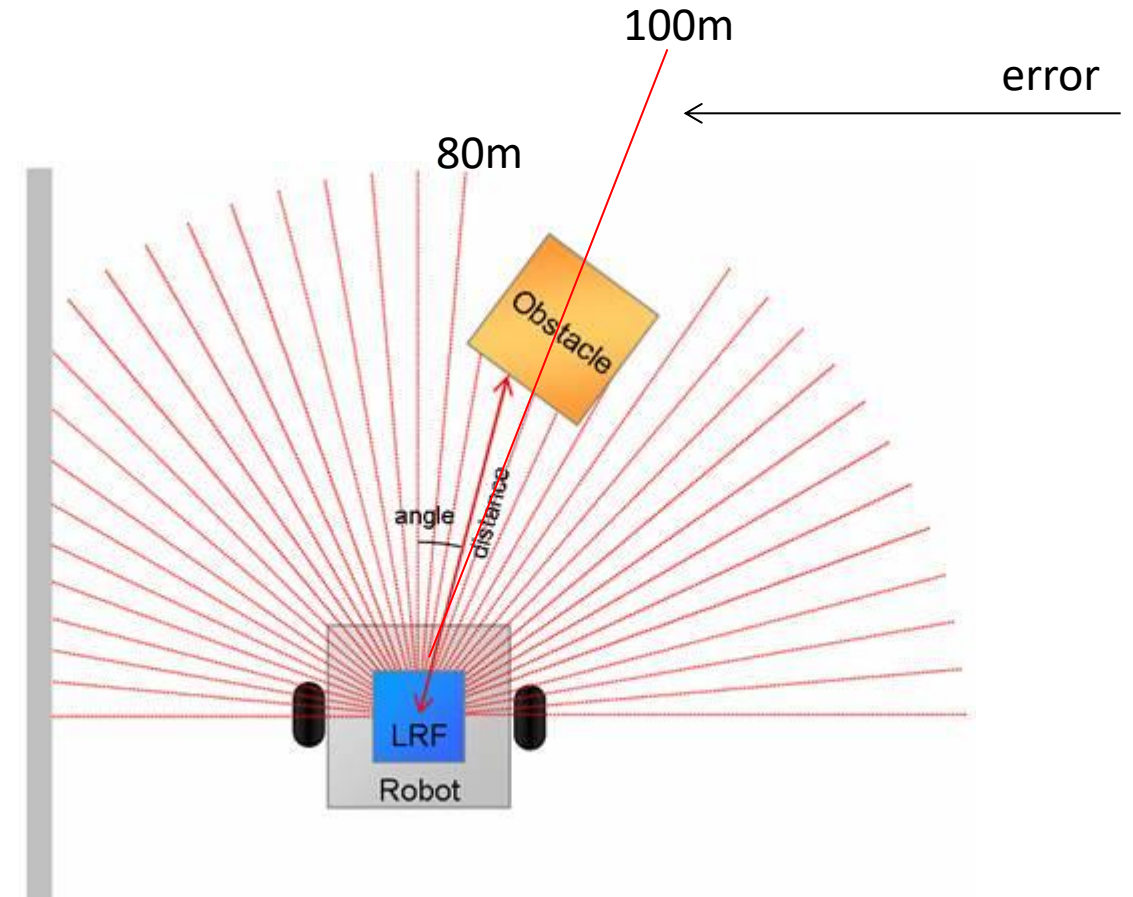
Link:
<https://www.youtube.com/watch?v=Aut32pR5PQA>

Counter-facts are not observable!



Uncertainty has different sources:

1. Physical



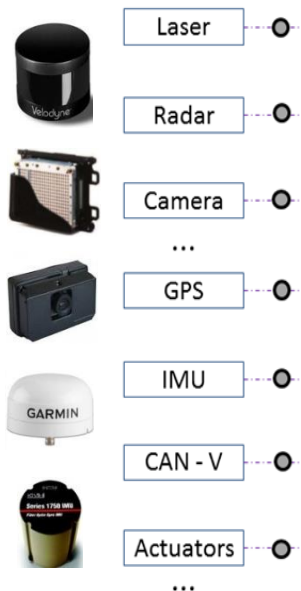


Uncertainty has different sources:

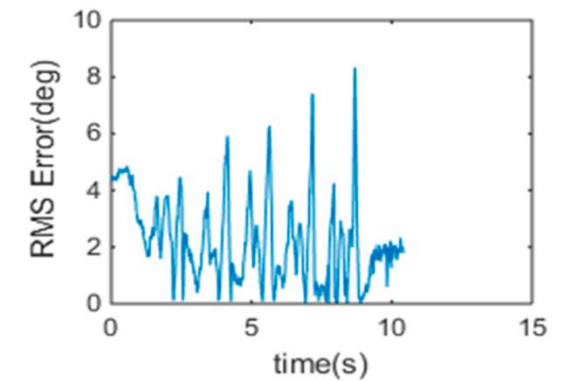
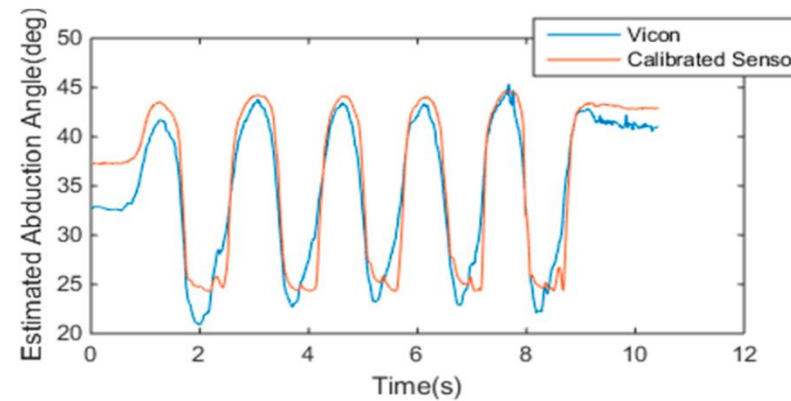
1. Physical



2. Measurement of initial conditions



**calibration and
measurement errors**



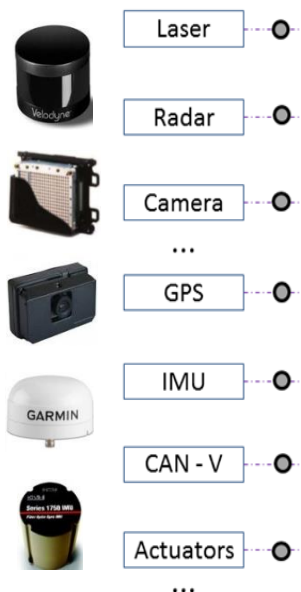


Uncertainty has different sources:

1. Physical



2. Measurement of initial conditions

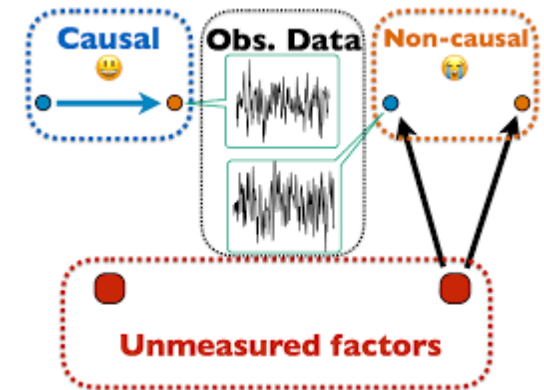


calibration and
measurement errors



3. Unmodeled factors

(such as change in environmental conditions from day to day)



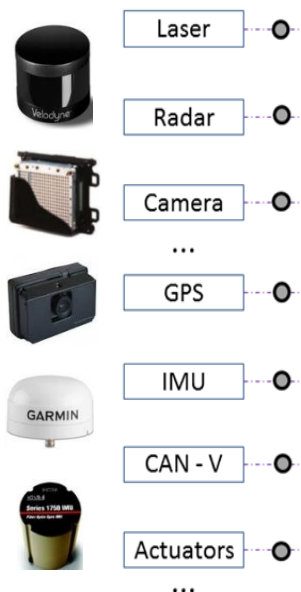


Uncertainty has different sources:

1. Physical



2. Measurement of initial conditions

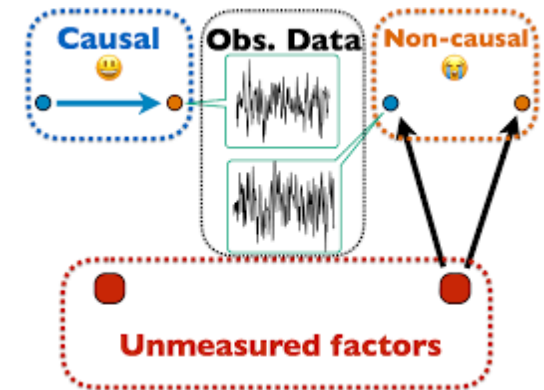


calibration and
measurement errors



3. Unmodeled factors

(such as change in environmental conditions from day to day)



4. Uncertainty about the causal or structural relationships between variables

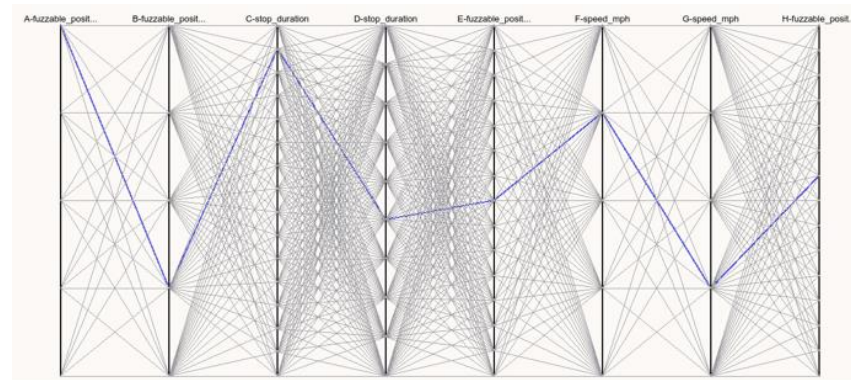
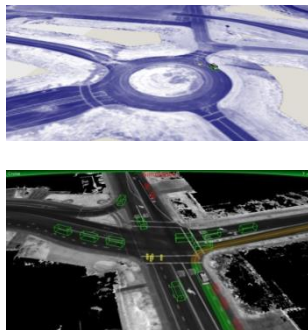




Uncertainties – ways...



How Alphabet understands its most ambitious artificial intelligence project.



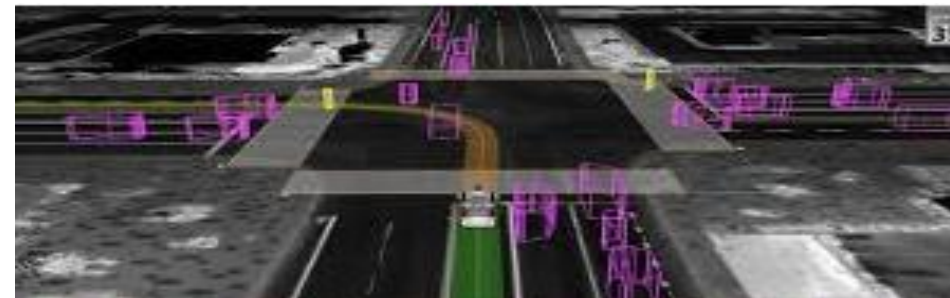


Uncertainties – ways...



....they now drive **8 million miles per day in the virtual world.**

In 2016, **they logged 2.5 billion virtual miles versus a little over 3 million miles by Google's self-driving cars** that run on public roads.





Uncertainties – ways...

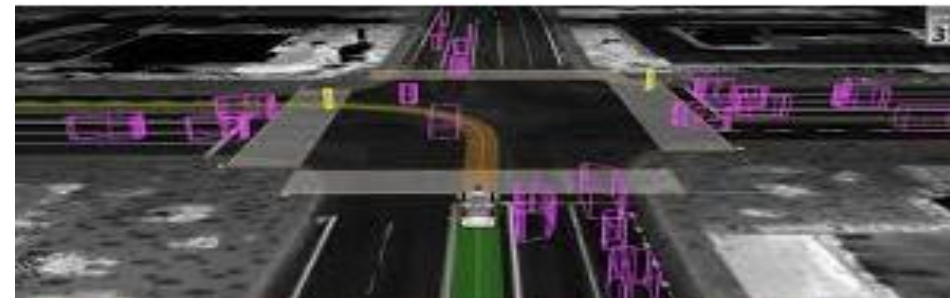
Waymo Self-Driving Cars Have Driven 16 Million Kilometres

The Ride-Hailing Company Is Steadily Achieving Near-Perfect Autonomy.

OCTOBER 24, 2018 | IN LATEST NEWS | BY MARTIN ALVA

....t

In 2016, they logged 2.5 billion virtual miles versus a little over 3 million miles by Google's self-driving cars that run on public roads.





Uncertainties – ways...



In that virtual space, they can unhitch from the limits of real life and create thousands of variations of any single scenario, and then run a digital car through all of them.

As the driving software improves, it's downloaded back into the physical cars, which can drive more and harder miles, and the loop begins again.



~~YESTERDAY~~
TODAY
~~TOMORROW~~

In that virtual space, the
of variations of any sir

and create thousands
rough all of them.

As the driving software improves, it's downloaded back into the physical cars,
which can drive more and harder miles, and the loop begins again.



Uncertainties – ways...



“Our cars see the world. They understand the world. And then for anything that is a dynamic actor in the environment—a car, a pedestrian, a cyclist, a motorcycle...

—our cars understand intent. It’s not enough to just track a thing through a space.

You have to understand what it is doing,”

Dmitri Dolgov, Waymo’s vice president of engineering



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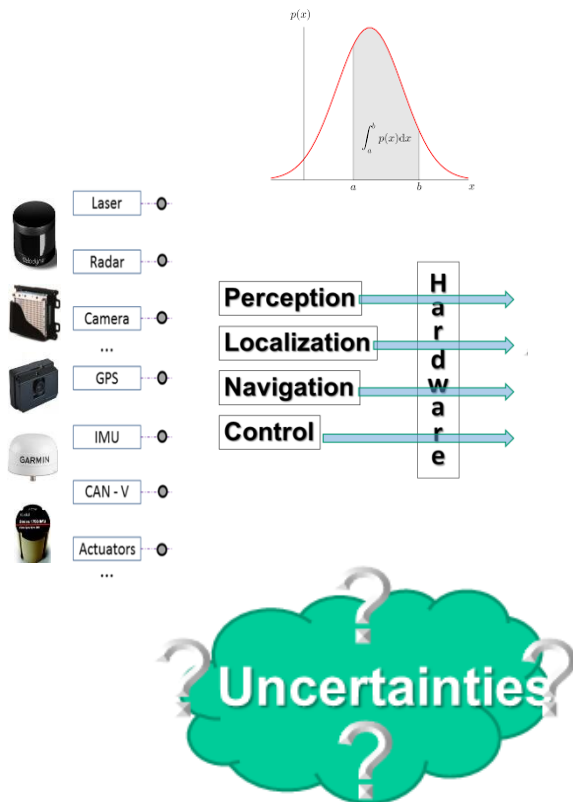
...our cars understand intent. It's not enough to just track a thing through a space. You have to understand what it is doing,"



Link: <https://www.youtube.com/watch?v=8X2mhUqO0go>



However, each one of its subsystems bring **uncertainties** due to distortions in the signals, problems related to signal processing, complications in components accurateness, among others.





EDRs should be required in autonomous vehicles



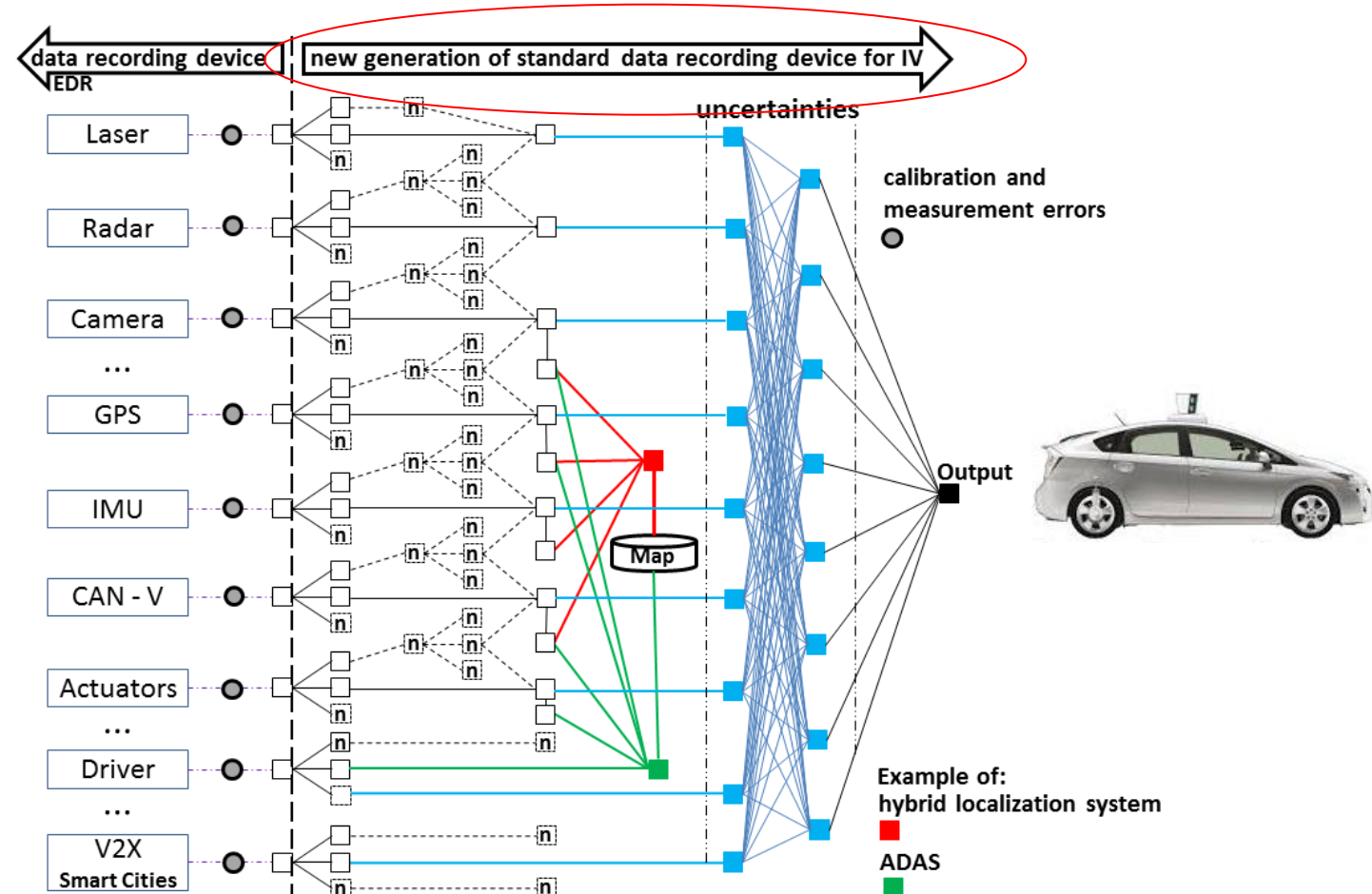
The
Federal Government



PARLIAMENT of AUSTRALIA



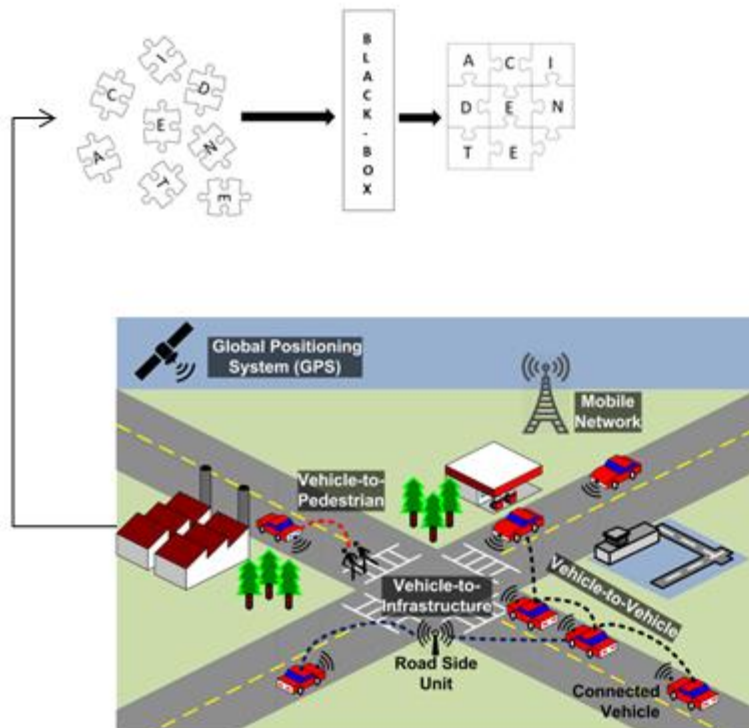
European Commission





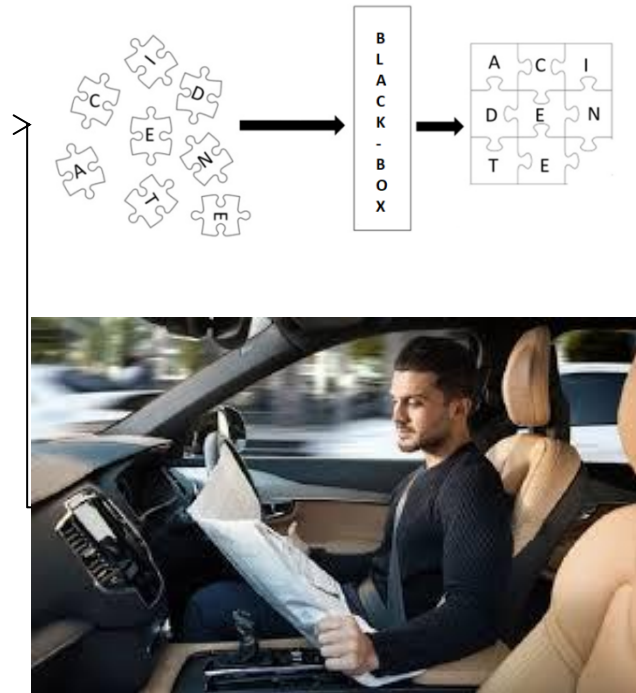
... and more...

driverless cars will definitely need smart road infrastructure





... and more...
don't ignore the human factor !



Self-Driving Tech Likely to Roll Out in Stages

Level	0 No Driving Automation	1 Driver Assistance	2 Partial Driving Automation	3 Conditional Driving Automation	4 High Driving Automation	5 Full Driving Automation
Who's steering and controlling speed?						
Who's monitoring the environment?						
Who must be able to take control in case something goes wrong?						
Automation systems limited to certain roadways or conditions	N/A	YES	YES	YES	YES	NO
Examples of tech	No assistant features	Cruise control, anti-lock brakes	Sensors monitoring driver awareness, lane keeping and traffic jam assist	Parking jam pilot, driverless valet parking	Highway driving pilot, closed-campus shuttles	No steering wheel or driver controls

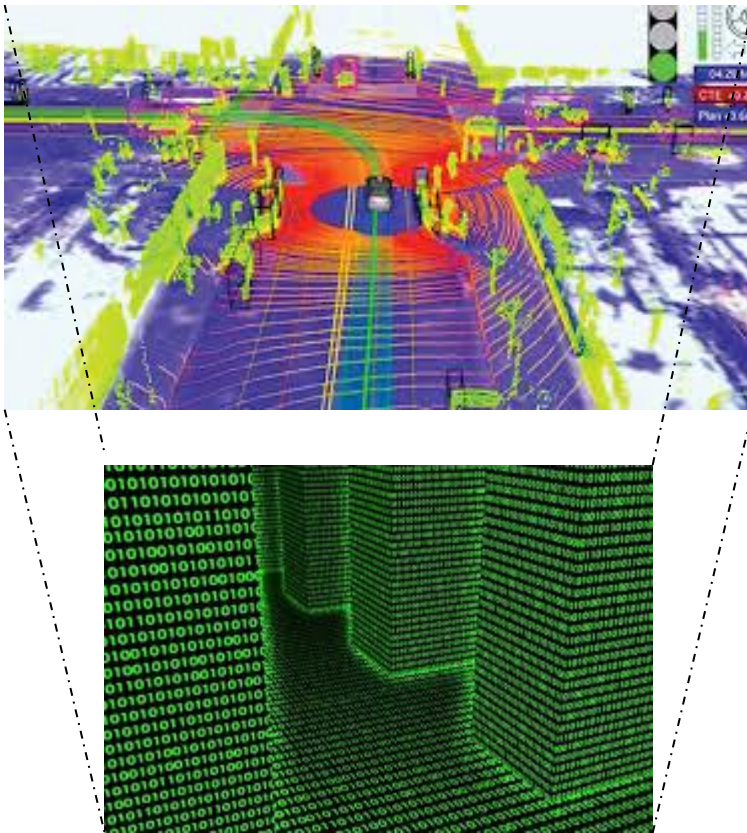
Source: SAE International

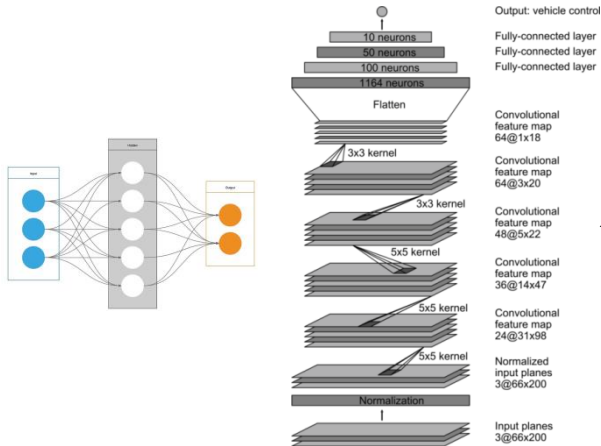
a Bloomberg BNA graphic



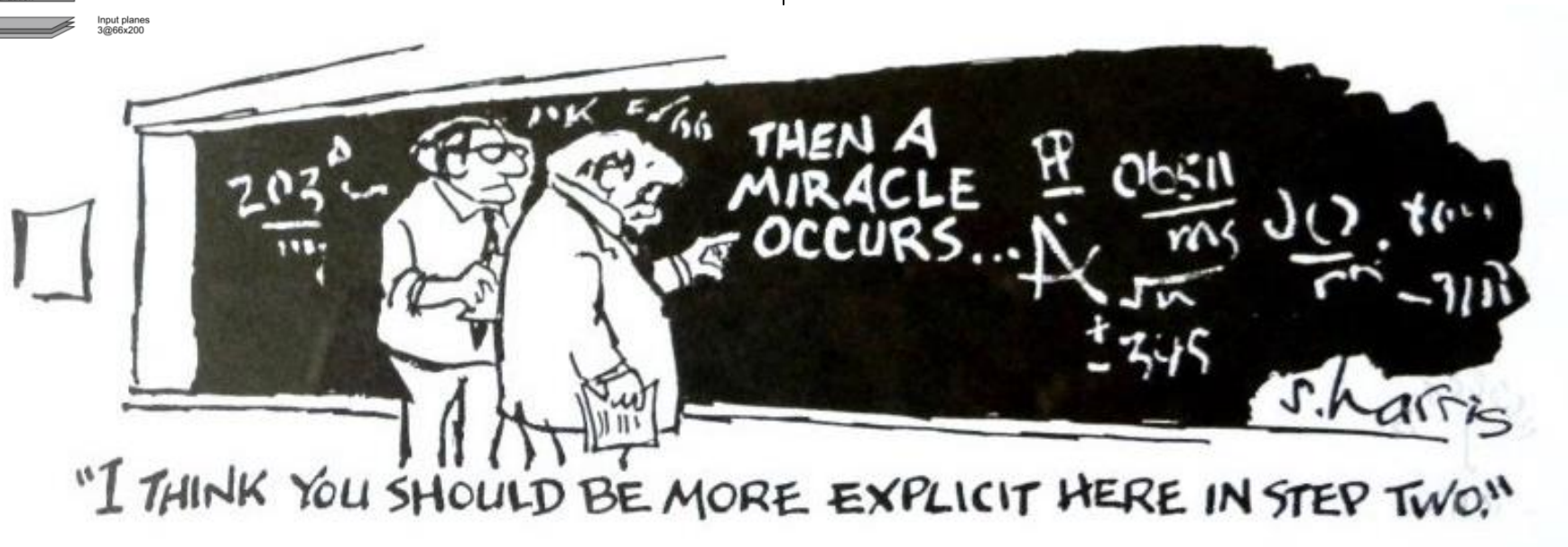
Problem 3 data

The challenges include: capturing data (what data?), data storage (what data? / for how long?), data analysis?, sharing?, transfer?, visualization?, querying?, updating? and information privacy?...





Problem 4 expertise analysis





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Proposal

(black-box for automated driving systems)



Next step...



New generation of standard data recording device

<http://dx.doi.org/10.1109/itsc.2016.7795985>

Published in: 2016 IEEE 19th International Conference on Intelligent Transportation Systems (ITSC)

Date of Conference: 1-4 Nov. 2016

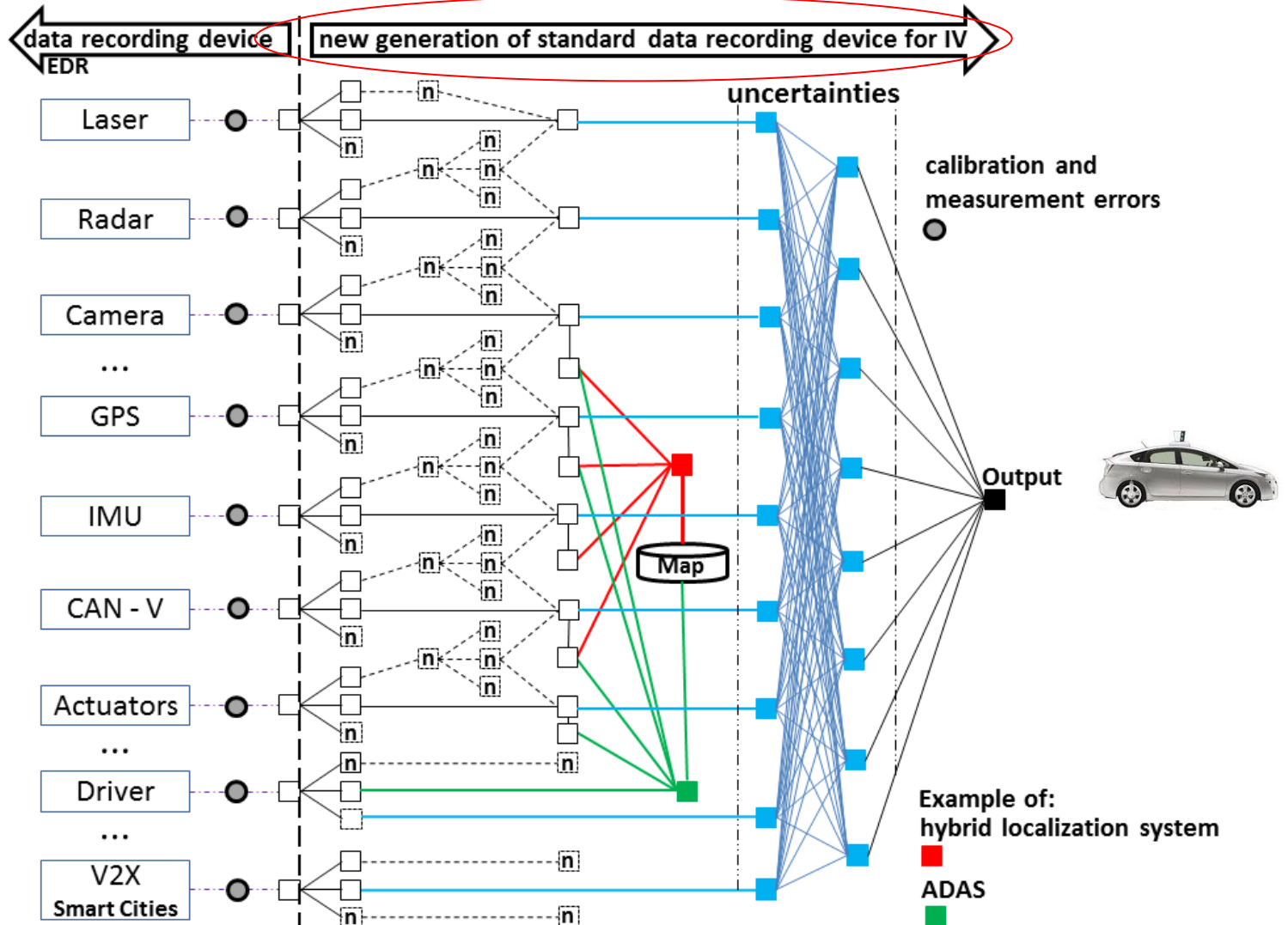
INSPEC Accession Number: 16555041

Date Added to IEEE Xplore: 26 December 2016

DOI: [10.1109/ITSC.2016.7795985](https://doi.org/10.1109/ITSC.2016.7795985)

► ISBN Information:

Publisher: IEEE

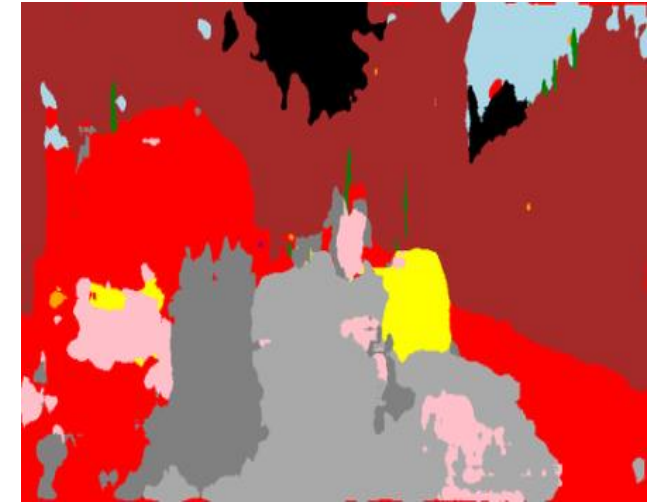
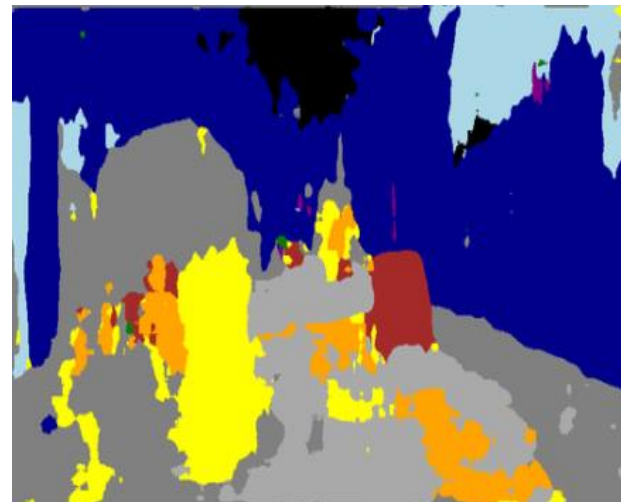
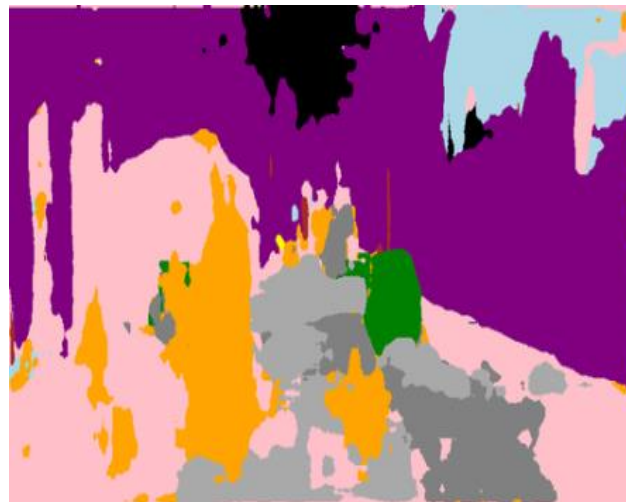
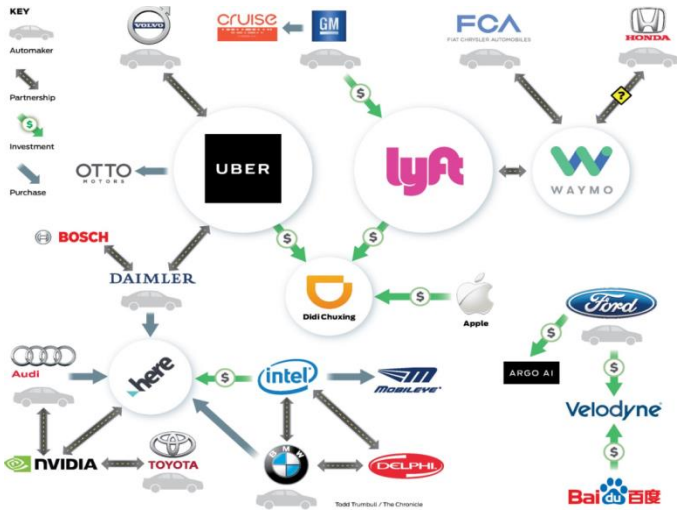




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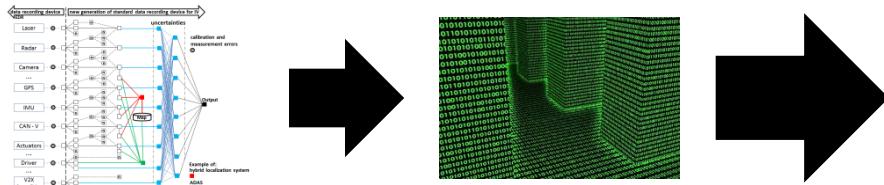




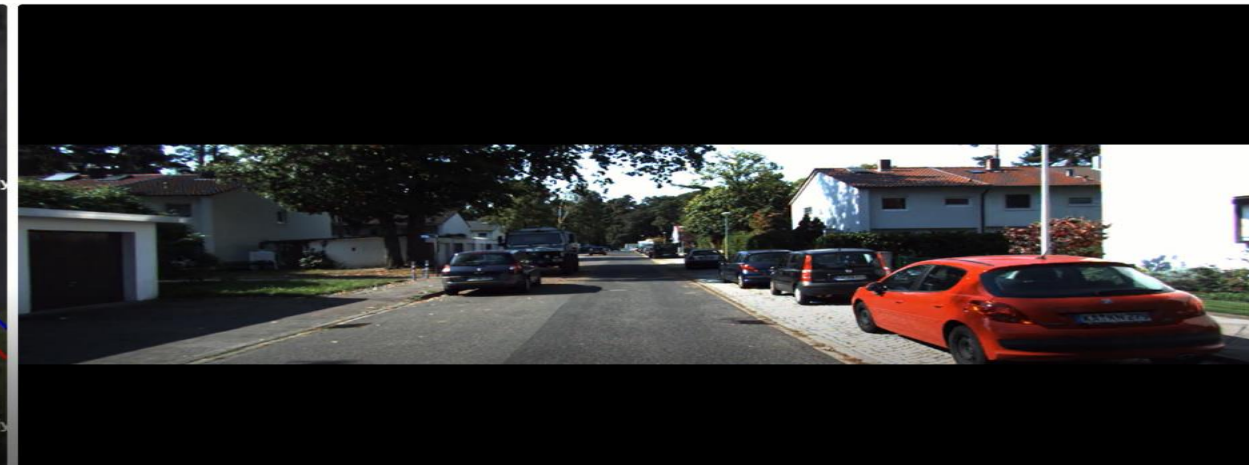
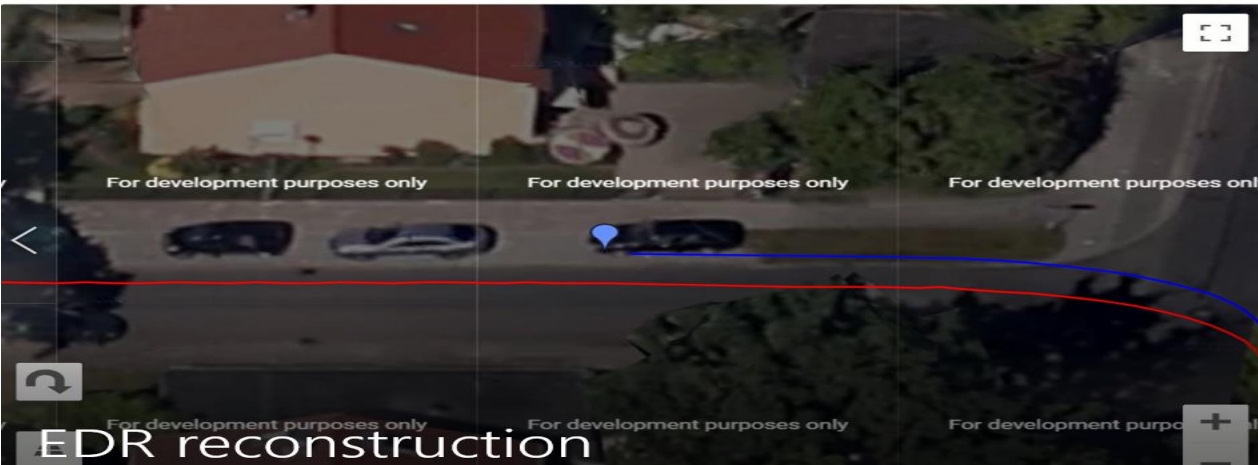
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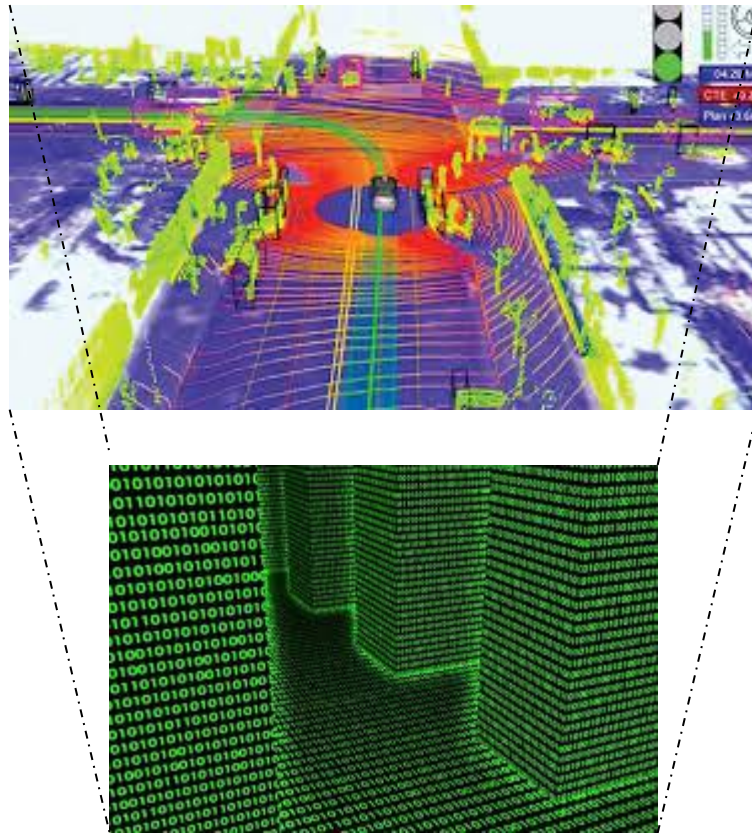
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Project Locale Perception Control Control + Semantic Segmentation



GREGO, S. A. ; **MIRANDA NETO, A.** ; LIMA, D. A. .
Reconstrução Visual de Dispositivo Registrador de
Eventos para ADS (Automated Driving System). 2018.
Patente: Programa de Computador. Número do registro:
512018051717-0, data de registro: 19/09/2018
INPI - Instituto Nacional da Propriedade Industrial.



Problem 3 data



The challenges include: capturing data (what data?),
data storage (what data? / for how long?), data
analysis?, sharing? transfer? visualization?, querying?,
updating? and information privacy?...

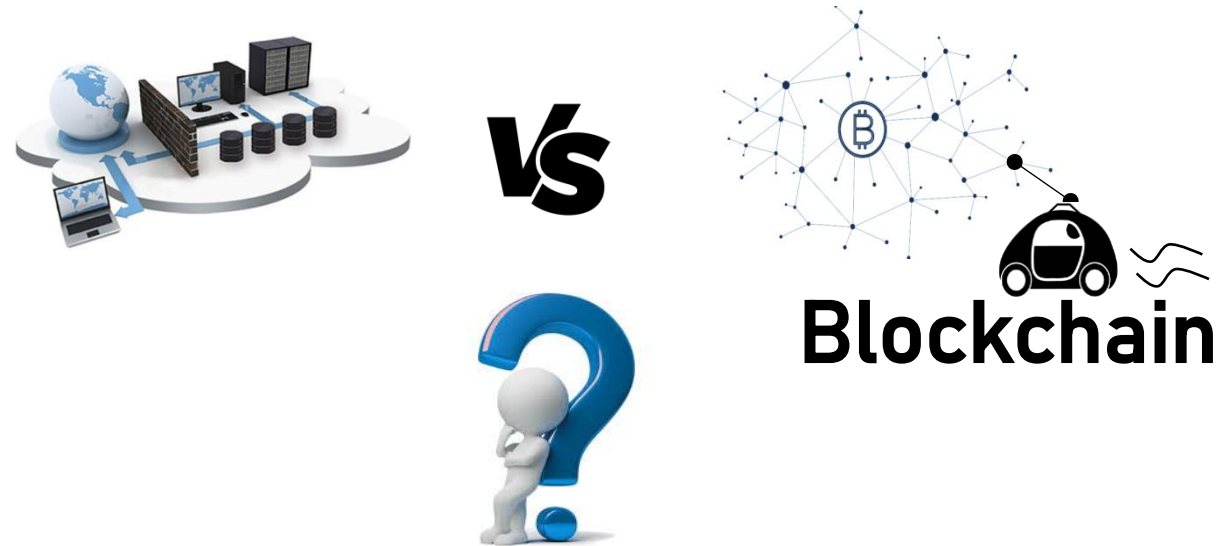
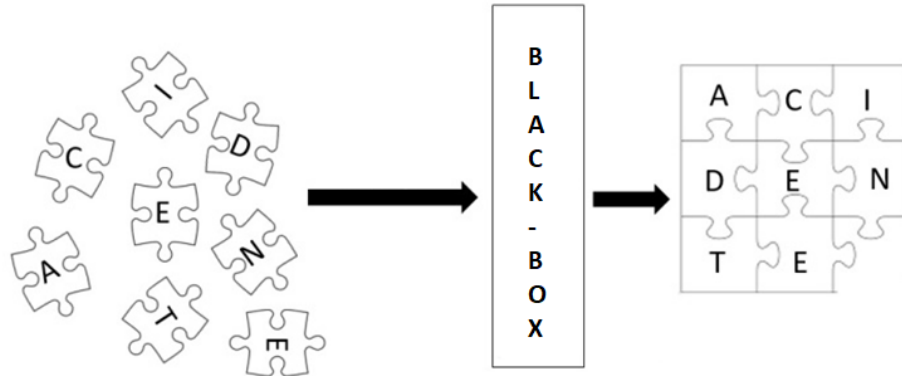


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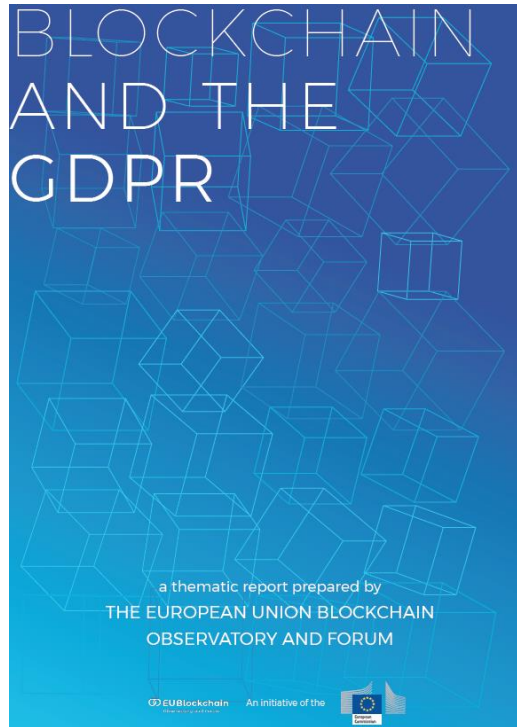
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...The CEO of Intel that suggested that, over an eight-hour period of driving, one of these vehicles will generate and consume 40 terabytes of data.



**Brazilian law
13.709/2018**

GDPR

**Brazil Adopts General
Data Protection Law**

- **Lawfulness, fairness and transparency.**
- **Purpose limitation.** Personal data shall be 'collected for specified, explicit and legitimate purposes', and only used for those purposes that have been stated.
- **Data minimisation.** The personal data collected should be 'adequate, relevant and limited to what is necessary' for the stated purposes.
- **Accuracy.** Personal data held by a controller must be 'accurate and, where necessary, kept up to date'.

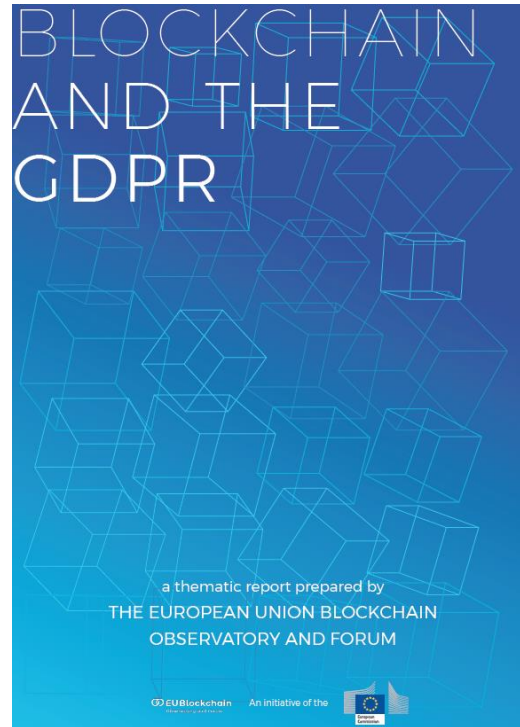
**PRINCIPLES, RIGHTS AND
OBLIGATIONS**



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PRINCIPLES, RIGHTS AND OBLIGATIONS

- **Storage limitation.** Personal data must be 'kept in a form which permits identification of data subjects for no longer than is necessary' for the stated purposes.
- **Integrity and confidentiality.**



GDPR

**Brazilian law
13.709/2018**

**Brazil Adopts General
Data Protection Law**



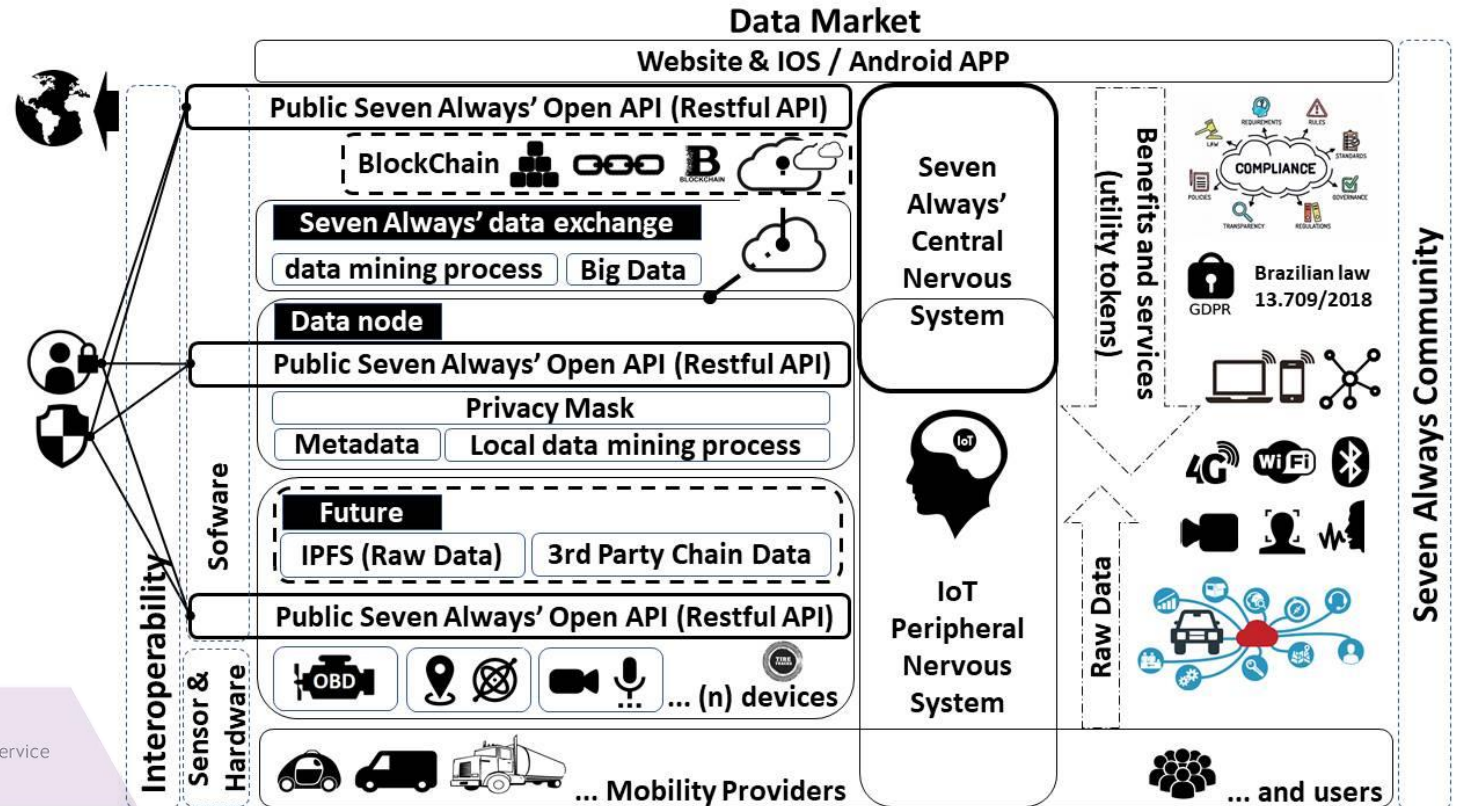
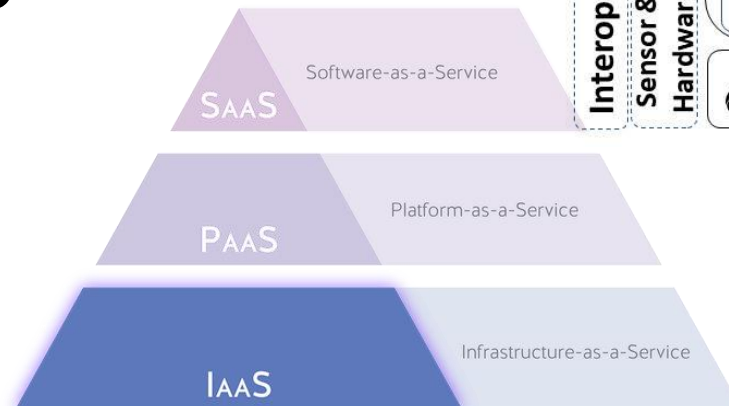
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www.sevenalways.io



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Exchange*





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Sobre Nós

www.lmt.ufla.br

Quem somos nós

Sediado na Universidade Federal de Lavras (UFLA), o Lab. Mobilidade Terrestre (LMT) nasceu em 2014 com um conceito inovador em veículos inteligentes - automação, comunicação e eficiência energética - no contexto dos Sistemas de Transporte Inteligentes (ITS).



Objetivos

O LMT procura descobrir, semear e nutrir programas inovadores para alcançar resultados em escala com os veículos inteligentes, providenciando contribuições significativas para a sociedade, aumentando a segurança nas ruas e desenvolvendo uma mobilidade mais eficiente, incluindo para pessoas idosas ou com deficiência física. Vários atores da sociedade civil estão cooperando com esta proposta. O LMT tem como alvo atuar na fronteira do conhecimento, preservando um caráter multidisciplinar. As partes interessadas incluirão todos os níveis do governo, agências do setor público, companhias do setor privado e indústrias associadas. Neste contexto, o trabalho do LMT incluirá o provimento de serviços de consultoria para companhias privadas e entidades públicas, assim como colaboração com organizações de pesquisa para melhorar a tecnologia embarcada e para garantir a inserção segura de veículos inteligentes nas várias modalidades do transporte público. Além disso, o LMT busca se posicionar como o maior representante da estratégia brasileira para desenvolver políticas, estratégias e planos no contexto dos veículos

