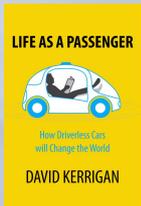


# AV Data - More Questions Than Answers (and lots of opportunities!)



David Kerrigan  
July 2019



# But first....there's ALWAYS another business model...

- First 2/3 of book is free - pay to unlock ending
- Pay per 1,000 words
- Tips at end of each chapter (\$0.15+)



# WE NOW LIVE IN AN ERA OF MOBILITY ON-DEMAND



RIDE HAIL



PACKAGE DELIVERIES



FOOD DELIVERIES



SHARED VEHICLES



AUTONOMOUS VEHICLES



# Common Themes Globally but Differing Priorities

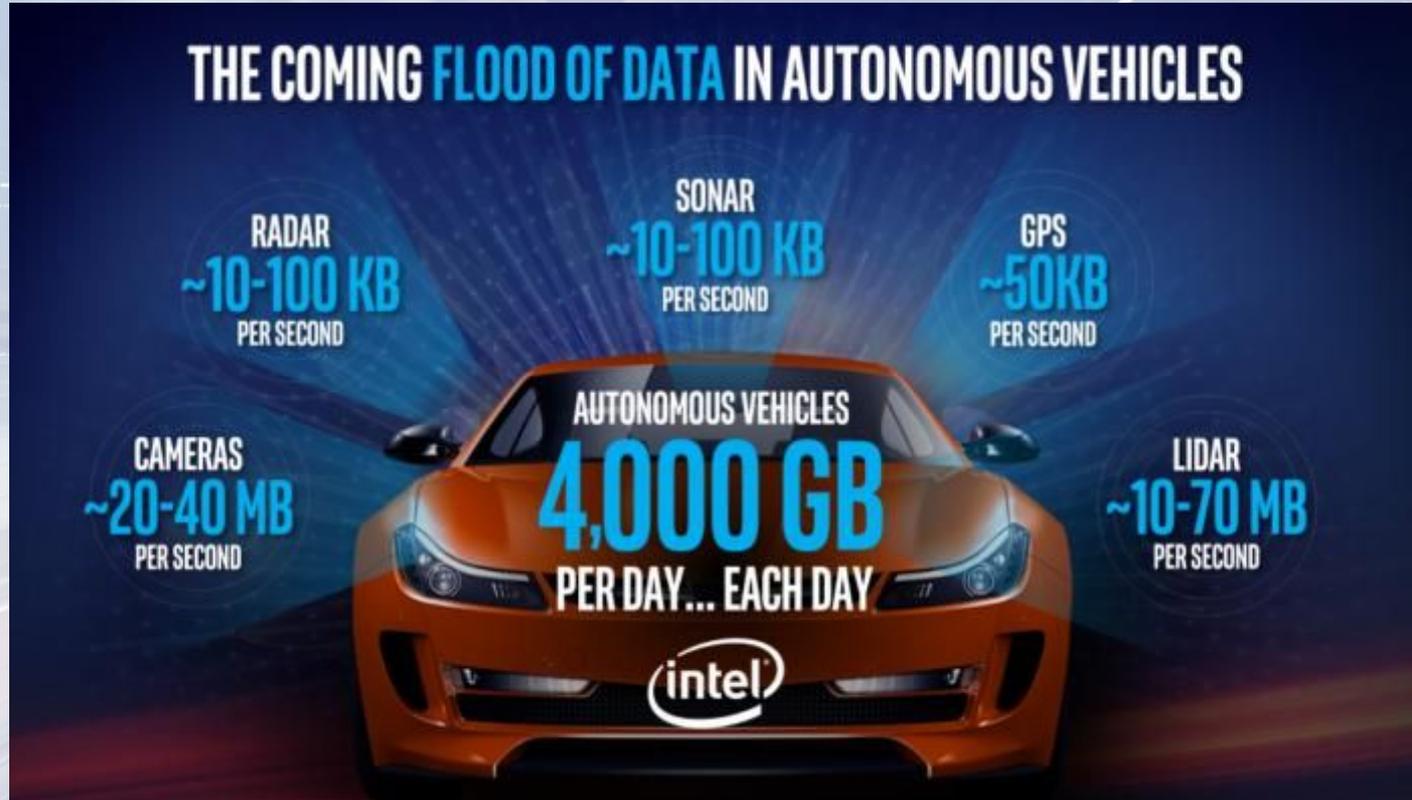
- Interaction with Transit
- Impact on suburbs (sprawl, health)
- Jobs impact
- VMT tax - ZOV/SOV
- Curb rules
- Privacy (GDPR)

Technology, innovation and its attendant wealth creation should not be considered from a purely domestic point of view...the incalculable value of a global perspective.

Naveen Jain, Moonshots

# Data Everywhere Already

- Driverless cars are estimated to each create approximately 4TB of data per day
- A contemporary car already creates upto 250Gb per day
- Micromobility & Ride sharing - Uber/Lyft, shared bikes and scooters collect data



# Sensors Everywhere

## Data Gathering

- Every digital interaction - app open, tap, dwell time, network traffic (LTE/5G/WiFi)
- Location
- Occupancy
- IoT (Tire Pressures, Engine Components)
- ADAS & AV Perception sensors - Radar, Lidar, Sonar, Cameras

## Data use (Individual & Aggregate):

- Behaviour - ML to spot patterns
- Commerce
- Digital Twins

# Would You Like Your Usual? Cui Bono?



# Privacy

## Who owns what data?

### Guidance for Drivers on the Use of Dash Cams



An Coimisiún um  
Chosaint Sonraí  
Data Protection  
Commission

The use of dashboard-mounted video recording systems – ‘dash cams’ – has increased in recent years as devices have become more affordable and of higher quality. Reasons for installing a dash cam in a vehicle appear to range from mitigating personal security concerns to having a means to establish liability in the event of an accident. Today, some insurance companies are offering discounts on policies to drivers who purchase a dash cam (whether they install/use it, or not).

Dash cams can be outward-only facing and record video of the road ahead. Equally, versions exist that record both audio and video, and that record both inside the vehicle and the road outside. Clearly, where both video and/or audio of individuals in a vehicle (typically a taxi or bus) is recorded, or where video of a road user captured by an outward-facing dash cam is recorded, data protection implications may arise and it is important that drivers who install dash cam understand their obligations under data protection legislation.

#### **Status of the Operator of a Dash Cam**

EU data protection legislation recognises those who collect and process personal information of individuals (including images and voice recordings of people) as either “data controllers” or “data processors”. Clearly, in an everyday context, many of us process the personal information of our family and friends in many different scenarios. The legislation exempts this latter kind of processing under what is known as a “household exemption”. This makes common sense.

However, case law from the highest Court in the EU makes it clear that this exemption must be construed narrowly. In its judgment in the case of *Rynes vs Urad* (2014), the Court of Justice of the European Union (CJEU) considered that:

# Data: The Urban Perspective

LA DoT Mobility Data Specification (MDS)

8 scooter/bike companies 36,000 vehicles

**Provider API**, enables mobility companies to send information about individual devices directly to the city. Information about the start, end, and route of each dockless vehicle trip, accurate within a few hundred feet. Whether the vehicle is broken, out of power, or in the process of being “rebalanced” (that is, being moved to another part of the city).

**Agency API**. It enables a city to instantly send digital information and instructions directly to private mobility companies. It allows the city to alert companies to events like a crash or a parade, and to notify companies of vehicles that are illegally parked. In theory, it could also allow cities to adjust pricing (like scooter fees) to incentivize mobility companies' behavior.

Opposition from Uber and EFF but adopted by several other cities

# Curb data

Tolls, Curbs, Parking, Bike Share

Real time regulation data

The screenshot displays the COORD web application interface. At the top left is the COORD logo with a green arrow. To its right are navigation links: BLOG, COMPANY, NEWSLETTER, LOGIN, and a prominent green button labeled SEE DEMO. Below the navigation is a search bar with a magnifying glass icon and the text "Search". The main content area is a map of San Francisco, showing street names like Vallejo St, Broadway, Pacific Ave, Washington St, Montgomery St, Mission St, Howard St, Post St, and Stockton St. The map is overlaid with a grid of colored lines representing different curb regulations. A white filter overlay is positioned on the left side of the map, containing the following elements:

- A dropdown menu set to "San Francisco" with an upward arrow.
- Two dropdown menus: "Thursday" and "4:00 pm PDT".
- A dropdown menu set to "Passenger vehicles".
- A dropdown menu set to "All uses".
- A section titled "All zones:" with an upward arrow, containing two radio button options:
  - No Stopping
  - No Standing
- A blue link labeled "About Coord" at the bottom of the filter.

At the bottom left of the map is the Mapbox logo, and at the bottom right is the copyright notice: © Mapbox © OpenStreetMap Improve this map.

# Data Can Tell You Unexpected Things

Zero miles travelled  
\$4 for 30 mins  
Remain in parking space

- 👤 Naps
- 💻 Work
- 📦 Storage
- 📱 Charge phones
- 🍽️ Eat
- 👉 Talk on the phone
- 📺 Watch TV
- 🎃 Dress up for halloween

theverge.com/2019/7/5/20683406/japan-car-sharing-renting-not-driving-private-space-orix-times24

**THE VERGE** TECH REVIEWS SCIENCE CREATORS ENTERTAINMENT VIDEO MORE

TL;DR \ TRANSPORTATION \ CARS \

## People in Japan are renting cars but not driving them

*'Traveled no distance'*

By Andrew J. Hawkins | @andyjayhawk | Jul 5, 2019, 3:14pm EDT

f t SHARE



The image shows a busy urban street in Japan. In the foreground, a person is riding a bicycle with a basket. To the left, a man in a dark suit is walking. In the middle ground, there are several cars, including a yellow taxi and a red car. The background is filled with tall buildings and numerous billboards, including one for 'LABI' and another for 'THE 20-100'. The scene is captured from a street-level perspective, showing the flow of traffic and pedestrians.

# Business Model: Intel's Passenger Economy 2017

Welcome to the  
**Passenger Economy**



In the near future, people everywhere will leave the driving to autonomous vehicles. That one simple fact will soon create one of the greatest economic opportunities of the twenty-first century.



**585,000 +**  
Conservative estimate of lives saved worldwide due to autonomous vehicles 2035–2045.\*\*



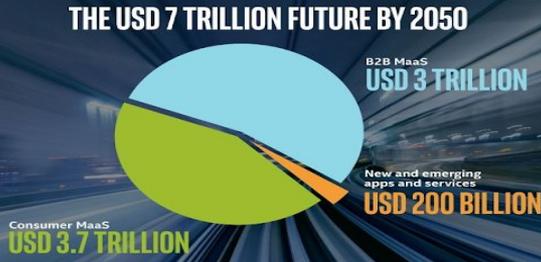
**USD 234 BILLION**  
Reduction in public safety costs related to traffic accidents between 2034–2045.\*\*



**USD 900 BILLION**  
Amount of cash freed up in the US by passengers foregoing car ownership.\*\*

This extra time and money will want somewhere to go.

**THE USD 7 TRILLION FUTURE BY 2050**



Consumer MaaS	<b>USD 3.7 TRILLION</b>
B2B MaaS	<b>USD 3 TRILLION</b>
New and emerging apps and services	<b>USD 200 BILLION</b>

ACHIEVING CRITICAL MAAS

Adoption of Mobility-as-a-Service is central to the emergence of the global passenger economy.



**MOBILE CONNECTEDNESS**

+

The boundaries between work and personal life will continue to evolve and disappear.



**URBANIZATION**

+

By 2050, nearly two-thirds of the global population will live in an urban environment. (New suburban growth also means more commuters.)



**VEHICLE SHARING**

=

Individual ownership is being replaced with a shared approach.

PASSENGER ECONOMY IN 2030

USD 800 BILLION

(estimated)

IT'S THE BIGGEST SHIFT IN HOW PEOPLE GET AROUND SINCE MODERN SOCIETY LEFT THE HORSE AND BUGGY BEHIND.

14000

80

A futuristic, blue-toned tunnel with light trails and a large blue number 80 in the center. The tunnel has a curved, ribbed interior and is illuminated by bright lights, creating a sense of motion and depth. The number 80 is prominently displayed in the center of the frame.

# Coopetition?

VW & Ford to work together



# Baidu Apollo Open Platform

apollo

Home Open Platform Cooperation Apollo Fund Developer Center

中文 | English Visit Baidu AI

Detail Hardware  
Data Vehicle Certificate  
Perception Simulation  
Security GameSim

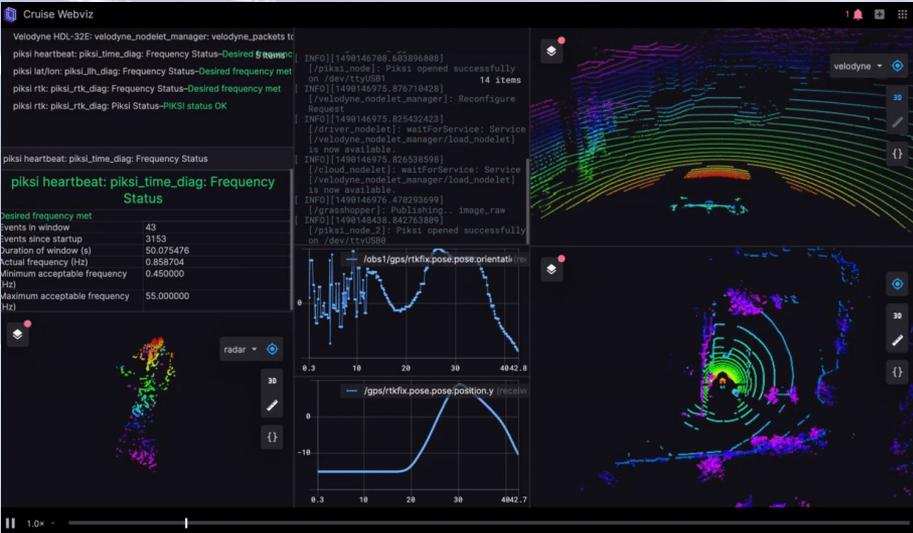
## Developer Center

### Lesson Structure

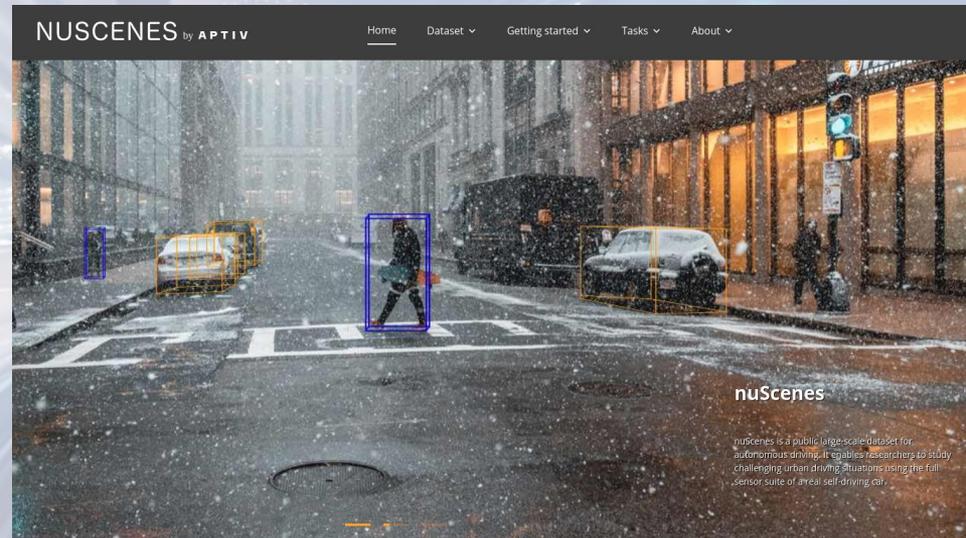
Through this course, you will be able to identify key parts of self-driving cars and get to know Apollo architecture.  
You will be able to utilize Apollo HD Map, localization, perception, prediction, planning and control, and start the learning path of building a self-driving car.

 <b>Self-driving Overview</b> Identify key parts of self-driving cars, and get to know Apollo team and architecture.	 <b>HD Map</b> Get to know how high-definition maps work, which underpin almost every other part of the software stack.	 <b>Localization</b> Learn how the vehicle localizes itself with single-digit-centimeter-level accuracy.	 <b>Perception</b> Identify different perception tasks such as classification, detection, and segmentation and learning convolutional neural networks which are critical to perception.
 <b>Prediction</b>	 <b>Planning</b>	 <b>Control</b>	 <b>Congratulations</b>

# Open Source Data



Cruise (<https://medium.com/cruise/webviz-fb5f77ebe52b>)



Aptiv (<https://www.nuscenes.org/>)

# 3,000 driving scenes and 16 hours of video data



## WAYMO Open Dataset

Waymo is inviting the research community to join us in accelerating the development of machine perception and self-driving technology with the release of a high-quality set of multimodal sensor data for autonomous driving.

The Waymo Open Dataset will be available soon. Sign up here to receive an update as soon as it's available.



# AV Data Monetization

Will the owners of RoboTaxis sell data about their passengers

- to advertisers?
- to businesses wishing to influence the route the car chooses?

Or will Robocars bring calls for a more private travel experience akin to Incognito Mode on web browsers?

# Waymo WiFi/Music

In car experience will be important

But what about privacy? QoS?

## Waymo is testing free WiFi in its self-driving taxis

0

Brittany A. Roston - Jul 8, 2019, 2:44 pm CDT



Waymo is aiming to make its autonomous taxis even more appealing by adding WiFi connectivity in them, according to a new report. The WiFi option would enable passengers to use their gadgets without relying on their own mobile service, potentially appealing to customers who want to spend their commuting time getting work done.

# Final Thoughts...

- Mobility data interacts with a lot of stakeholders, who move at different paces with differing agenda:
  - City authorities
  - Interest groups
  - Public perception
  - Commercial interests
- Priorities vary globally:
  - Trust
  - Transit
  - Accessibility
  - Connectivity
  - Data
- And all of this will happen under the microscope of social media commentary, and against the backdrop of litigation that previous technological advances did not endure.
- Don't forget the lack of familiarity with the tech outside of SV and testing towns

# Thank You! And Good Luck!!

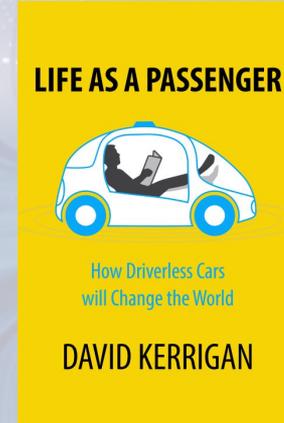
## Contact

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<http://david-kerrigan.com>

<https://medium.com/@david.kerrigan>

<https://www.linkedin.com/in/davidkerrigan>



New 5 part series "Waiting for the Robocars" now on Medium!

# Further Reading

<https://connectedautomateddriving.eu/library/>

<https://hackernoon.com/autonomous-car-pricing-will-turn-your-town-into-a-science-experiment-a7b797734df6>

[https://issuu.com/sasakiassociates/docs/shifting\\_gears\\_20180531\\_-\\_issue](https://issuu.com/sasakiassociates/docs/shifting_gears_20180531_-_issue)

<https://sidewalklabs.com/blog/av-event/>

<https://ixn.intersection.com/with-autonomous-vehicles-its-not-about-the-journey-it-s-about-the-destination-6bdc821fa92b>

<https://assets.kpmg/content/dam/kpmg/xx/pdf/2019/02/2019-autonomous-vehicles-readiness-index.pdf>

<https://www.gov.uk/government/publications/future-of-mobility-urban-strategy>

<https://nacto.org/publication/bau/blueprint-for-autonomous-urbanism/>

## RECENT PUBLICATIONS

### Arup

*"Future of Highways"*

### Bloomberg Associates

*"Taming the Autonomous Vehicle: A Primer for Cities"*

### Buro Happold Engineering

*"Global Design Sprints: How to Reimagine Our Streets in an Era of Autonomous Vehicles"*

### HR&A, Arcadis Design & Consulting, Sam Schwartz

*"Driverless Future: A Policy Roadmap For City Leaders"*

### IDEO

*"The Future of Automobility"*

### WSP | Parsons Brinckerhoff

*"Driving Towards Driverless: A Guide for Government Agencies"*

Questions?

The background of the slide is a dynamic, futuristic scene. It features a perspective view of a tunnel or a road that curves into the distance. The walls and ceiling of the tunnel are lined with glowing blue and white lights, creating a sense of depth and movement. The floor is also illuminated, with light trails suggesting speed. In the background, there are faint, glowing patterns that resemble digital data or city lights, adding to the high-tech, digital atmosphere of the image.