JUNE 2016

# FUTURE OF DRIVING

## JUSTINE BRIAN

MOTION:

# "ALL VEHICLES SHOULD BE AUTOMATED"

FUTURE OF ENGINEERING DEBATES BY:

Institute of Ideas

Institution of
MECHANICAL
ENGINEERS

# CONTENTS

## KEY TERMS

Artificial intelligence (AI)

Autonomous car

Google self-driving car

In 2010 technology giant Google announced its Self-Driving Car project to "make driving safer, more enjoyable and more efficient." [Ref: Google] Google ask us to imagine a point where "Deaths from traffic accidents—over 1.2 million worldwide every year—could be reduced dramatically, especially since 94% of accidents in the U.S. involve human error." [Ref: Google] The idea of 'automated vehicles' isn't a new one [Ref: Computer History Museum], but the advent of Google's recent project has caused both excitement and concern, and raises questions about responsibility, the future of driving and human autonomy. Supporters of the new technology argue that: "The strongest case for self-driving cars is safety" [Ref: Guardian], although critics are concerned that self-driving cars "introduce a whole new category of road user...that entirely lacks an understanding that all those road users share" [Ref: Slate], and question how this new automated technology will integrate into a human-controlled, human-centred environment. As well as this, some commentators ask whether automation will end our love of driving altogether, as we seem to have reached "peak car" because of, "the possibility that both car ownership and vehicle-kilometres driven may be reaching saturation in developed countries—or even be on the wane" [Ref: Economist]. In other quarters, there is anxiety about whether we are too quick to embrace automation, at the expense of human pleasure and control: "The self-driving car will only change our lives for the worst" because of what "it'll take away from future generations. The car gives many of us our first taste of true freedom. Countless weekends can be spent just driving, with no particular destination in mind. Often, after getting hopelessly lost, new places are found, and returned to throughout our lives. This is only possible because we're in complete control." [Ref: Digital Trends] So is the future of driving an automated one, or is that still a futuristic dream? What are the pros and cons of this new technology, and how might it effect humankind's relationship to machine?

## Safety first

One of the key motivations developers give for a move to automated cars is improving road safety. Cars that are able to anticipate risky situations and avoid them will, it is argued, reduce road-traffic accidents, "helping to make the roads safer for everyone." [Ref: Telegraph] The small fleet of Google automated cars (both commercial makes and Google's own prototype) have driven over a million miles within California since 2009 [Ref: Telegraph], but in February this year one of their vehicles had an accident and collided with a public transport bus [Ref: Financial Times]. Google admitted that the computer had made an "incorrect assumption about where [the bus] would go", and that the crash would not be the last [Ref: Daily Mail]. That incident is considered an important moment in the development of the technology, not only because it's the first one where the technology has been deemed to bear 'some responsibility' for the incident [Ref: Daily Mail], but because it highlights the concerns of some about the safety of driverless cars more broadly. Whilst future automated vehicles might be able to safely "navigate roads, they don't think like humans", and some question whether automated cars can really be safe in an environment where they need to interact with humans, and as such, "cope with the uncertainty and complexity of human behaviour." [Ref: Popular Mechanics] However, despite this, others call for perspective on the Google car crash, and ask us to consider "the number of crashes that occurred on the same day that were the result of human behaviour." [Ref: BBC News] In addition, some worry that computer-controlled cars might be 'trollable' – falsely led into reacting in a particular way for nefarious or accidental reasons – because: "As self-driving cars

increase in complexity (and they are among the most complex computer systems ever made)…the number of ways they can fail will increase", as even the most sophisticated AI systems don't possess our "uniquely human intelligence" [Ref: Slate].

## Man vs Machine

For writer and journalist Carl Franzen, "the biggest issue with self-driving cars lies in their inability to make moral and ethical decisions for which human drivers have so far been almost entirely responsible. Would-be autonomous carmakers might be uncomfortable programming such choices into their systems, but human drivers make such momentous split-second decisions with regularity." [Ref: Popular Mechanics] The development of artificial intelligence (AI), including in transport, has led some to consider ethical and moral questions about introducing this new technology into our lives. Human drivers make constant judgements – practical and moral – especially about the safety of ourselves and those around us, but will computers be programmed to do the same, and if so what decisions will their algorithms make? "Here is the nature of the dilemma. Imagine that in the not-too-distant future, you own a self-driving car. One day, while you are driving along, an unfortunate set of events causes the car to head toward a crowd of 10 people crossing the road. It cannot stop in time but it can avoid killing 10 people by steering into a wall. However, this collision would kill you, the owner and occupant. What should it do?"[Ref: MIT Technology Review] Others contest that: "When machines take over, the work required of the human is typically not removed", but rather our interaction with cars changes, and instead we will be a "monitor—one who constantly watches to detect and correct

technology failures". Ultimately, they argue that driving will become "a cooperative effort between humans and technology—one where the human plays a vital, active role in systems that optimize the interaction between the driver and the technology" [Ref: Newsweek]. There is also the question of responsibility, and if we can hold a machine to account in the event of accidents. Some argue that even if the law and ethics of automated vehicles are resolved: "Insurers still need to make confident judgments about risk, and this will be very difficult." [Ref: Atlantic]

## The future of driving

In parts of the world where the car has been prominent in our lives and cultures over the past half century, we are driving less, due to improvements in public transport and increased city-centre living, and some point out that, "in the rich world the car's previously inexorable rise is stalling." [Ref: Economist] Those who believe we have a duty to move to automation to reduce road-deaths, argue that despite peoples "illusion of an inalienable right" to drive, "passing laws [to move to automation] that protect us from harm is a good idea, even if some liberty is lost as a result." [Ref: Fusion] But despite the obvious advantages of road safety, might the driverless-car be a "dispiriting prospect" which deprives us of our autonomy and turns the freedom of travel into something "joyless" [Ref: Guardian]? Google and other developers point to the prospect of driving being opened up to everyone, and changing how we use that time spent in a car, "everyone could get around easily and safely, regardless of their ability to drive. Ageing or visually impaired loved ones wouldn't have to give up their independence. Time spent commuting could be time spent doing what you want to do."

[Ref: Google] So is a move to automation an unquestionable good for society? Will machines be granted 'personhood' in the future [Ref: Atlantic], and if so, do humans risk losing their sense of autonomy and control?

## IN DEPTH

[Autonomous and driverless cars case study](#)

*Institution of Mechanical Engineers* 10 February 2016

[Where to? A history of autonomous vehicles](#)

*Computer History Museum* 2016

[Why self-driving cars must be programmed to kill](#)

*MIT Technology Review* 22 October 2015

[The moral challenges of driverless cars](#)

*Communications* 2015

[Seeing the back of the car](#)

*Economist* 22 September 2012

## FOR

[A future of self-driving cars? We're ready now](#)

Stephen Shankland *Cnet* 23 January 2016

[Safety first: the future of driving](#)

Tim Gibson *Telegraph* 15 January 2016

[Self-driving cars: safe, reliable – but a challenging sell for Google](#)

Jemima Kiss *Guardian* 6 October 2015

[Driving should be illegal](#)

Kevon Roose *Fusion* 5 October 2015

## AGAINST

[The big question about driverless cars no one seems able to answer](#)

Brian Fung *Washington Post* 17 February 2016

[Sorry to disappoint, but driverless cars will still need drivers](#)

Michael Nees *Newsweek* 10 May 2015

[Why self-driving cars aren't ready to share the road with humans](#)

Carl Franzen *Popular Mechanics* 5 February 2015

[Driverless cars will ruin the thrill of driving](#)

Laura Barton *Guardian* 31 July 2014

Can self-driving cars cope with illogical humans?
Mark Prig *Daily Mail* 14 March 2016

Driverless cars pose worrying questions of life and death
Andy Sharman *Financial Times* 20 January 2016

Google's self-driving cars aren't as good as humans—yet
Alex Davies *Wired* 12 January 2016

Humans are slamming into driverless cars and exposing a key flaw
Keith Naughton *Bloomberg* 8 December 2015

Five big tests that driverless cars will have to pass
James Titcomb *Telegraph* 15 November 2015

When humans and robots share the roads
Adrienne Lafrance *Atlantic* 9 October 2015

Future proofing: Mobility
*BBC Radio 4* 26 September 2015

The future of driving, in one provocative chart
Alexander C. Kauffman *Huffington Post* 4 August 2015

The driverless car debate: how safe are autonomous vehicles?
Lauren Keating *Tech Times* 28 July 2015

If a self-driving car gets in an accident, who—or what—is liable?
Alexis C. Madrigal *Atlantic* 13 August 2014

Driverless cars: increased road safety and efficiency or 'lethal weapons'?
Oliver Balch *Guardian* 1 August 2014

Will Google's autonomous cars ruin driving, or liberate us from it?
Jeffrey Van Camp *Digital Trends* 31 May 2014

The ethics of autonomous cars
Patrick Lin *Atlantic* 8 October 2013

The trollable self-driving car
Samuel English Anthony *Slate* 2012

Self-driving car project
*Google*

Self-driving pods
*Transport Systems Catapult*

The CNN 10: Future of driving
*CNN*

[Google car crash 'not a surprise' - US transport secretary](#)
*BBC News* 14 March 2016

[Google self-driving car caught on video colliding with bus](#)
*Guardian* 9 March 2016

[BMW sees its future shift to ultimate self-driving machine](#)
*Bloomberg* 7 March 2016

[Google driverless car in road accident](#)
*Financial Times* 1 March 2016

[Ford speeds towards a self-driving future](#)
*Daily Mail* 23 February 2016

[Computers will take legal control of driverless cars](#)
*The Times* 11 February 2016

[Driverless cars: London wants Google vehicle trials](#)
*BBC News* 6 February 2016

[Autonomous vehicles will be safer, not perfect](#)
*Automotive News* 10 January 2016

[Self-driving vehicles expected on roads in next few years](#)
*China.org* 13 April 2015

[FBI warns driverless cars could be used as 'lethal weapons'](#)
*Guardian* 16 July 2014

[Google's driverless cars are 'safer' than human drivers](#)
*Telegraph* 29 October 2013

## AUDIO/VISUAL

[Uber and out: is there a future for driving?](#)
*Battle of Ideas* 17 October 2015

[Future proofing: Mobility](#)
*BBC Radio 4* 26 September 2015

[The CNN 10: Future of driving](#)
*CNN*

## ORGANISATIONS

[Google](#)

[Institution of Mechanical Engineers](#)

# ADVICE FOR DEBATING MATTERS

## FOR STUDENTS

READ EVERYTHING .....
In the Topic Guide and in the news - not just your side of the argument either.

STATISTICS ARE GOOD BUT.....
Your opponents will have their own too. They'll support your points but they aren't a substitute for them.

BE BOLD
Get straight to the point but don't rush into things: make sure you aren't falling back on earlier assertions because interpreting a debate too narrowly might show a lack of understanding or confidence.

DON'T BACK DOWN
Try to take your case to its logical conclusion before trying to seem 'balanced' - your ability to challenge fundamental principles will be rewarded - even if you personally disagree with your arguments.

DON'T PANIC
Never assume you've lost because every question is an opportunity to explain what you know. Don't try to answer every question but don't avoid the tough ones either.

## FOR JUDGES

Judges are asked to consider whether students have been brave enough to address the difficult questions asked of them. Clever semantics might demonstrate an acrobatic mind but are also likely to hinder a serious discussion by changing the terms and parameters of the debate itself.

Whilst a team might demonstrate considerable knowledge and familiarity with the topic, evading difficult issues and failing to address the main substance of the debate misses the point of the competition. Judges are therefore encouraged to consider how far students have gone in defending their side of the motion, to what extent students have taken up the more challenging parts of the debate and how far the teams were able to respond to and challenge their opponents.

As one judge remarked *These are not debates won simply by the rather technical rules of schools competitive debating. The challenge is to dig in to the real issues.'* This assessment seems to grasp the point and is worth bearing in mind when sitting on a judging panel.

## FOR TEACHERS

Hoping to start a debating club? Looking for ways to give your debaters more experience? Debaitng Matters have have a wide range of resources to help develop a culture of debate in your school and many more Topic Guides like this one to bring out the best in your students. For these and details of how to enter a team for the Debating Matters Competition visit our website, **www.debatingmatters.com**

## DEBATING MATTERS TOPIC GUIDES
www.debatingmatters.com

"WORLD REQUIRES THE CAPACITY TO MARSHALL CHALLENGING IDEAS AND ARGUMENTS"

LORD BOATENG, FORMER BRITISH HIGH COMMISSIONER TO SOUTH AFRICA