



## Autonomous Vehicles – the Butterfly Effect

Notes to follow presentation:

**Slide 3** WOMAN CRANKING an engine to start  
Driver Assist, not Autonomous yet!  
*Short term use*

**Slide 4** AUTOMATIC TRANSMISSIONS - Still Driver Assist.... How many can drive a stick?

**Slide 5** POWER BRAKES AND STEERING More driver assist - *Short term use*

Actuators on the brakes in the form of ABS (Antilock Braking System) or accident prevention devices are controlled with the computer,

and some vehicles already use an electric motors for steering assist.

**Slide 6** POWER WINDOWS AND LOCKS – just assisting still!

**Slide 7** AIRBAGS !

*Did you know.....?*

Computers measures number of bodies and bodyweight,  
body position,  
speed of impact,  
angle of impact,  
seat belt ON/OFF, and deploy in mili-seconds

Somewhat autonomous..... Doesn't wait on you to put your hands over your face!

**Slide 8** AUTONOMOUS - acting independently or having the freedom to do so

**Slide 9** COLLISION AVOIDANCE **LEVEL 1** Autonomous

No autonomous feature is more important to safety than collision avoidance systems.

This works with the vehicle's braking system and applies the brakes when a vehicle gets too close to something in front of it.

Other systems merely chime or vibrate the driver's seat when a crash threat is detected

**Slide 10** ADAPTIVE CRUISE CONTROL - **LEVEL 1/2** Autonomous

Adaptive Cruise Control – This radar-based technology is one of the most obvious and necessary features when asking a car to drive itself.

How adaptive cruise control essentially works is the driver sets a speed and determines distance to maintain ahead and then when engaged, the vehicle will slow down, even stop, with the flow of traffic, and then pick back up as traffic flows faster.

Adaptive Cruise uses radar and cameras to locate the vehicle in front of the consumer vehicle and matches the speed by keeping the same distance between the two vehicles.

This technology allows the control of the throttle and brakes by the computer to keep this distance consistent

**Slide 11** LANE DEPARTURE WARNING **LEVEL 2** Autonomous

Lane detection is used to keep a distracted or tired driver from crossing into another lane of traffic

This sensor-based technology is perhaps the most common.

It's called different things according to each automaker, but even affordable vehicles like the Honda CR-V, Ford Fusion, Chrysler 200 and Toyota Prius use this system, which alerts drivers when they go over a line into another lane.

Some of these systems, will even self-correct, gently steering the vehicle back into its own lane – LANE KEEPING OR CENTERING

**Slide 12** NIGHT VIEW ASSIST

This is perhaps the most advanced, and least common autonomous technology currently available.

It uses infrared cameras to help a driver see beyond the reach of the vehicle's headlights.

This can help a driver, in darkness and poor weather conditions, avoid hitting pedestrians, animals or objects that may be on the road.

You only find this technology on the luxury vehicles (due to the cost) as Audi, BMW, Lexus and Mercedes-Benz all have vehicles with night view assist.

**Slide 13** Point Cloud

Point clouds may be created by 3D scanners. These devices measure a large number of points on an objects surface and often output a point cloud as a data file.

The point cloud represents the set of points that the device has measured.

False Color - A **false-color image** is an image that depicts an object in colors that differ from those a photograph would show – infrared, night vision, etc.

**Slide 14** DAD BRAND! <https://youtu.be/2jopCaHOfxY>

**Slide 15 Autonomous Cars:** In 2018 the first self-driving cars will appear for the public.

Around 2020, the complete industry will start to be disrupted.

The computer receives information from several inputs such as radar, cameras, sensors, lasers, and GPS coordinates.

Cameras allow the computer to see in 360 degrees, radar allows for sight in low visibility situations (Pullen).

Cameras also struggle in low light situations where radar is a necessary device for safe maneuvering (Reina, Johnson, and Underwood).

Lasers provide a three dimensional omni-directional view with sensors providing raw data to the computer (Pullen).

The image provided by the lasers and the data collected from the sensors allow for a second fail safe image to compare to the camera image to make sure all things are being seen.

The high resolution of the lasers also makes it the desired device to help with accident avoidance (Reina, Johnson, and Underwood).

The GPS gives the computer an exact location of where it is on the earth to compare to already existing maps for the use of steering, throttle and brake controls (Pullen).

All of these devices allow the computer to make programmed decisions to drive a vehicle safely without human

**Slide 16 – 17** CONCEPT VEHICLES Chevy FNR Concept Mercedes F015

**Slide 18** - TESLA Video

**Slide 19** the Butterfly Effect .....

**KODAK - In 1998, Kodak had 170,000 employees and sold 85% of all photo paper worldwide.**

Within just a **few years**, their business model disappeared and they went bankrupt.

What happened to Kodak will happen in a lot of industries in the next 10 years - and most people don't see it coming.

Did you think in 1998 that 3 years later you would never take pictures on paper film again?

#### **Slide 20** AIRBNB

**Airbnb is now the world's largest accommodation provider, owns no real estate.**

<https://www.airbnb.com>  
<http://qz.com/329735/airbnb-will-soon-be-booking-more-rooms-than-the-worlds-largest-hotel-chains>

#### **Slide 21** UBER

**Uber is just a software tool**, they don't own any cars, and are now the biggest taxi company in the world.

<https://www.uber.com>

#### **Slide 22 - 23** FACE RECOGNITION

Facebook, the world's most popular media owner, **creates no content.** **Facebook** now has a pattern recognition software that can recognize faces better than humans.

Watching head movement, blinks, pupil dilation, ....

By 2020 there will be apps that can tell by your facial expressions if you are lying - More **Point Cloud** Technology!

x

#### **Slide 24** 3D PRINTING

**All major shoe companies started 3D printing shoes**

At the end of this year, new smart phones will have 3D scanning possibilities.

You can then 3D scan your feet and print your perfect shoe at home

**Slide 25** BY 2027, 10% of everything being produced will be 3D printed

**Slide 26** WELCOME TO THE NEXT INDUSTRIAL REVOLUTION!

**Slide 27** BABY ON IPAD

By 2020, 70% of all humans will own a smart phone.

That means, **almost** everyone has the same access to world class education

**Slide 28** IBM WATSON

**IBM Watson**, you can get legal advice (so far for more or less basic stuff) within seconds, with 90% accuracy compared with 70% accuracy when done by humans

**Watson** already helps nurses diagnosing cancer, 4 time more accurate than human nurses

How could Watson and the automobile work together? Diagnosis?

**Slide 29** WORKFORCE

I read once that 70-80% of jobs will disappear in the next 20 years.

There will be **a lot of new jobs**, but it is not clear if there will be enough new jobs in such a small time.

**Slide 30** AUTONOMOUS TRACTORS!

There will be a \$100 agricultural robot in the future.

Farmers in 3rd world countries can then become managers of their field instead of working all days on their fields.

**Slide 31** SOLAR

Last year, more solar energy was installed worldwide than fossil.

The price for solar will drop so much that all **coal companies** will be out of business by 2025

**Slide 32** WATER

With cheap electricity comes **cheap and abundant water**.

Desalination now only needs 2kWh per cubic meter.

**We don't have scarce water in most places, we only have scarce drinking water.**

Imagine what will be possible if anyone can have as much clean water as they want, for *nearly no cost*

**Slide 33** So, Let's bring all this together and TALK AUTONOMOUS !

**Autonomous Cars:** In 2018 the first self-driving cars will appear for the public.

Around **2020**, the complete industry will start to be disrupted.

An American on average spends forty-two hours a year stuck in traffic,  
**You don't want to own a car anymore.**

**Slide 34** CALL UP YOUR TRANSPORTATION

**An automobile is the second largest purchase in your life, next to housing.**

**Today, the vehicles entering shops for maintenance or repairs sit parked 95 percent of the time.**

**Tomorrow**, fleets of driverless cars will spend nearly all their time on the road—with an increase in wear and tear and a proportionate need for maintenance and repair.

**Slide 35** NOT COOL ENOUGH?  
Who cares??

**Slide 36** 16 YEAR OLD GETTING A LICENCE

Our kids will never get a driver's license and will never own a car.  
It will change the cities, because we will need 90-95% fewer cars for that

**Slide 37** 24.5% of 16 year olds have a drivers license

The top three reasons were:  
"too busy or not enough time to get a driver's license" (37 percent),  
"owning and maintaining a vehicle is too expensive"(32 percent),  
"able to get transportation from others" (31 percent)

<http://www.usatoday.com/story/news/nation/2013/10/13/teen-drivers-license/2891701>

**Slide 38** NETFLIX

We don't leave home as much....

Alibaba, the most valuable retailer, has no inventory! It is a market place, a search engine and a bank – ALL IN ONE!

**Slide 39** PARKING

Seeing that a typical vehicle today sits parked 95% of the time and 4 times the parking spaces per car are required, significant savings from land costs could be achieved

You will not need to park it, you only pay for the driven distance and **can be productive** while driving

We can transform former parking space **into parks**

#### **Slide 40** INSURANCE

**Insurance Companies** will have massive trouble because without accidents, the insurance will become 100x cheaper.

Consulting firm KPMG predicts the auto insurance industry to shrink by up to 40% in the next twenty-five years

Their car insurance business model will disappear

#### **Slide 41** *BESIDES INSURANCE* – WHAT ABOUT ACCIDENTS ?

Accidents involving automobiles is one of the leading causes of death for Americans,

33,000 deaths a year are far too many to not try to make cars safer.

The national highway Traffic Safety Administration concludes driver fault is the result of 94% of all road accidents

**1.2 million people die** each year in car accidents **worldwide.**

We now have one accident every 100,000 km (62K miles)

with autonomous driving that will drop to one accident in 10 million km (6.2Million miles)

That will save a million lives each year.

#### **Slide 42 - 44** CYBER-HACKING

The biggest negative for autonomous vehicle technology is the blame for when this technology fails.

like anything else there will be failures.

So who is to blame for the results of said failures?

Cyber Hacking?

With this technology come some very real concerns.

Among them are the owner's right to privacy, and the vulnerability of these systems to cyber attack.

#### **Slide 45** GEO-FENCING

Able to track young drivers as well as older!

With this technology come some very real concerns.

Among them are the owner's right to privacy, and the vulnerability of these systems to cyber attack.

## **Slide 46** GOOGLE Vehicle

Most car companies **may** become bankrupt

Traditional car companies try the evolutionary approach and **just build a better car,**

while tech companies (Tesla, Apple, Google) will do the revolutionary approach and build a computer on wheels.

Google purchased 60 acres then expanded to around 100 acres to train safety drivers and test autonomous vehicles.

These courses are set to mimic normal driving conditions, included are street lights, urban and semi-urban neighborhoods, slip roads, and t-stops.

In total Google has already driven over 1.3 million miles on public streets, routinely driving 10 to 15 thousand a week (Levy).

All the mileage Google has been adding up is all recorded.

Over the last year in California only ten accidents have occurred with an autonomous vehicle involved.

**Zero** have been the fault of the autonomous vehicles, all were the fault of driver error

## **Slide 47** TESLA Vehicle

In the fall of 2015, the Tesla Model S was able to drive from Los Angeles to New York City with 96% autonomy in two days making the first cross country trip.

This led to Tesla founder Elon Musk to predict fully autonomous cars to be operating in the United States within the next three years.

engineers from Volkswagen and Audi are completely terrified of Tesla.

May 7, 2016 – 40 Year old Floridian Joshua Brown dies in auto pilot accident

**Slide 48** APPLE Vehicle -- The iCar project is codenamed '**Titan**', according to The Wall Street Journal

Apple has spent more money on the research and development of electric, autonomous vehicles in the last few years than it did on the development of the iPhone, iPad, and Apple Watch — combined.

<https://cleantechnica.com/2016/06/01/apple-invested>

*Even more astonishingly, Apple is outspending the major car manufacturers at a rate of 20:1.*



*The near \$5 billion it has spent in the last three years compares to the average spend of \$192 million at the top 14 auto makers.*

*It even outranks Tesla by a factor of more than 10:1.*

**Slide 49** - The Trolley Problem [https://en.wikipedia.org/wiki/Trolley\\_problem](https://en.wikipedia.org/wiki/Trolley_problem)

**Slide 50** - SNOW

**Slide 51** BIG OIL

So, other businesses that could be affected:

- Medical insurance
- Medical costs
- Medical earnings – doctors, nurses, hospitals, ambulance drivers & EMT
- Funeral expenses
- Automobile insurance
- Legal expenses due to accident faults
- Collision repair and suppliers
- Automotive education – both mechanical and collision
- EPA and OSHA
- Construction
- Public transportation – air, land, train, etc
- Big Oil !

Will we eventually lose these driving skills? Like speed dial or GPS?

Generations to be born who **never** have driven!

**Slide 52** Act Autonomously (Independently) about your education!

*What technologies are necessary to create Autonomous vehicles?*

*Sensor fusion - the car's eyes*

*How lane departure systems are calibrated*

*Vehicle stability control strategy*

*Throttle controls*

*Steering control*

*Long range radar*

*Short range lidar*

*Digital mapping and geo location techniques*

*Vehicle to vehicle communications*

*Vehicle to infrastructure and intelligent transportations systems*

Help make society a better place for everyone.

Get informed, share the information, and help progress autonomous vehicle technology into common practice.

Remember- a small change early on can lead to tremendous changes later!



## Works Cited

- Jimmy Dinsmore / the Driversside (@driversside) Twitter  
<https://www.linkedin.com/in/jimmydinsmore>  
[https://www.google.com/url?sa=t&rct=j&q=&src=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwiiJPo86POAhXEwiYKHaExDmEQ6F4IHDAA&url=https%3A%2F%2Ftwitter.com%2Fdriversside%3Fref\\_src%3Dtwsr%255Egoogle%257Ctwcamp%255Eserp%257Ctwgr%255Eauthor&usg=AFQjCNHGN-PWj8Qmb8MyTIZ3DP5u-E0ooA&sig2=xqXhzNlt6DNLUTQcNgmvWQ&bvm=bv.128617741,d.eWE](https://www.google.com/url?sa=t&rct=j&q=&src=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwiiJPo86POAhXEwiYKHaExDmEQ6F4IHDAA&url=https%3A%2F%2Ftwitter.com%2Fdriversside%3Fref_src%3Dtwsr%255Egoogle%257Ctwcamp%255Eserp%257Ctwgr%255Eauthor&usg=AFQjCNHGN-PWj8Qmb8MyTIZ3DP5u-E0ooA&sig2=xqXhzNlt6DNLUTQcNgmvWQ&bvm=bv.128617741,d.eWE)
- Abrams, Rachel. "Self-Driving Cars May Get Here Before We're Ready." *The New York Times*. The New York Times, 21 Jan. 2016. Web. 23 Mar. 2016.  
<[http://www.nytimes.com/2016/01/22/business/dealbook/davos-self-driving-cars-may-get-here-before-were-ready.html?\\_r=0](http://www.nytimes.com/2016/01/22/business/dealbook/davos-self-driving-cars-may-get-here-before-were-ready.html?_r=0)>.
- Fung, Brian, and Matt McFarland. "These Charts Show Who's Lapping Whom in the Race to Perfect the Driverless Car." *Washington Post*. The Washington Post, 15 Jan. 2016. Web. 23 Mar. 2016. <<https://www.washingtonpost.com/news/the-switch/wp/2016/01/15/how-googles-driverless-car-stacks-up-against-the-competition/>>.
- Korosec, Kirsten. "Feds Try to Hit the Gas on Self-Driving Cars." *Fortune Feds Try to Hit the Gas on Self Driving Cars Comments*. Time Inc. Network, 14 Jan. 2016. Web. 23 Mar. 2016. <<http://fortune.com/2016/01/14/self-driving-car-laws/>>.
- Levy, Steven. "License to (Not) Drive - Backchannel." *Medium*. Medium, 13 Jan. 2016. Web. 23 Mar. 2016. <<https://backchannel.com/license-to-not-drive-6dbea84b9c45#.8uy2ykb9y>>.
- Luettel, T., M. Himmelsbach, and Hans-Joachim Wuensche. "Autonomous Ground Vehicles—Concepts and a Path to the Future." *Proceedings of the IEEE Proc. IEEE* 100.Special Centennial Issue (2012): 1831-839. Web. 17 Mar. 2016.
- Pullen, John Patrick. "You Asked: How Do Driverless Cars Work?" *Time*. Time, 24 Feb. 2015. Web. 11 Mar. 2016. <<http://time.com/3719270/you-asked-how-do-driverless-cars-work/>>.
- Reina, Giulio, David Johnson, and James Underwood. "Radar Sensing for Intelligent Vehicles in Urban Environments." *Sensors* 15.6 (2015): 14661-4678. Web. 17 Mar. 2016.
- "Report of Traffic Accident Involving an Autonomous Vehicle (OL 316)." *Report of Traffic Accident Involving an Autonomous Vehicle (OL 316)*. California Department of Motor Vehicles, n.d. Web. 23 Mar. 2016.  
<[https://www.dmv.ca.gov/portal/dmv/detail/vr/autonomous/autonomousveh\\_ol316](https://www.dmv.ca.gov/portal/dmv/detail/vr/autonomous/autonomousveh_ol316)>.
- Thompson, Clive. "The Worst Thing about Driving Is about to Change." *Mother Jones*. Mother Jones, Jan. 2016. Web. 23 Mar. 2016.  
<<http://www.motherjones.com/environment/2016/01/future-parking-self-driving-cars>>.
- Vella, Matt, and Katy Steinmetz. "The Increasingly Compelling Case For Why You Shouldn't Be Allowed To Drive." *The Increasingly Compelling Case For Why You Shouldn't Be Allowed To Drive*. Time, 07 Mar. 2016. Web. 17 Mar. 2016.  
<<http://web.a.ebscohost.com/ehost/detail/detail?sid=8d203737-39b1-4981-9dbe-032884402cac%40sessionmgr4001&vid=0&hid=4207&bdata=JnNpdGU9ZWWhvc3QtbGl2ZQ%3d%3d&preview=false#AN=113323729&db=mth>>.