

# Automated Vehicles: Insuring a Driverless Car



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Rick Gorrivett, PhD, FCAS, MAAA, CERA, FRM, ARM

Professor and Chair, Mathematics Department



**Bryant**  
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**HISTORICALLY SPEAKING**

AMANDA FOREMAN

# Insuring Against Disaster



“The only thing worse than dealing with the insurance industry is trying to conduct business without it.”

- Amanda Foreman, WSJ, 3-23-19

# Agenda

- Automated Vehicles (AVs): Overview and Current State
- Insurance and Actuaries: “Arbiters of Risk”
- AVs – What *Are* the Risks?
- Other AV Issues
- Conclusion

# **Automated Vehicles (AVs): Overview and Current State**

# AVs: The 40,000-Foot View

The movement toward more-autonomous vehicles will transform society

- 1) Transportation *safety* enhanced
- 2) Cost *savings*
- 3) New *socioeconomics* / demographics
- 4) Mobility becomes a *service*
- 5) The means of transportation becomes more *shared* vs. private ownership

# AVs: Facts or Hyperbole?

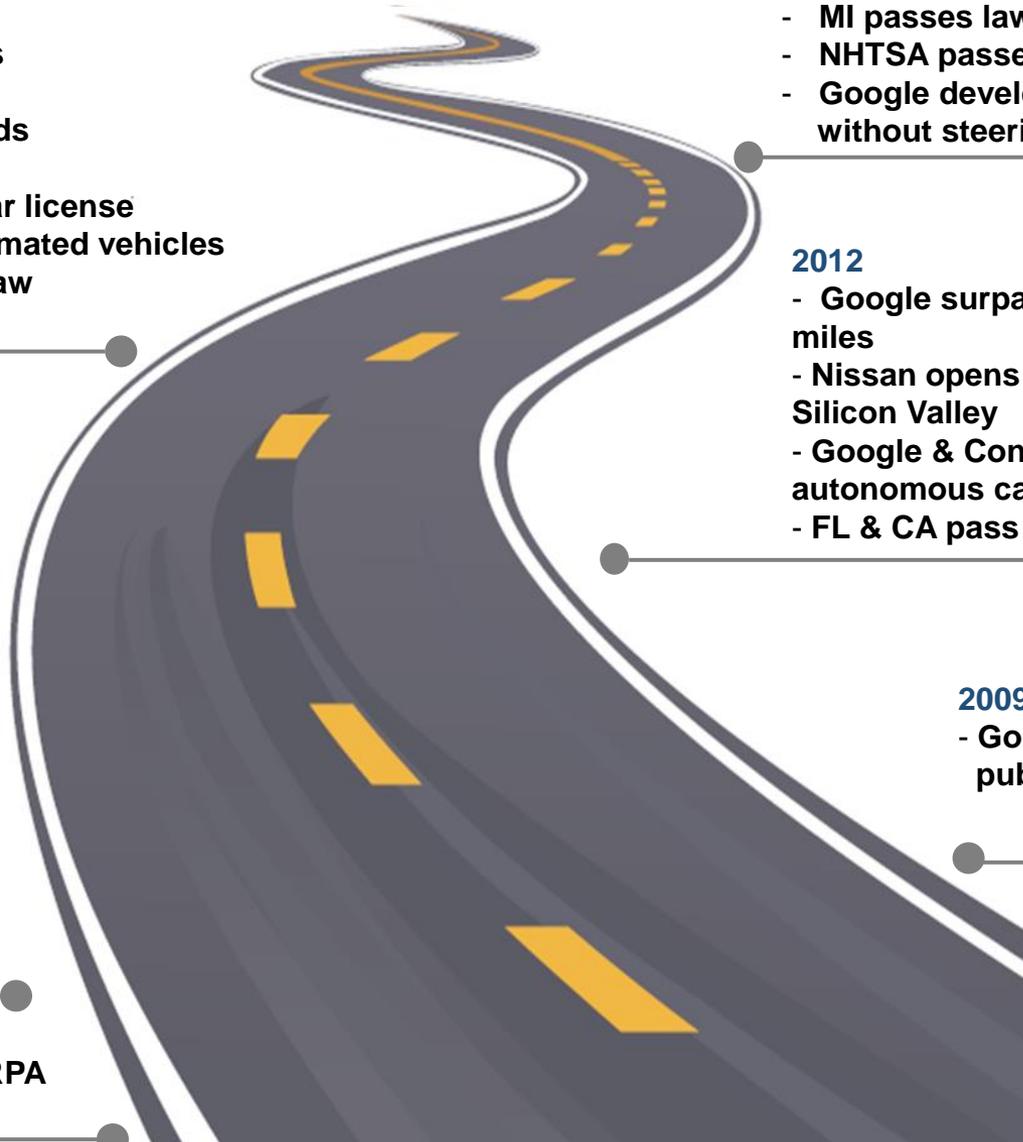
- Technological development
  - Feasible?
- Timeframe
  - Too optimistic?
- Safety
  - Evidence?
- Socioeconomic impact
  - Overstated?
- Public willingness
  - Hmmm...

# AVs: Background

## *Evolution*

- Technological
  - Next step in development of personal transportation
- Economic and social
  - Benefits economy and certain demographics
  - Sharing economy
- Risk and insurance
  - Telematics → Usage-Based Insurance (UBI)

# Historical Development



**2013**

- Google surpasses 500K miles
- Britain tests on public roads
- Mercedes tests on public roads
- CMU tests on public roads
- Audi receives autonomous car license
- NHTSA issues policy on automated vehicles
- DC passes autonomous car law

**2011**

- Google surpasses 150K miles
- BMW tests on public roads
- NV passes autonomous car law

**2010**

Volvo CitySafe standard

**2007**

CMU wins DARPA Urban Challenge

**2005**

Stanford wins DARPA Grand Challenge

**2014**

- MI passes law
- NHTSA passes V2V
- Google developing driverless car without steering wheel or brakes

**2012**

- Google surpasses 300K accident free miles
- Nissan opens research facility in Silicon Valley
- Google & Continental receive autonomous car licenses
- FL & CA pass autonomous car laws

**2009**

- Google begins testing on public roads

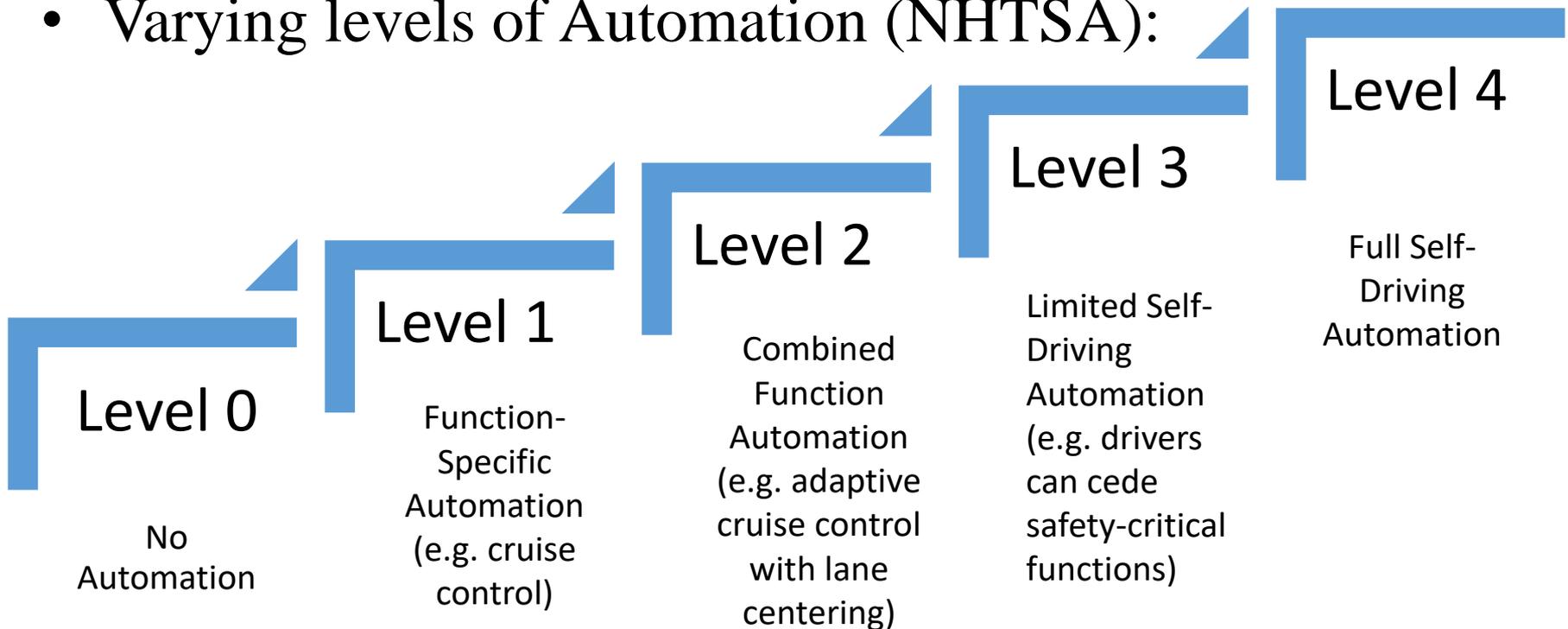
# Even More Recently

- **The Good**
  - Self-driving buses
    - Japan
    - Helsinki
  - Self-driving taxis
  - Waymo's Phoenix program
- **The Bad and the Ugly**
  - Accidents
    - Tesla
    - Google
    - Uber
    - Las Vegas bus



# Level of Vehicle Automation

- Autonomous Vehicles (AV): Vehicles that are able to guide themselves from an origin point to a destination point desired by the individual
- Varying levels of Automation (NHTSA):



**Insurance and Actuaries:**

**“Arbiters of Risk”**

# “Arbiters” of Risk: Insurers

- Risk mitigation
  - Education
  - Loss prevention
- Social policy
  - WC laws
  - Auto Fin. Resp. laws
- Capital / infrastructure
  - Without insurance, the bridge / surgeon / event does not get built / operate / happen

# “Arbiters” of Risk: Actuaries

- Experts in the identification, quantification, and management of risk
  - Analytics
  - Contingencies
- Two key traditional roles
  - Pricing: assessing the cost of risk
  - Reserving: assessing the solidity of organizations in the presence of risk

# Question

If actuaries and insurers are experts in assessing and managing risk... then why were the

- Auto manufacturers
- AV technology companies
- Regulators
- Etc...

*not* more proactive in partnering with actuaries and insurers to gather information, set standards, and analyze AV data?

# Casualty Actuarial Society: Research and White Paper

“Automated Vehicles and the Insurance Industry – A Pathway to Safety: The Case for Collaboration”

- CAS Automated Vehicles Task Force (2018)

**Automated Vehicles:**

**What *Are* the Risks?**

# Risk Measures Re: *AV Safety*

- Are AVs safe?
- What should the safety standard be?
- *“93% of accidents are caused by human error.”*
  - NHTSA’s 2008 National Motor Vehicle Crash Causation Survey
- **BUT...** this is NOT EQUAL TO “Automated vehicles will reduce accidents by 93%”

# Safety (cont.)

- Additional Statistical Caveats
  - ***Lower frequency  $\neq$  lower losses***
    - Higher severity can offset any frequency reduction
    - For pricing of risk, we care about *loss* reduction
  - ***Lower frequency risk  $\neq$  fewer accidents***
    - Increase in miles driven may offset lower risk
  - ***Safer cars  $\neq$  safer drivers***
    - Drivers may adjust habits (e.g., cell phone usage)

# Safety (cont.)

- More on drivers adjusting their driving habits...
- We are notoriously bad at paying attention when we believe someone or something else has us covered
- Multi-car families: what if one car is an AV and another car is a non-AV?
- Distracted driving
  - U.S.: 3,192 people killed in 2019
  - Talking on cell phone less, but typing more

# Safety (cont.)

- Recent auto statistics...
- Over the last ten or so years – when automated safety features have been introduced and are more common – we have seen periods of...
  - Increasing numbers of claims
  - Increasing claim severity
  - Increasing driving fatalities

# What if we *Misprice* AV Risk?

- Overprice the risk associated with AVs
  - Make life saving technology unaffordable for some customers
  - Delay the coming to market of important technological advances
- Underprice the risk associated with AVs
  - Insureds in other, less-safe vehicles subsidize the insurance of insureds with safer vehicles.
  - May come to market too quickly

# Actuarial Pricing of *Auto* Insurance

## Cost-Based pricing approach

- As auto insurance losses decrease, premiums eventually decrease

$$\text{Premium} = \text{Rate} \times \text{Exposures}$$

$$\text{Rate} = \text{Losses} + \text{Expenses} + \text{Risk \& Profit Load}$$

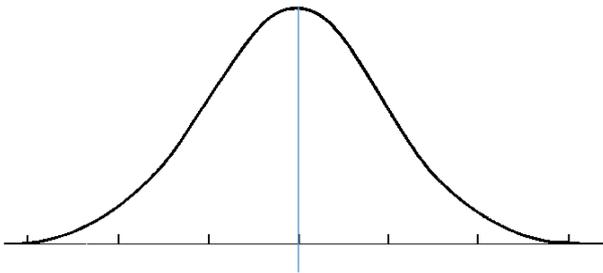
As opposed to a

## Market-Based pricing approach

- Charge what the market allows

## Law of large numbers

- Risks grouped by characteristics
- Rates charged based on group rating
- Actual discount determined by vehicle rating



## Rating Characteristic Examples

- Driver age
- Location
- Driving history
- Mileage
- Vehicle

# AV Insurance Pricing Will Depend on the *Liability* Framework Chosen

- Product Liability
  - Attach liability to sellers and manufacturers of the vehicle
  - Tends to be complex and expensive – as the standard to establish a defect is vague/unpredictable
- Strict liability when an AV is at fault
  - Making the owner of the vehicle responsible when the owner's automobile is at fault
- First party insurance
  - Similar to UM coverage, injured parties would look to their own insurers
- A combination of above?

# Liability System Goals

- Align accountability & responsibility
  - Product
  - Claim settlement
- Compensate claimants fairly & efficiently
- Encourage product development & safety
- Perform these tasks at the lowest possible cost

# Risk of *Timing* of AV Introduction

- “How important is it that autonomous vehicles are safe when they’re introduced versus how quickly they improve? Do we allow them on the roads when they’re like teenage drivers or do we wait for them to be as good as professional drivers? We’re helping to answer that question by quantifying the lives at stake.”

- Nidhi Kalra, RAND Corporation, 2017

# Timing (cont.)

## Create Your Own Scenario

Autonomous vehicles are introduced in

, when they are

compared to human drivers.

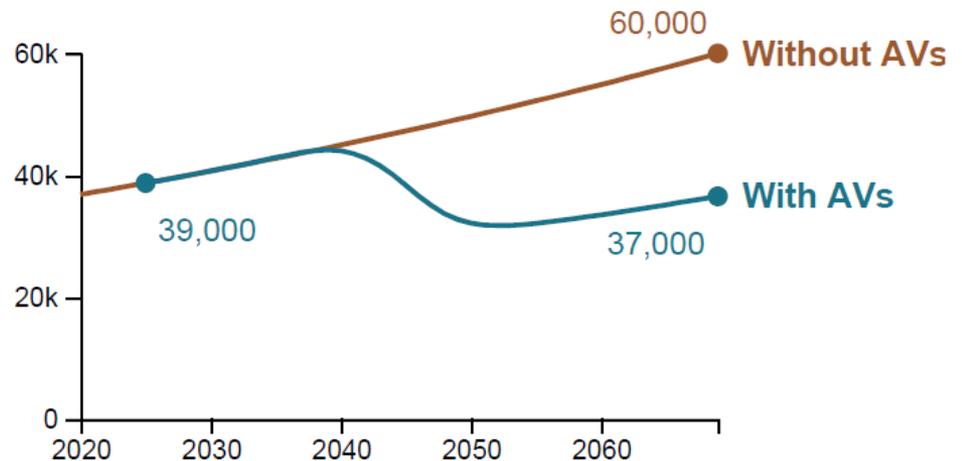
Autonomous vehicles make up 80 percent of

vehicle travel  years later. At this point,

autonomous vehicles will be

compared to human drivers.

Projected annual U.S. road deaths under this scenario



**500,000 lives saved** over 50 years in a future with autonomous vehicles.

- RAND Corporation, 2017

\* The [complete model](#) uses eight variables, not four.

# Risk of *AV Decision-Making*

- Can they learn over time?
  - A standard question for AI
- Do humans have to teach them?
  - <http://moralmachine.mit.edu/>
  - MIT's *Moral Machine* website
  - “A platform for gathering a human perspective on moral decisions made by machine intelligence, such as self-driving cars”

# Decisions (cont.): Moral Machine

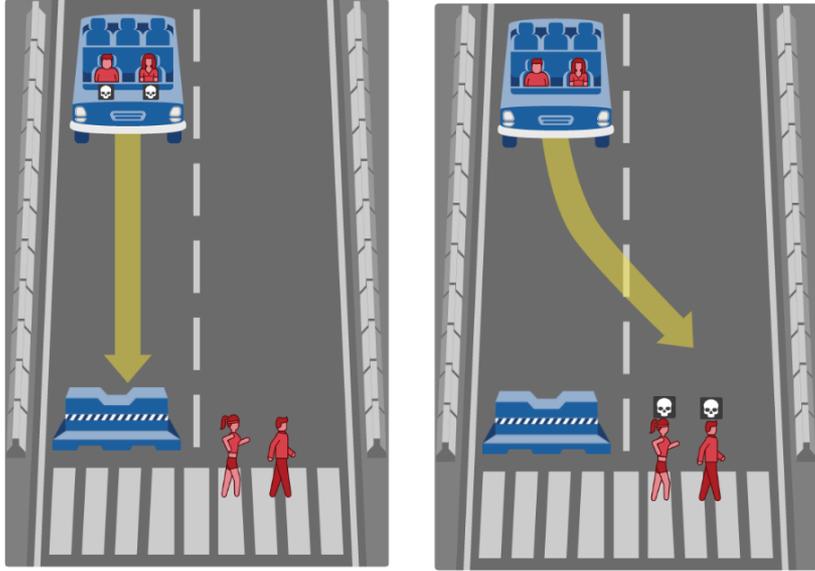
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What should the self-driving car do? 1 / 13



Each dilemma has a red button labeled "Show Description" below it.

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# Risk: *Cybersecurity*

- The more interconnected, the more (potentially) vulnerable
- Privacy issues
  - Who owns the data collected by AVs

# **Other AV Issues**

# Issues

- **Adoption of AVs for Pricing**
  - New car / product?
  - Next model in an existing product line?
- **Insurance / Actuarial**
  - Individual driver → car / manufacturer
  - New pricing paradigm may be needed
- **Regulation**
  - What regulations should govern the testing and driving of an AV?
  - Federal, or individual states?
- **Infrastructure**
  - Adequate? Cost to upgrade?
- **Mix of AVs and non-AVs on the Road**
  - Can they co-exist?
  - Villainy

# **Conclusion**

# We Need to Immediately...

- Treat this as an *interdisciplinary* issue
- Collect comprehensive and relevant *data* – and share it
- As a society, we need to make a number of decisions...
  - Do we *want* autonomous vehicles?
  - How *safe* is safe enough?
  - Are we more tolerant of *people* making mistakes than of *machines* making mistakes?

Gracias

Merci

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BuzanbYoung.com

THANK  
YOU

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a ri ga to u

Vielen  
Dank

Grazie