TAS Conversations Transcript

Episode 1: Autonomous Vehicles

Recorded on 28 July 2021

Hosted by Sean Riley

Featuring: Siddhartha Khastgir, Professor Sarah Sharples, Dr Jo-Ann Pattinson, Professor Mohammad Mousavi, and Dr Jack Stilgoe.

Transcript begins

0:00:04.400,0:00:08.480

Welcome to this the first of our TAS Hub

conversations the Trustworthy Autonomous Systems

0:00:08.480,0:00:14.480

Hub is here to establish a platform for the UK to

deliver best practices for design regulation and

0:00:14.480,0:00:19.600

operation of autonomous systems which are there to

benefit society. The idea is that we build systems

0:00:19.600,0:00:26.240

that are trustworthy in principle and also trusted

in practice. For this first fireside chat note the

0:00:26.240,0:00:31.200

air quotes albeit socially or more importantly

physically distanced we are looking at AVs or

0:00:31.200,0:00:35.360

autonomous vehicles perhaps if we get an AV we might be able to meet each other who knows now

0:00:35.360,0:00:40.560
the TAS podcast living with AI has talked a couple of times about AVs and we've gathered a diverse

0:00:40.560,0:00:45.120
group of experts to chat about it today and before we get into the meat of it you can get all sorts

0:00:45.120,0:00:53.440
of information about the TAS Hub events, podcasts and how to get involved at our website task.ac.uk.

0:00:53.440,0:00:58.080
So on to the main event first I'd like to welcome all our guests and we'll get them to introduce

0:00:58.080,0:01:02.640
themselves and for no other reason than it's how I've typed it here first name alphabetical order

0:01:02.640,0:01:08.160
let's start with Jack. Hi everybody I'm Jack Stilgoe, I'm associate professor in science

0:01:08.160,0:01:14.880
technology studies at University College London and I run a social science research project

0:01:15.680,0:01:21.200
that's called Driverless Futures that's all about
how we make good policy for autonomous vehicles.

0:01:21.200,0:01:26.400
My name is Jo Pattinson and I'm a research
fellow at the Institute for Transport Studies

0:01:26.400,0:01:32.080
at the University of Leeds and I'm a
Legal Research Fellow so I investigate

0:01:32.080,0:01:36.080
legal issues to do with autonomous
vehicles. I'm also a solicitor

0:01:36.640,0:01:40.640
I'm a consultant at Addulshaw Goddard
solicitors in their transport team.

0:01:40.640,0:01:45.280
I'm Mohammad Mousavi, Professor of Software
Engineering about to join King's College London,

0:01:45.280,0:01:48.160
probably by the time this is broadcast
I will be at King's College London

0:01:48.880,0:01:54.400

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my area of interest is in validation and
verification of autonomous systems and I lead

0:01:54.400,0:02:00.400
also the Verifiability Node in the TAS programme.
Hi Sean, hi everybody, Siddhartha Kastgir Head

0:02:00.400,0:02:04.560
of Verification and Validation for
connected autonomous vehicles at WMG,

0:02:04.560,0:02:12.080
the University of Warwick. I'm on a mission
of making autonomous vehicles safe but also

0:02:12.080,0:02:16.720
ensuring they're deployed in a safe manner. I
do a lot of work on the standard side of things

0:02:16.720,0:02:24.000
ensuring that the industry as a whole agrees
to strong standards that we have to adhere to.

0:02:24.000,0:02:29.520
Hi everyone I'm Sarah I'm a Professor in Human
Factors at the University of Nottingham and one

0:02:29.520,0:02:36.640
of the investigators on the TAS Hub where I take
a lead on equality, diversity and inclusion. I'm

0:02:36.640,0:02:40.640
currently a pro-vice-chancellor at the University
of Nottingham but by the time this is broadcast

0:02:40.640,0:02:44.640
I will be chief Scientific Advisor for the
Department for Transport and obviously in

0:02:44.640,0:02:50.560
that role responsible for making sure that we have
the right research ecosystem to inform transport

0:02:50.560,0:02:56.880
policy but also taking the understanding that we
have from academic research and ensuring that that

0:02:56.880,0:03:01.760
informs transport policy in the most effective
way and speaking here in a personal capacity.

0:03:01.760,0:03:05.840
Fantastic, and so if I can start with
you actually because the thing I wondered

0:03:05.840,0:03:08.480
initially I was going to say so what are
you going to be telling the government about

0:03:08.480,0:03:12.160

AVs but I was going to just sort of say
can we draw on something you've worked on

0:03:12.160,0:03:15.600
in the past so I know you've been involved
in Network Rail and doing things to do with

0:03:15.600,0:03:19.440
the railways, did they ever
consider autonomous trains?

0:03:20.240,0:03:25.600
Yes I mean it's worth remembering that we've
almost had autonomous trains since the 1960s

0:03:25.600,0:03:30.000
so many of you may or may not be aware that
the Victoria line was one of the pioneers

0:03:30.000,0:03:35.440
in terms of autonomous vehicles and it uses
now it's it's been modified in recent years

0:03:37.200,0:03:46.160
a system where the spacing of the vehicles is
managed from an autonomous an automated system,

0:03:46.160,0:03:51.600
of course, the driver still has an important role
in that context but the driver is much more about

0:03:52.400,0:03:56.960
making sure that they provide that really
important link between the automated vehicle

0:03:56.960,0:04:03.520
and the passengers themselves but if you ever get
a chance to go and visit the Victoria line control

0:04:03.520,0:04:09.760
system it's a really really interesting space
to explore because actually we'll see that the

0:04:09.760,0:04:14.640
majority of the decisions particularly about the
routing and the spacing and the frequency of the

0:04:14.640,0:04:20.160
trains happens on an automated basis and in fact
it's pretty much been doing so since the 1960s.

0:04:20.160,0:04:22.400
We're living in an age of
automated vehicles already.

0:04:24.480,0:04:28.160
Has anyone got anything they particularly want
to say before I start directing because I mean

0:04:28.160,0:04:32.480

we've got liability issues and we've got Jo
there who hopefully can talk to us about those,

0:04:32.480,0:04:37.600
we've got sort of the trust issues and
and there are all sorts of you can talk

0:04:37.600,0:04:40.400
to us about that from a social point of
view, from a technical point of view.

0:04:40.400,0:04:46.480
Yeah I definitely agree with everything that Sarah
said that we have a history a very rich history of

0:04:46.480,0:04:50.320
research in designing and engineering
autonomous systems. I think what is

0:04:50.320,0:04:55.520
changing right now is that we are entering an era
where autonomous systems will interact with lots

0:04:55.520,0:05:00.000
of human and non-autonomous systems and they
have to make themselves understood, negotiate

0:05:00.880,0:05:05.200
their way and then this is something that is
somewhat unprecedented to what we have had

0:05:05.200,0:05:12.880
in the past. So future AVs will have to talk to
and communicate to human beings to human drivers

0:05:12.880,0:05:16.320
to other road users and this is a very
very interesting challenge ahead of us.

0:05:16.880,0:05:21.360
And socially, I'm going to come to Jack with this
one because you know that idea of communicating

0:05:21.360,0:05:27.520
with a robot, I mean, we do this all the time
you know we've all become accustomed to saying

0:05:27.520,0:05:31.360
I'm not going to mention any of the virtual
assistants by name in case it sets somebody's

0:05:31.360,0:05:38.320
device off but hey 'blah' you know what's the
next train to London? or whatever is that going

0:05:38.320,0:05:43.200
to be a similar kind of thing, are we just going
to get used to you know asking the vehicle to

0:05:43.200,0:05:47.840

take us where we want or the vehicle is going
to tell us that we're in the way or whatever,

0:05:47.840,0:05:50.720
how's that going to work socially are
going to people going to accept that?

0:05:50.720,0:05:54.720
That's the right way of thinking about it Sean
is to ask well how are we going to get used to

0:05:54.720,0:06:00.800
this right because the the the sort of ideal of
artificial intelligence is that it's a technology

0:06:00.800,0:06:09.120
that can adapt and learn human capacities and then
emulate those and then and then supersede them

0:06:09.680,0:06:16.480
and what will happen certainly with with
autonomous vehicles is that there will be you know

0:06:16.480,0:06:21.840
the technology adapting to society and learning
how to fit in in effect learning how to drive

0:06:21.840,0:06:26.320
but also there will be a huge amount of
society learning to adapt to the technology

0:06:26.320,0:06:31.280
and that's a bit of a dirty secret among among the
engineers right they don't want to talk about that

0:06:31.280,0:06:36.320
because they don't want to be seen to be making
impositions upon people saying you know you might

0:06:36.320,0:06:40.800
learn how they might have to learn how these
things behave so that you you learn to cross the

0:06:40.800,0:06:45.440
road differently or you learn to drive differently
around these these technologies when you're when

0:06:45.440,0:06:51.120
you're in mixed traffic so it's going to be a
negotiation that trust relationship and at the

0:06:51.120,0:06:59.360
moment we're hearing more of the sort of utopian
techno side of that of that conversation than the

0:06:59.360,0:07:04.320
rather more complicated messy side which is how
does the society learn to deal with these things.

0:07:04.960,0:07:08.880

And the often the thing that's brought up with anything to do with AVs is all the edge cases

0:07:08.880,0:07:14.400
but actually just the general day-to-day is going to be really interesting but the thing that we can

0:07:14.400,0:07:19.680
never get away from and we've got to discuss it is this kind of liability issue what happens if

0:07:19.680,0:07:26.720
you know from accidents to mistakes taking you to the wrong place all sorts of things like that

0:07:26.720,0:07:31.280
you know we live in an ever-increasing litigious society Jo how are we going to

0:07:31.280,0:07:36.080
manage this kind of idea of let's be honest whose fault is it where is the blame lie?

0:07:36.800,0:07:42.640
Yeah well I guess there's two on this topic I guess there's two things that I'm particularly

0:07:42.640,0:07:47.440
interested in, one is that the way that the framework that we're that looks as though we're

0:07:47.440,0:07:56.800
currently setting up at the UN level and at a UK
level is that especially where you're looking at

0:07:56.800,0:08:03.840
having a a driver that is sharing responsibility
with an AV is that we it looks as though we

0:08:03.840,0:08:09.600
are potentially going to be legislating behavior
on the heart of the driver that might not actually

0:08:09.600,0:08:16.400
be physiologically possible on the part of the
driver as in here I'm talking specifically about

0:08:17.600,0:08:22.720
responding to transfer demands transfer
of driving demands from system to driver

0:08:23.600,0:08:30.400
and everyone who works in this space knows that
the drivers don't necessarily do that very well

0:08:31.040,0:08:37.120
but as when you as Jack pointed out their
the public is necessarily aware of that

0:08:37.840,0:08:43.200

they're not aware of their own physiological and
cognitive limitations that may prevent them from

0:08:43.200,0:08:49.040
responding with the best will in the world drivers
may not respond in the way that they're meant to

0:08:49.040,0:08:55.920
and they will end up there will be liability
issues for them despite all their best intentions

0:08:55.920,0:09:00.560
in sharing responsibility with the vehicle and
the other issue which I'm particularly interested

0:09:00.560,0:09:07.040
in is the types of data and how are they how the
types of data that is going to be recorded about

0:09:07.040,0:09:14.720
all this and who has access to that data what type
of format that data is going to be given to people

0:09:15.280,0:09:19.760
because that is extremely relevant in terms of
an insurance investigation in terms of a criminal

0:09:19.760,0:09:25.440
investigation, civil liability are you going to
get a spreadsheet that simply says yes you did a

0:09:26.080,0:09:33.680
break input for example or do you have access to
the data behind that behind that data so these

0:09:33.680,0:09:39.440
are the types of very gritty issues which
we still haven't gotten to the bottom of.

0:09:40.000,0:09:46.800
Yeah this is the kind of the idea of the machine
beeping or whatever the notification is to say

0:09:46.800,0:09:51.200
hey you've got to take control now and how much
warning you're going to get for that and what

0:09:51.200,0:09:57.200
sort of you know state is going to put the driver
in there's another side issue to this which is

0:09:57.200,0:10:00.800
you know whenever we talk about technology
and things become more computerized we have

0:10:00.800,0:10:04.640
to worry about the possibility of being
hacked and various things like that is

0:10:04.640,0:10:09.280

that something one of you would like to sort of take on is that Siddhartha or Mohammed from a

0:10:09.280,0:10:13.280
technical point of view how do we guard against say you know hacks or whatever?

0:10:13.840,0:10:21.200
If we try and stop hacking from happening that's not going to happen there will always be a clever

0:10:21.200,0:10:28.560
person in the society who will find out a way of penetrating the system what we as engineers or

0:10:28.560,0:10:35.040
as as designers of systems need to do is identify that we are being hacked and then go into a safe

0:10:35.040,0:10:41.600
mode it's not about preventing the hacking from initially taking place it's about identifying that

0:10:41.600,0:10:47.200
something is going happening so if we take that mindset into picture I think that's that's would

0:10:47.200,0:10:54.080
be a kind of a departure from the way we tend to look at cyber security we tend to ensure that

0:10:54.080,0:11:02.000
the system is secure but that's actually kind of
oxymoron you cannot prevent somebody from creating

0:11:02.000,0:11:08.480
a append text on your system so it's about trying
to detect and then doing the subsequent activities

0:11:08.480,0:11:13.360
just accepting that these are going to be things
that happen and making sure that we manage them

0:11:13.360,0:11:17.760
yeah it's it's uh makes sense I mean there are
safety and security concerns across the board

0:11:17.760,0:11:23.120
with this so I mentioned hacking we've obviously
mentioned kind of the the blame or the the legal

0:11:23.120,0:11:28.240
side of things but the point is as well is that
there's always potentially going to be a glitch

0:11:28.240,0:11:32.800
maybe it's in an edge case maybe it's something
nobody's thought of maybe it's you know what's

0:11:32.800,0:11:38.000

the safe mode here how you mention safe mode
for hacking is that just well the vehicle comes

0:11:38.000,0:11:44.320
to a gentle stop and you know hopefully in a safe
place what what's the what's the way around this?

0:11:44.320,0:11:49.040
Let's first give an engineering viewpoint on this
and then I'll give you the right viewpoint on this

0:11:49.040,0:11:55.680
uh the engineering viewpoint on this is to
make the system come to a standstill that's an

0:11:55.680,0:12:01.920
engineering viewpoint on this but if you consider
the kind of interactions the autonomous vehicles

0:12:01.920,0:12:07.120
or autonomous systems are going to have we
need to have a departure from the way we

0:12:07.120,0:12:13.760
treat safety we tend to think of safety as just
that vehicle needs to be safe and because now

0:12:13.760,0:12:19.760
the vehicle is in a wider system we need to have
this systems approach where society and public and

0:12:19.760,0:12:25.680
humans are also part of that system so safety
needs to be taken at a much higher abstraction

0:12:25.680,0:12:30.880
level than just at that vehicle level so I think
so that would be the right answer I'm not sure

0:12:30.880,0:12:36.560
that we've got to it right now but that's the
journey that we as a society need to uh take.

0:12:37.200,0:12:42.160
There's also a there's a cost implication here
isn't it I mean we've seen commitments from

0:12:42.160,0:12:49.200
various governments to switching from fossil fuels
and and looking if you take a sort of look at the

0:12:49.200,0:12:54.400
market now and just decide right I'm going to move
to an electric vehicle there's a huge price sort

0:12:54.400,0:12:59.840
of bump in moving over to that if we also take
into account the technology that will be required

0:12:59.840,0:13:04.240

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to make autonomous vehicles work it's going to
be costly isn't it is it going to be expensive?

0:13:05.440,0:13:11.200
I think this is another another one of those
issues where where the hype and the reality

0:13:11.200,0:13:18.800
are currently wildly far apart right I think so
the story that's currently being told you know

0:13:18.800,0:13:22.880
if you would listen if you were to listen to what
say Elon Musk would say about autonomous vehicles

0:13:22.880,0:13:28.400
it's about in effect a like for light replacement
you take a conventional car off the road you put

0:13:28.400,0:13:33.760
an autonomous vehicle in its place it learns
how to drive and basically nothing else in the

0:13:33.760,0:13:42.240
world needs to change I think we have to realize
that the whole system of vehicles roads mobility

0:13:43.440,0:13:48.720
you know we do need to see that as as a whole and
that throughout history when there has been a new

0:13:48.720,0:13:54.880
technology arriving the system the infrastructure
has to adjust as well in order to make that

0:13:54.880,0:14:01.280
technology work and in order for it to to work
safely and it will happen with autonomous vehicles

0:14:01.280,0:14:07.760
as well we can imagine you know small incremental
changes to things like traffic lights to mean that

0:14:07.760,0:14:13.680
they communicate their status electronically
rather than a camera having to look at the

0:14:13.680,0:14:19.840
color of a traffic light which is a rather absurd
thing for to imagine in in engineering terms but

0:14:19.840,0:14:24.960
also we could look at you know the redesign
of roads that maybe suit autonomous vehicles

0:14:24.960,0:14:29.680
slightly better than they suit conventionally
driven vehicles we might look at the redesign of

0:14:29.680,0:14:34.480

of our lives to mean that pedestrians are no
longer allowed to go on certain forms of roads in

0:14:34.480,0:14:40.400
the same way as they know that they're currently
not allowed to go on motorways and things so

0:14:40.400,0:14:46.640
if you see this as a as one big what a social
scientist would call a socio-technical system

0:14:46.640,0:14:53.520
the engineering challenge looks vast right how we
get from here to there looks extremely complicated

0:14:53.520,0:14:59.120
it's going to be a mix of sort of incremental
changes and some pretty radical disruptions.

0:14:59.120,0:15:02.880
But one of those changes that is mooted
occasionally and it seems to make perfect sense

0:15:02.880,0:15:08.320
to me is this idea of sharing vehicles because
you know I have a car parked outside maybe once

0:15:08.320,0:15:12.560
or twice a week I need to drive somewhere and film
something with my video camera and the rest time

0:15:12.560,0:15:17.120
it's sitting there there might be 10 cars on our
street and and half of them are there nearly all

0:15:17.120,0:15:22.240
the time you know they might not be the same
ones but why not have this idea of you know

0:15:22.240,0:15:27.040
when you need an estate car because you're
going to Ikea the estate car is the one you take

0:15:27.040,0:15:31.680
it's not it doesn't belong to the guys at number
four it might just be a pool car I don't know

0:15:31.680,0:15:34.560
so is that something that's been
seriously considered across the board?

0:15:35.600,0:15:39.680
Absolutely and I think one of the things
that's worth us remembering is the spectrum

0:15:39.680,0:15:47.440
of what we mean by autonomous vehicles so first
of all as as Jack's sort of implied actually what

0:15:47.440,0:15:54.320

we're probably not going to have is a big bang
switch we're going to have gradual incremental

0:15:54.320,0:16:00.720
addition of autonomy and automated technologies
in the vehicles that we already have but we're

0:16:00.720,0:16:08.720
also going to see this shifting mindset so as Jack
was talking about in terms of the socio-technical

0:16:08.720,0:16:15.440
challenge of the what a future transport system
might look like let's remember that some of the

0:16:15.440,0:16:22.560
best use cases for autonomous vehicles aren't
necessarily a conventional family car that you

0:16:22.560,0:16:29.840
talked about here it's how do we get from the
car park to the airport in an an airport context

0:16:29.840,0:16:37.280
it's looking at last mile delivery of goods it's
looking at particular types of cities or types of

0:16:37.280,0:16:44.240
rural locations that might particularly benefit
from autonomy and and it's also interesting that

0:16:44.240,0:16:49.440
you talk about the sort of electric vehicles and
other factors as well we've got lots of different

0:16:49.440,0:16:55.040
things happening that are radically changing
the way in which we move both as individuals

0:16:55.040,0:17:00.400
and within our public transport and actually what
we need to do is try and understand how all of

0:17:00.400,0:17:05.600
this fits together because some of these things
are going to be much much easier and quicker to

0:17:05.600,0:17:10.720
shift and some of them will require that quite
difficult mindset change that Jack referred to.

0:17:11.520,0:17:17.040
We've discussed in a podcast before you know
automated vehicles flying vehicles taking medical

0:17:17.040,0:17:21.680
supplies to places and as you say you know this
idea of that last-mile delivery you know we know

0:17:21.680,0:17:26.880

Amazon are trialing whether it's successful or
not drone deliveries whether it's practical or

0:17:26.880,0:17:31.360
not as well might be another question but hey.
So one point that is relevant to the discussion

0:17:31.360,0:17:37.440
both about liability and about safety and security
and their connection I think it's the way we build

0:17:37.440,0:17:43.760
systems so so we may as also pointed out by
Jack and Sarah we may need a different mindset

0:17:43.760,0:17:48.720
in engineering these systems that takes human
beings very seriously and also takes this whole

0:17:48.720,0:17:57.120
interaction very seriously and one aspect that
is definitely um not very prominent right now and

0:17:57.120,0:18:02.400
should become much more prominent in the future
is technical transparency of these systems so

0:18:02.400,0:18:08.320
these systems evolve they learn that they
they change their behavior and if there is not

0:18:08.320,0:18:13.760
sufficient technical transparency being built into
these systems then finding the root cause for for

0:18:13.760,0:18:20.800
various accidents becomes impossible and because
these systems are becoming increasingly complex

0:18:20.800,0:18:25.280
we need more transparency built into these
systems in order to analyze how they behave

0:18:25.840,0:18:30.880
and and also make the user and this divider
society aware of of the consequences of

0:18:30.880,0:18:36.160
that different behavior that also relates to the
aspects like ethics right so the the user should

0:18:36.160,0:18:42.480
be aware of the type of ethics that is implemented
in the car and if that that is modified the user

0:18:42.480,0:18:46.160
should also be aware of those modifications so I
think technical transparency is something that is

0:18:46.160,0:18:51.280

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a bit overlooked and and should become much more
prominent in the agenda of building these systems,

0:18:51.280,0:18:56.480
And even with some of the complicated edge cases
in the engineering side of things the ethics is

0:18:56.480,0:19:02.960
of I would say more difficult problem to solve
than than even any of the the technical side of it

0:19:03.600,0:19:08.560
we've talked about it being a sort of slow
change over into it it won't be an on off switch

0:19:09.120,0:19:13.200
so there's going to be all sorts of integration
issues with human drivers working with

0:19:13.200,0:19:17.360
autonomous vehicles in the same mix
as well as in different kind of areas

0:19:17.360,0:19:22.240
you know whether it be drones or whatever
but are we going to have a huge kind of

0:19:22.880,0:19:27.280
pardon the kind of cliche rise of the
robot style unemployment problem Sarah?

0:19:27.280,0:19:31.760
If you've ever heard me speak before then I've
probably mentioned my favourite ever academic paper

0:19:31.760,0:19:36.320
which was called ironies of automation
and it was published in 1983

0:19:36.880,0:19:42.560
and one of the ironies of automation that
was highlighted was around the changing

0:19:42.560,0:19:48.000
nature of jobs as we introduce automation
and the change of jobs from active jobs

0:19:48.000,0:19:53.680
active control jobs to passive monitoring jobs
and the fact that those different skills might

0:19:53.680,0:19:59.840
be required and but actually we might end up
with almost the the wrong skills being trained

0:19:59.840,0:20:05.200
in the people who are now doing the jobs because
the automation itself has changed. When I think

0:20:05.200,0:20:10.320

about automation in all sorts of contexts whether
it's vehicles or manufacturing or other contexts

0:20:11.040,0:20:15.680
I try and think about what the changing
nature of skills requirements might be

0:20:16.240,0:20:22.480
and the changing nature of jobs so yes of course
we have a responsibility to make sure that any

0:20:22.480,0:20:29.440
sort of whole scale implementation of technology
doesn't radically shift the number of jobs that

0:20:29.440,0:20:33.280
are available from a sort of national point of
view because then we end up with all sorts of

0:20:33.280,0:20:38.560
unintended consequences but what's really helpful
for us to think about is the changing nature of

0:20:38.560,0:20:43.840
jobs that might come about through the nature
of automation it's worth remembering that in

0:20:43.840,0:20:51.840
the 1970s we all thought that by now in fact by
the 1990s we would be working four day weeks um

0:20:51.840,0:20:58.400
we would have all of our household tasks and many
of our other tasks done by automated technologies

0:20:58.400,0:21:05.360
and actually what happened was those automated
technologies came but our work tie our work lives

0:21:05.360,0:21:10.080
actually probably increased in terms of the number
of hours we worked rather than decrease the number

0:21:10.080,0:21:14.960
of hours because as a society and there are others
around who know much more about this than I do

0:21:14.960,0:21:21.120
as a society we changed and adapted so actually
what's really important here I think is to think

0:21:21.120,0:21:27.200
about what the changing nature of jobs might
be and the changing nature of roles might be

0:21:28.000,0:21:32.240
and make sure that the work that we're doing
when we're looking at autonomous vehicles

0:21:32.240,0:21:37.120

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is linked up with that wider societal
questioning so that we can make sure

0:21:37.120,0:21:41.200
that we're informing those skills requirements
in those skills debates in a responsible way.

0:21:41.840,0:21:46.560
And just on the subject of automation because I
used to work in broadcast automation where the

0:21:46.560,0:21:52.160
idea was you came in and you took a gallery in
a television station of five or ten people and

0:21:52.160,0:21:57.600
you switched it to be one person pressing one
button and what actually happens is all of the

0:21:57.600,0:22:02.160
jobs that are being done in the gallery just have
to be done at a different stage usually by typing

0:22:02.160,0:22:07.440
instructions into a computer but you can just
end up moving where the decision making process

0:22:07.440,0:22:12.800
happens so that when you do press that one button
lots of things happen that have been pre-decided

0:22:12.800,0:22:15.760
that actually you have now haven't got
much of a chance to change if you need to

0:22:16.480,0:22:19.440
so you become less dynamic,
Jack you wanted to speak.

0:22:19.440,0:22:25.040
Yeah just to follow what what Sarah was saying I
think she's absolutely right but you know I think

0:22:25.040,0:22:31.360
it's important to remember that the sort of the
history of technology employment and automation

0:22:31.360,0:22:37.600
you know is one in which automation does not
replace labour it sort of displaces and transforms

0:22:37.600,0:22:46.080
labour it reconfigures jobs jobs are not the same
things as as as tasks so what does that mean for

0:22:46.080,0:22:54.080
the road? well I mean it it could mean all sorts
of things but if you want to sort of un some of

0:22:54.080,0:23:00.480

the transformations that that might be created
in a world in which a lot of driving is automated

0:23:00.480,0:23:04.000
I think you can look at what's been happening
the last few years to do with the gig economy

0:23:04.560,0:23:11.920
right where it wasn't a robot saying I can drive
your goods from a to b it was a relatively small

0:23:11.920,0:23:17.200
technological uh invention but more a business
model innovation that has transformed the

0:23:17.200,0:23:22.640
nature of work yet which yes it's created some
flexibility but also it's created some enormous

0:23:22.640,0:23:28.800
downsides as well right and we so we shouldn't kid
ourselves that robots put people out of work right

0:23:28.800,0:23:35.120
people put people out of work and then create
different different jobs using the affordances

0:23:35.120,0:23:40.800
of robots so it's not going to be at all at all
straightforward to anticipate what's going to

0:23:40.800,0:23:46.560
happen to the future of of driving jobs and and
there is an interesting point there which is uh

0:23:46.560,0:23:50.880
which has been brought up before which is uh with
the amount of computation required a minute to

0:23:50.880,0:23:57.600
take a car somewhere for instance and safely it's
much cheaper to have a human sitting potentially

0:23:57.600,0:24:03.200
short term anyway uh Siddhartha I think you wanted
to say something yeah just to add to what Sarah

0:24:03.200,0:24:10.960
and Jack's point here um I think we should look
at it rather as an opportunity uh of leveraging

0:24:10.960,0:24:18.720
the benefits of automation while compensating for
what might be perceived as drawbacks so there's a

0:24:18.720,0:24:25.760
lot of work we as academics engineers policymakers
could do in terms of reskilling the workforce uh

0:24:25.760,0:24:31.840

to cater to the new types of jobs that would be
created because automation has been introduced so

0:24:31.840,0:24:38.480
I would rather say that we are creating new jobs
than uh losing jobs over here I think that focus

0:24:38.480,0:24:43.520
needs to be brought in in terms of reskilling
you can look at it even as a as engineer so I am

0:24:43.520,0:24:48.960
a trained mechanical engineer but I'm not working
on nuts and bolts right now I'm working on making

0:24:48.960,0:24:53.920
autonomous vehicles safer so there's a lot of
transition I have had in my own career in the last

0:24:53.920,0:24:59.440
10 years from being a hardcore mechanical engineer
to what I now call as a mechatronics person so i

0:24:59.440,0:25:06.480
think the same is true for the wider workforce
non-engineering workforce uh also over here.

0:25:06.480,0:25:10.960
Yeah so I wanted to react to two points first
of all I disagree that it's cheaper to have

0:25:10.960,0:25:15.680
a human driver in in the driver's seat in
many applications if you look at how much

0:25:15.680,0:25:24.160
for example an NVidia board costs right now uh if
you have a proper programming uh skill in place

0:25:24.960,0:25:30.880
and you can make it work and then you calculate
for how long that nvidia board will uh will go

0:25:30.880,0:25:35.760
for for an autonomous vehicle it's much cheaper
than a human driver for the same period so I think

0:25:35.760,0:25:42.320
the challenge is not um the cost of hardware and
and having an autonomous vehicle built I think the

0:25:42.320,0:25:46.880
challenge is to have the right skills to program
them and and make sure that they're safe if you

0:25:46.880,0:25:51.040
manage you may manage to do that it's likely to
be much cheaper in many applications then ...

0:25:51.040,0:25:54.880

The point was at the moment right now
put someone in a car quite cheap...

0:25:54.880,0:25:58.240
If you have the right software then
it's much cheaper to use the the

0:25:58.240,0:26:01.760
autonomous technology but anyway and the
second point I wanted to make is that

0:26:01.760,0:26:08.880
um we we learned from this all this automation
history that we need to be more agile

0:26:08.880,0:26:14.640
in terms of engineers in terms of educators
in terms of students and and be reactive to

0:26:14.640,0:26:19.920
all those changes in our surroundings so in
the past you could uh join a company and have

0:26:20.640,0:26:27.520
30 years of safe career just doing what you
did 30 years ago maybe but nowadays we should

0:26:27.520,0:26:32.160
be more more receptive of the changes around
us also us as academics we should be much more

0:26:32.160,0:26:38.000
receptive of things changing around us and
reacting to that and that is something that

0:26:39.920,0:26:44.640
we should take into account also for example in
designing curriculum which we should uh we should

0:26:44.640,0:26:48.480
look into what is happening and then design
our curriculum accordingly every now and then.

0:26:49.040,0:26:53.920
And it's interesting mentioning kind of
like reactive and agile and changing i

0:26:53.920,0:26:58.240
I want to bring Joe in on this because we've
mentioned the podcast before how does the law

0:26:58.240,0:27:01.120
keep up with things that are changing so fast? and

0:27:01.760,0:27:06.160
you know it it's difficult isn't it to make laws
about something that perhaps isn't there yet?

0:27:07.520,0:27:14.480
Yeah the laws it's never really been famous for

um being at the forefront of these things it

0:27:14.480,0:27:24.000
generally is playing catch-up um in terms of no
matter what aspect of or of autonomous vehicles

0:27:24.000,0:27:31.520
or or autonomous systems you happen to name um we
we're currently at an international level and a

0:27:31.520,0:27:39.200
national level there are regulations being drafted
and redrafted with the input of various um experts

0:27:40.080,0:27:49.380
and it is a constantly changing and updating uh
situation so and it really is um it's it really is

0:27:49.920,0:27:54.400
an adaptive form of regulation that that
we that we're involved in when it comes to

0:27:54.400,0:28:00.960
automation where we are literally learning as
we go along um but unfortunately in terms of

0:28:00.960,0:28:08.560
it is always going to be behind um and and that
is that is that is the nature uh unfortunately

0:28:08.560,0:28:15.840
of law that it it has to it has to look at
what it has to react to to what's happened so

0:28:15.840,0:28:17.520
Fair enough yeah go ahead Jack

0:28:17.520,0:28:21.360
It's quite an interesting question I know the
Siddhartha will have will have thoughts about this

0:28:21.360,0:28:25.600
as well so you can think about the relationship
between law and technology in a number of

0:28:25.600,0:28:28.720
different ways I think particularly interesting
when you're thinking about technologies that

0:28:28.720,0:28:36.560
purport to be able to drive right because one one
requirement could be here this technology has to

0:28:36.560,0:28:44.000
follow exactly the rules that a human driver needs
to follow in order to be certified to be released

0:28:44.000,0:28:49.520
onto the road right so we could actually say well
the law already exists the technology just needs

0:28:49.520,0:28:56.560
to follow the the law now that becomes complicated
in a few ways that Siddhartha can can can tell you

0:28:56.560,0:29:03.520
uh all about but it might lead to sub-optimal
social outcomes because maybe actually in order

0:29:03.520,0:29:08.560
to realize the potential of this technology we
need to change the law so and this so there's

0:29:08.560,0:29:14.240
this sort of dialogue between between the the law
and technology we're just saying a rule following

0:29:14.240,0:29:19.200
technology might not be the best for everybody
and might lead to some impossible situations.

0:29:19.200,0:29:23.120
I can just imagine one we mentioned
before about the kind of clumsy

0:29:23.120,0:29:27.360
camera looking at the traffic light working out
what color it is and deciding whether to go well

0:29:27.360,0:29:31.520

if the entire road was just autonomous
vehicles the traffic lights shouldn't be

0:29:31.520,0:29:37.760
required at all right because presumably the
the vehicles would communicate and negotiate

0:29:37.760,0:29:40.400
who goes where would is that am
i right with that Siddhartha?

0:29:41.600,0:29:47.760
Yeah yeah yeah you but that's a utopian world that
we're talking about and as Sarah and Jack said we

0:29:47.760,0:29:54.560
would be in a gradual shift towards this i'll give
you a very simple example where just following

0:29:54.560,0:30:01.120
the law as it is today is not the optimal
solution so imagine of a zebra crossing as as

0:30:01.120,0:30:05.840
human drivers if we approach a zebra crossing as
a pedestrian standing next to the zebra crossing

0:30:05.840,0:30:11.040
you're supposed to stop that's all what sane human
drivers would do imagine the same thing being

0:30:11.040,0:30:16.640
done by an autonomous vehicle so the autonomous
vehicle stops at the zebra crossing as per the law

0:30:17.360,0:30:22.960
the law does not state how long should the
autonomous vehicle stop if the pedestrian just

0:30:22.960,0:30:28.880
stands next to the zebra crossing chatting on the
phone does the autonomous vehicle stop there in

0:30:28.880,0:30:35.520
indefinitely and cause you uh traffic jam behind
itself so those are the kind of assumptions that

0:30:35.520,0:30:41.760
need to be taken into consideration when we
sort of redraft the law or come up with the

0:30:41.760,0:30:49.760
the law of framework 2.0 for autonomous vehicles
we keep on saying autonomous vehicles automation

0:30:49.760,0:30:56.560
is much safer than human drivers but we
uh belittle how good human drivers are

0:30:56.560,0:31:00.640

there's a lot of implicit things that
we do that are not defined in anyway

0:31:01.360,0:31:07.840
which actually keep the world safe and those
will need to be defined in this in this new law

0:31:08.560,0:31:14.000
when we are planning of a safer society
considering all the actors it's very easy

0:31:14.000,0:31:19.360
to make autonomous vehicles safe it's difficult
to make a society with autonomous vehicles safe.

0:31:19.360,0:31:20.080
Sarah,

0:31:20.080,0:31:24.880
Siddhartha's uh follow-up is music to my
ears really because one of the things I see

0:31:24.880,0:31:30.320
as a professor of human factors is humans are
fallible and humans are brilliant and our job

0:31:30.320,0:31:35.280
is to design systems that minimize the impact
of human fallibility and maximize the impact of

0:31:35.280,0:31:40.000
human brilliance and what Siddhartha is really
talking about is we need to design a resilient

0:31:40.000,0:31:46.960
transport system and we need to remember that very
often sources of resilience are human brilliance

0:31:46.960,0:31:53.760
so we're very very good at noting when things go
wrong but actually we're not so good at realizing

0:31:53.760,0:31:58.880
the number of times that things go right and
Siddhartha's example of the zebra crossing is

0:31:58.880,0:32:03.680
actually it's it's brilliant because think about
the subtleties of human behaviour that happen

0:32:03.680,0:32:09.280
as you stop at a zebra crossing um because you
stop you observe you don't just observe whether

0:32:09.280,0:32:13.920
there's a person and whether they're walking
across the zebra crossing you observe the age

0:32:13.920,0:32:18.480
of that person you observe whether they've got

mobility impairments of some sort and they might

0:32:18.480,0:32:24.400
need to um uh walk more slowly you might even have
a little friendly wave or a smile at the person i

0:32:24.400,0:32:29.840
live in Nottingham so we're very friendly here um
and uh or you might have someone who's standing

0:32:29.840,0:32:33.760
at the side of the road they realize oh whoops
I've stood by the side the road I'm on my phone

0:32:33.760,0:32:39.440
they'll give a little wave to the driver and we're
talking about what five ten seconds of interaction

0:32:39.440,0:32:45.120
here the complexity of programming all of those
different possibilities is absolutely enormous

0:32:45.120,0:32:50.720
but also let's remember that humans are
sentient beings and actually it's quite nice

0:32:50.720,0:32:55.280
if you're driving along and you stop and you have
a pleasant interchange with a passenger um sorry

0:32:55.280,0:33:02.160
with a pedestrian on a zebra crossing um so just thinking about where the economies of scale are

0:33:02.160,0:33:08.480
in introducing automation um is really really important and and this comes back to the fact

0:33:08.480,0:33:15.200
that are we really talking about fully autonomous vehicles or are we talking about um vehicles that

0:33:15.200,0:33:20.560
really help you in those situations where we know that human fallibility comes to the fore

0:33:20.560,0:33:25.520
so one of the things that is a human cognitive and physiological limitation is fatigue and

0:33:25.520,0:33:30.960
distraction fatigue and distraction comes much more into play when we're on motorway driving

0:33:30.960,0:33:34.800
so the case for autonomous vehicles in a motorway setting

0:33:34.800,0:33:40.480
is much stronger than in that sort of city

or town type environment where not only is

0:33:40.480,0:33:45.760
it much more complex to design autonomy but
actually also humans are often brilliant.

0:33:46.880,0:33:51.760
Mohammed.
Yeah so I want to emphasize the importance of

0:33:51.760,0:33:57.840
trust in all these scenarios right so we tend to
trust uh the system then we think it's helpful to

0:33:57.840,0:34:01.840
us and then the scenarios that Sarah pointed out
are those scenarios where autonomous systems are

0:34:01.840,0:34:07.360
likely to be much more helpful than in an urban
situation in London when there are lots of uh

0:34:08.080,0:34:12.800
different sorts of road users that that may
interfere with what the autonomous system will

0:34:12.800,0:34:20.160
want to do so you think that trust level is is
something that we need to be able to measure and

0:34:20.160,0:34:26.960
understand properly by by looking at human aspects
of autonomous driving and also we should find

0:34:26.960,0:34:32.400
the right compromise between things like safety
comfort of the the human driver all those aspects

0:34:32.400,0:34:37.840
will play into the measurable notion of trust that
you are going to develop in in the coming years.

0:34:37.840,0:34:40.560
How's the TAS Hub going to help
with some of these problems then?

0:34:40.560,0:34:43.920
One of the great things about the
Trustworthy Autonomous Systems Hub

0:34:43.920,0:34:47.840
is the fact that it's bringing people together
from all sorts of different perspectives

0:34:49.040,0:34:53.360
one of the things that that's particularly
helpful is that we've got a really strong

0:34:53.360,0:34:58.880
multi-disciplinary perspective so we're not just

looking at the engineering solution in isolation

0:34:58.880,0:35:03.840
we're not just looking at the computer science
solution in isolation we've got social scientists

0:35:03.840,0:35:09.040
we've got legal experts we've got um engineers
we've got computer scientists we've got designers

0:35:09.040,0:35:13.520
who are all working together on some of these
wicked problems that we're encountering when

0:35:13.520,0:35:17.920
it comes to the trustworthy autonomous systems
the other thing though is that the Trustworthy

0:35:17.920,0:35:24.800
Autonomous Systems Hub with with association with
the Nodes also has a mission to influence policy

0:35:24.800,0:35:33.840
um and to accelerate the um embedding of the novel
technologies in an industrial and a policy setting

0:35:33.840,0:35:39.680
so I think that in many ways it's worth thinking
of the TAS Hub as being a convener of all of these

0:35:39.680,0:35:44.160
different perspectives and transfer of knowledge
between different settings we've talked quite a

0:35:44.160,0:35:49.280
lot about transport today but there are other
sectors particularly manufacturing for example

0:35:49.280,0:35:55.920
where we see a lot of the autonomous technologies
being used and being able to learn from one sector

0:35:55.920,0:35:59.360
and apply it to another sector is something
else I think that the TAS Hub really brings

0:36:00.480,0:36:00.980
Mohammed.

0:36:01.680,0:36:07.040
And so I think one other aspect that the TAS
Programme uh could be very very helpful in is

0:36:07.040,0:36:11.440
building a community around the trustworthy
autonomous system and raising awareness both

0:36:11.440,0:36:16.640
in terms of policy making it but also in terms of
interaction and engagement with the general public

0:36:17.200,0:36:22.320
and that's something that has already started so
we see Pump Priming for our projects that that

0:36:22.320,0:36:26.080
involve institutions that are
not traditionally part of the

0:36:26.080,0:36:31.920
TAS Programme uh interacting with the TAS Hub and
the Nodes and I think this is something that will

0:36:31.920,0:36:39.040
sustain for a few years and then they'll have
a very uh wide and large and broad community of

0:36:39.040,0:36:41.360
different stakeholders engaging
with the TAS Programme which is

0:36:41.360,0:36:45.840
fascinating I don't think this has this has
happened anywhere else in the world so far.

0:36:46.800,0:36:51.760
Joe.
I'm involved in a Pump Priming project um which

0:36:51.760,0:37:00.160

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is investigating the use of um the use of data
in autonomous vehicles and the user's ability and

0:37:01.280,0:37:04.800
the ethical and legal implications
of the recording of that data

0:37:05.360,0:37:12.720
and certainly having um and as Sarah's pointed
out having a this multi-disciplinary team

0:37:12.720,0:37:17.440
um but having having a legal background and
then being able to work on this project with a

0:37:17.440,0:37:25.760
multi-disciplinary team um has provided
a fantastic platform for me personally

0:37:26.880,0:37:33.200
to be able to think about these ideas in in a
completely different way um where for example

0:37:33.200,0:37:39.680
where we're um we're putting our ideas in
terms of where we're building simulations

0:37:41.600,0:37:48.160
of of autonomous vehicle scenarios and and how
being able to provide input into the types of

0:37:48.160,0:37:54.880
scenarios that we think may occur in a day in a
day-to-day um situation and the types of data that

0:37:54.880,0:38:01.200
that needs to be recorded and how that data can be
used and and being able to have this tackled from

0:38:01.200,0:38:08.880
all different sciences I think it's going to be
um very useful and it is going to end up with the

0:38:08.880,0:38:13.200
types of conclusions that we're going to be able
to draw um and the recommendations that we're

0:38:13.200,0:38:19.760
going to make are going to be that much stronger
um so I'm very excited to be involved in this.

0:38:22.280,0:38:23.280
Siddhartha.

0:38:23.280,0:38:26.880
I think a lot has been said but
one thing I would like to say is

0:38:26.880,0:38:33.680
uh not only the multi-disciplinarity of of the

Hub but also learning from different domains

0:38:33.680,0:38:39.600
so we've talked a lot about road autonomous
vehicles right now but aviation has had on

0:38:39.600,0:38:45.040
automation for a long long time a lot of good
things about that that we can learn from,

0:38:45.040,0:38:50.560
marine has is also introducing on automation
right now uh sarah mentioned about manufacturing

0:38:50.560,0:38:53.920
automation so there are a lot of things
that we can learn from other industries

0:38:53.920,0:39:00.240
especially into the road and land domain and I
think such a programme enables that to happen

0:39:00.240,0:39:05.440
so I think that that's a very uh important aspect
that we shouldn't forget that uh we are good at

0:39:05.440,0:39:10.560
what we are doing in our domain but there's other
brilliant engineers also working in other domains.

0:39:11.120,0:39:16.960
Space of course but yes the first word came
from Jack maybe i'll give you the last word Jack

0:39:16.960,0:39:22.640
The difficult thing the big challenge faced
by engineers working on questions of of

0:39:22.640,0:39:29.680
trustworthiness and by the Trustworthy Autonomous
Systems Hub in in particular is that ultimately

0:39:29.680,0:39:35.040
you know we people in universities we researchers
designers of technology we don't get to decide

0:39:35.760,0:39:41.200
what gets trusted right that's for that's
for society it's ultimately a democratic

0:39:41.920,0:39:46.640
question and ultimately the things
that determine trustworthiness

0:39:47.200,0:39:52.800
are not just whether a system does what we expect
it to do right which are the sort of things that

0:39:52.800,0:39:59.680
engineers can check and certify and assure and all

the rest of it but often people are interested in

0:39:59.680,0:40:05.120
how systems function so opening up the black
box of technology and they're interested in what

0:40:05.120,0:40:10.400
systems are for as well so they're interested in
the purposes of technology and the trustworthiness

0:40:10.400,0:40:18.160
of these systems might be undermined by for
example um their use in cutting people's jobs

0:40:18.160,0:40:23.840
or their use in you know enabling rich people
to get about but doing nothing for poor people

0:40:24.640,0:40:31.840
so those questions trust is re is a really
complicated multi-dimensional uh issue

0:40:31.840,0:40:38.400
and it means that it's hard for engineers to
end the conversation right what they can do is

0:40:38.400,0:40:42.800
help to start the conversation and inform
it but ultimately it becomes a democratic

0:40:42.800,0:40:48.320
challenge which makes it very tricky and extremely
interesting if you're a social scientist like me.

0:40:48.320,0:40:52.400
So you're you're off to do a very big new job
which we'll be doing by the time people watch

0:40:52.400,0:40:58.080
this and what do you think about the TAS Hub
so as incoming chief scientific advisor for the

0:40:58.080,0:41:02.560
department for transport I'm absolutely delighted
that the Trustworthy Autonomous Systems Hub

0:41:02.560,0:41:09.600
and its Nodes are in place one of the things that
will be my job is making sure that I've got access

0:41:09.600,0:41:14.800
to an understanding of the excellent science and
social science and engineering research that's

0:41:14.800,0:41:21.920
happening in the UK and that we can smooth the
path between that research and its implications

0:41:21.920,0:41:27.520
for policy and for future investment as well

so I'm really really pleased to be able to be

0:41:27.520,0:41:32.480
working with the TAS Hub in my new role as well
as remaining as an investigator on the TAS Hub

0:41:33.120,0:41:35.840
in the current role that I retain
at the University of Nottingham.

0:41:35.840,0:41:40.880
It just remains for me to say thank you
to all of our fireside chat uh chattees

0:41:40.880,0:41:44.160
Sarah Sharples Siddhartha
Khastgir, Mohammad Mousavi,

0:41:44.800,0:41:49.760
Joe Pattinson and Jack Stilgoe. Thank you ever
so much for being part of this for any of more

0:41:49.760,0:41:56.320
information uh you can visit our website tas.ac.uk
where you'll find links to the podcast Living with

0:41:56.320,0:42:07.520
AI details of events news and opportunities and
all the other fireside chats that we'll be doing

Transcript ends

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Autonomous
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