

March 2022
APPG AI Evidence Meeting



Artificial Intelligence, Policy & Regulation: Feedback on the National AI Strategy

PARLIAMENTARY BRIEF



Artificial Intelligence, Policy & Regulation: Feedback on the National AI Strategy is a Parliamentary Brief based upon the All-Party Parliamentary Group on Artificial Intelligence (APPG AI) Evidence Meeting held online on the 14th March 2022.

This APPG AI is co-Chaired by **Stephen Metcalfe MP** and **Lord Clement-Jones CBE**.

We would like to express our appreciation to the following people for their oral evidence:

- **Prof. Dame Wendy Hall**, Regius Professor of Computer Science, **University of Southampton & AI Council**.
- **Sara El-Hanfy**, Head of Artificial Intelligence & Machine Learning, **Innovate UK UKRI**
- **Prof. Michael Wooldridge**, Professor of Computer Science, **University of Oxford & The Alan Turing Institute**
- **Scott Steedman CBE**, Director-General, Standards, BSI
- **Caroline Gorski**, Group Director R² Data Labs, **Rolls Royce**

Big Innovation Centre is the appointed Secretariat for APPG AI

- CEO, **Professor Birgitte Andersen**
- Rapporteur, **George Farrer**

The video recording of the Evidence Meeting can be found on our websites.

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All Party Parliamentary Group on
Artificial Intelligence

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1. Introduction

In this meeting, the APPG AI welcomed feedback on the **National AI Strategy**, published by the UK Government in September 2021. The APPG AI ran a series of three meetings from **June to September 2021** discussing how the National AI Strategy should look like, and subsequently this APPG AI meeting discussed the National AI Strategy with five expert speakers giving their feedback and thoughts on the Strategy. The National AI Strategy is the latest development in the UK's journey with AI, following the **AI Sector Deal** in April 2018 and the AI Council's **AI Roadmap**, in January 2021. The latter called for the creation of a National AI Strategy.

The National AI Strategy has three main 'pillars'. First, 'Investing in the Long-Term needs of the AI Ecosystem'. Second, 'Ensuring AI Benefits all Sectors and Regions'. Third and finally, 'Governing AI Effectively'. All three of these pillars were heavily considered and debated by the expert speakers at this meeting. The group addressed the need to create a skills pipeline to ensure we always have people with AI-related abilities, from all sectors and backgrounds, and paramount need for diversity in the AI space. Additionally, the APPG on AI considered how the UK could become a world leader in AI Governance? In addition the need for effective standards around AI, and AI regulation, whatever form this will take.

Main questions:

- *What is included and what is missing in the National AI Strategy?*
- *How shall the National Strategy be implemented? (Including useful input from the three APPG AI Round Tables on the National Strategy, which took place over summer and autumn 2021)*
- *What direction should AI regulation and policy take?*

List of panellists:

- **Prof. Dame Wendy Hall**, Regius Professor of Computer Science, **University of Southampton & AI Council**.
- **Sara El-Hanfy**, Head of Artificial Intelligence & Machine Learning, **Innovate UK UKRI**
- **Prof. Michael Wooldridge**, Professor of Computer Science, **University of Oxford & The Alan Turing Institute**
- **Scott Steedman CBE**, Director General, Standards, **BSI (British Standards Institution)**
- **Caroline Gorski**, Group Director R² Data Labs, **Rolls Royce**

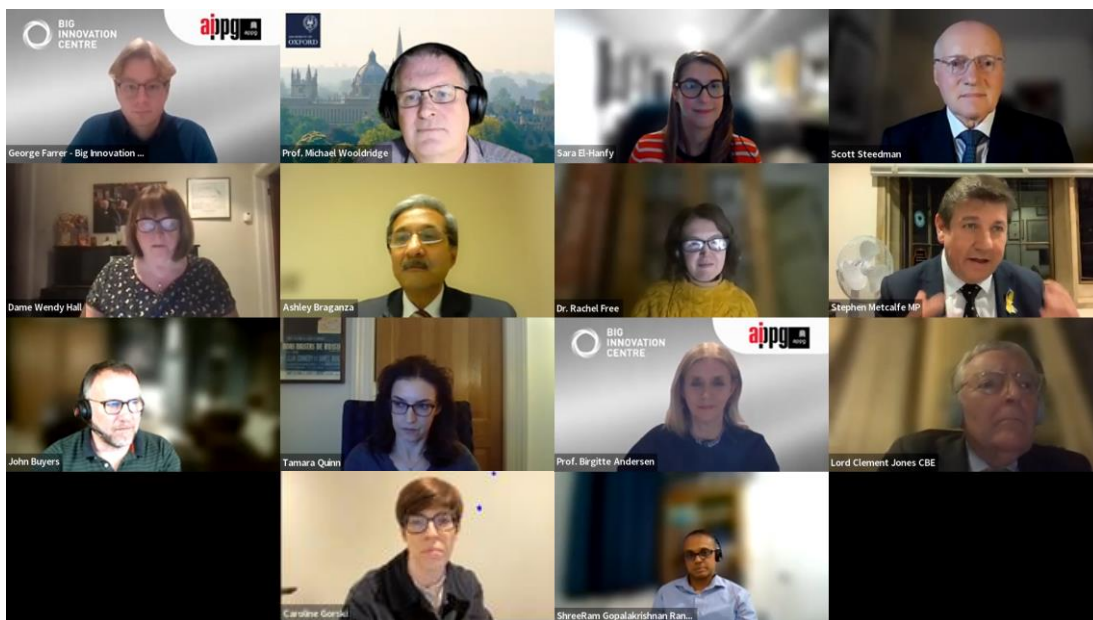
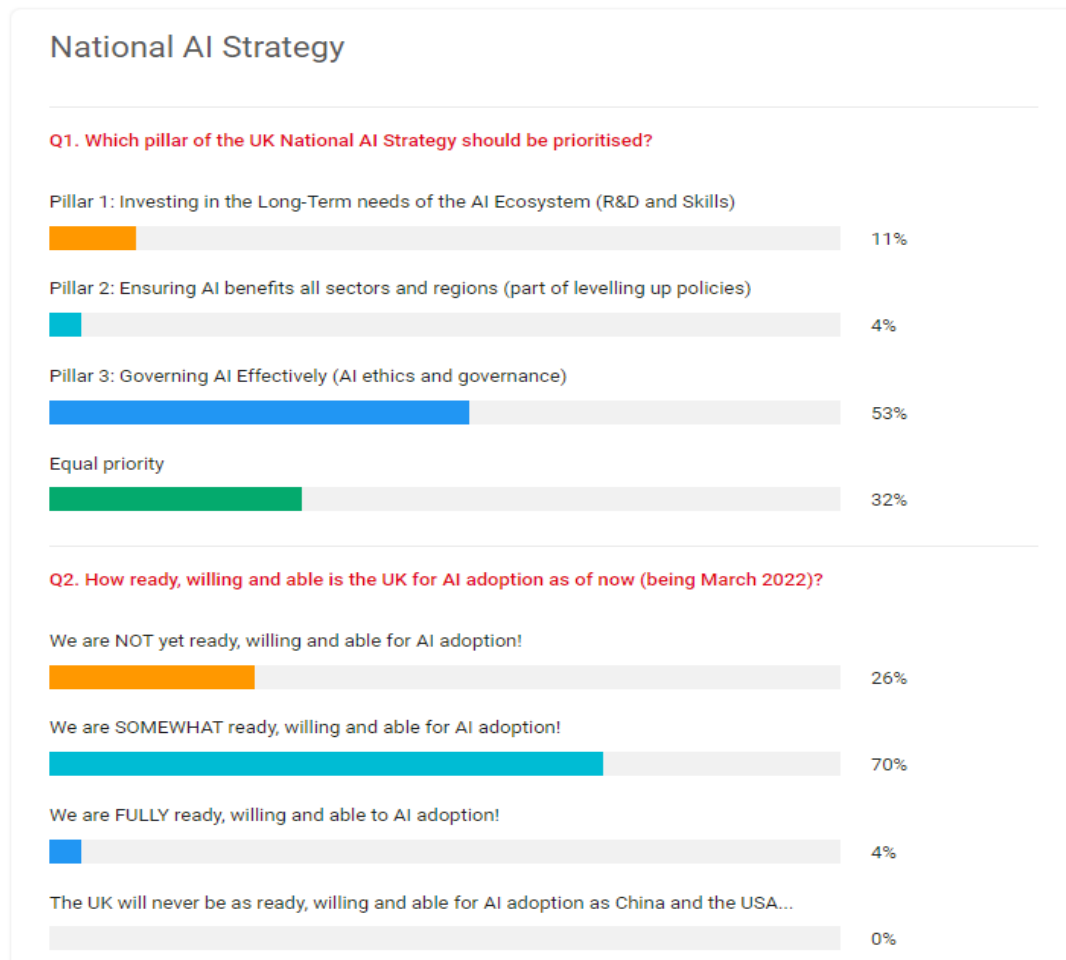


Photo: Zoom snippet from the meeting

This meeting was Chaired by Co-Chair **Stephen Metcalfe MP**. Co-Chair **Lord Clement-Jones CBE** sent his apologies for most part of the meeting, due to votes taking place in House of Lords.

Parliament has appointed Big Innovation Centre as the **Secretariat of the APPG AI**, led by **Professor Birgitte Andersen (CEO)**. The Project Manager and Rapporteur for this meeting is **George Farrer**.

2. APPG AI Pavilion Survey



Prior to the APPG AI meeting, a survey was issued on the **APPG AI's Pavilion Platform**. Question 1 examined APPG members on what pillar of the National AI Strategy they think should be prioritised? Or whether they should all have equal priority. 53% of respondents believe that **Pillar 3 'Governing AI Effectively'** is the most important pillar of the National AI Strategy. 32% think that all 3 pillars should be of equal priority, and only 11% and 4%, respectively, contended that **Pillar 1 'Investment in the Long-Term needs of the AI Ecosystem'** and **Pillar 2 'Ensuring AI benefits all sectors and regions'** were the areas that should be prioritised.

Question 2 asked, 'How ready, willing and able is the UK for AI adoption?' today – in reference to the **House of Lords Artificial Intelligence Select Committee** report published in April 2018. The overwhelming response (70%) was that the UK is '**somewhat 'ready, willing and able'**' for AI adoption today. Contrastingly, just over a quarter (26%) of respondents believe that the UK is **not yet 'ready, willing and able'** for AI adoption. Only 4% would say that the UK is **fully ready**, and no-one responded that '**the UK will never be as ready, willing and able for AI adoption as China and the USA**'.

3. Recommendations for policymakers

1. **A skills pipeline needs to be created, and the digital skills gap should be addressed.** Demand for people with AI skills is outweighing the supply. We need to incentivise those with skills to remain within the AI industry, and also introduce those with other abilities into the space. This is not just focused upon computer scientists, **also required are people that can apply the AI.** Creating this skills pipeline should start earlier, in primary & secondary schools with a greater national emphasis on maths.
2. **AI should be for everyone**, no matter what gender, race, class or original discipline. Prior to the release of the National AI Strategy, **2,500 places on AI & Data Science conversion courses were issued**, for students with non-science backgrounds. This will help increase diversity within AI, both demographically and skill-based, but more needs to be done to make AI a completely diverse sector. **A non-diverse workforce may act in non-ethical ways.**
3. The UK must adopt a **multi-stakeholder approach to AI**, and make sure that everything we do within the AI space is integrated. This starts with joined-up government – various departments, working together effectively. There has been an uneven adoption of AI across sectors in the UK, so to further develop AI initiatives, a holistic approach would be necessary. **Bringing together different perspectives will make it easier to integrate AI adoption in the UK.**
4. All across the UK's **AI space, stakeholders should be consulted on standards** – increased standards at all levels will lead to greater assurance. Strong standards around AI can make the UK a world leader in AI Governance. Therefore, **these standards can be used to support regulation, which is definitely required** – self-regulation does not work with AI. Integrating the stakeholder consensus in regulation will lead to increased assurance.
5. The UK needs to increase its AI R&D if it is to match international competitors. **Increased investment in R&D will help the even adoption of AI across sectors, and help properly fulfil the UK's AI potential.** The pace of technological development and investment from other leading AI nations shows that the UK needs to *double down* on its investment, **to drive the direction of worldwide AI R&D.**
6. **Data governance** is extremely crucial, the UK is already strong in this area but we have the ability to be a world leader. In 2021 at the Global Partnership on AI (GPAI), a £1m fund was introduced for data governance research. **We have huge national resources in terms of data, therefore we need to make sure that these resources are leveraged for the benefit of the nation.** We must work out how to treat data as a strategic asset category and see, how well engineered it is, how comprehensive and how free from bias it is. **Quality assurance around data will give businesses greater assurance in the use of AI tools.**

Our expert speakers at the meeting all welcomed the National AI Strategy, agreeing that it looks to **strengthen the UK's position as an AI superpower**, and that it seeks to put the UK at the forefront of worldwide AI developments. The initiatives the Government had already put forward in AI prior to the release of the National AI Strategy were strong, and this Strategy builds upon those, and develops the ways in which the UK can increase its AI adoption.

There is widespread agreement about the need for the **creation of a skills pipeline** among our expert speakers. If we have not got the skills, we cannot maintain our position as a global AI leader. This not only involves **upskilling** those already in the AI space, but also bringing people in to the AI-world, through AI & Data Science conversion courses (MSc's), amongst other initiatives. The experts on the panel agreed that **shrinking the digital skills gap** would help realise the benefits of the growing digital economy.

Additionally, and importantly, the expert speakers identified the **need for diversity within AI in the UK**. The Government has tried to bring diversity into the AI space, through AI Conversion MSc's – of which 50% must go to underrepresented groups. A diverse team means that it will be an ethical team – Dame Wendy Hall asserts, *"if it isn't diverse, it isn't ethical"*. The lack of diversity may be born from the **lack of access to numerate degrees**, such as Computer Science, at top UK universities. To get a place at a top university doing a numerate degree you, more often than not, require A-Level further maths. Prof. Michael Wooldridge details how most state schools do not enter students for further maths A-Level, which is a problem for diversity within this space. This must be fixed if AI is to claim to be a truly diverse, and ethical industry.

Dame Wendy Hall, Regius Professor of Computer Science at the University of Southampton, started by explaining what had been achieved since the initial **AI Review** in October 2017 (which Dame Wendy co-authored), including the **AI Sector Deal** (April 2018) and the **AI Council's AI Roadmap** (January 2021). Since the release of the UK's **National AI Strategy** in September 2021, the Strategy has delivered a consultation on AI and intellectual property, Global Partnership on AI funding for research on data governance, and among other initiatives, an AI Standards Hub Pilot, announced by the Alan Turing Institute. Dame Wendy then displays how AI has been adopted in the UK, through programmes such as the 'NHS AI in Health and Care Award' – with £140m being made available over 4 years – and the 'Tech Nation Applied AI' growth programme.

Furthermore, Dame Wendy states that *"if we are to do anything in the AI space, we have to have the skills"*. **We have to ensure that there is a continual pipeline for AI-skills growth**. Dame Wendy describes that we must fund fellowships at mid-career and senior levels, so that we can recruit and retain people, but that we should be training people from other professions to move into the AI space. This can be done through **AI and Data Science Conversion courses**. These are MSc's, of which 50% must go to underrepresented groups. It is important that we not only have a supply of computer scientists, but also those who are able to **apply AI**, and advise companies on how to get the best out of the AI.

Bringing more people into the AI space leads Dame Wendy on to one of her most crucial

points, of **“AI for everyone”, not just computer scientists**. This is also the case within diversity. Dame Wendy explains that **diversity is so much worse in AI than in anything else**. The National AI Strategy seeks to augment this through the 2,500 MSc Conversion courses, of which 76% have gone to female students, 45% to black students and 24% to disabled students. The problem of a lack of diversity must be solved within AI and this starts with **AI education from an early age**, and encouraging those from non-computer science backgrounds to get involved with AI. Dame Wendy finishes by asserting that *“if it isn’t diverse, then it isn’t ethical”*, and that we need to **incorporate diversity at every stage of the AI process**.

Sara El-Hanfy, Head of Artificial Intelligence & Machine Learning at Innovate UK – UKRI, welcomes the National AI Strategy as it *“seeks to **strengthen the UK’s position as a global AI superpower**”*, and looks to *“**seize the potential of AI technologies to improve people’s lives**”*. However, El-Hanfy does assert that the potential of AI technologies is far from being realised, and the **adoption of AI in the UK is uneven across sectors**. El-Hanfy believes that stimulating engagement between those that are developing the AI and the end users will help address the barriers to adoption – academia, research and technology, organisations, and industry need to work together.

El-Hanfy argues that a **key barrier to the adoption of AI is the acute skills gap**, with supply not being able to keep up with demand. El-Hanfy does caveat and say that investment in programmes such as the **Turing Fellowships, Centres for Doctoral Training (CDTs) and AI Conversion Courses** will certainly help supply the skills pipeline. However she states that this does not solely address the immediate need in industry. El-Hanfy believes that **reskilling and upskilling the wider workforce** will help address the skills gap, and so will a heavier focus on digital skills and literacy, but also this will help increase the diversity of the AI workforce.

Increasing the UK’s AI research and innovation capabilities will be key to accessing the benefits of AI technology, El-Hanfy details. She continues to say that the UK needs to *“double down on our investment”* to keep up with other leading AI-nations who have significantly increased their investment in AI. El-Hanfy believes that we **should bring different perspectives together in order to agree on a way to increase AI capabilities**, therefore continued engagement with the AI community is essential for delivering on the National AI Strategy, and to truly reap the benefits.

Prof. Michael Wooldridge, Professor of Computer Science at the University of Oxford and the Programme Co-Director for Artificial Intelligence at the Alan Turing Institute, also welcomes the National AI Strategy, asserting that the UK can be proud to look back on what we have done in the AI space. Wooldridge agrees with Sara El-Hanfy that the **development of a skills pipeline is important** – he details that university lecturers can get 10 times their salary, when working with AI in industry. This tells us that AI-related skills are very scarce.

To help with this, Wooldridge states that we need both **extremely sophisticated mathematical skills, as well as programming skills**. Mathematics is crucial for the teaching

of AI and machine learning, and this is a problematic area. Wooldridge details that if you want to do a numerate degree (e.g. Maths, Physics, etc.) at a top university like Oxford, you require an A* at A-Level maths, and to stand a better chance you need to have done further maths. Wooldridge discloses that he is oversimplifying, but says **that state schools do not offer further maths**, therefore removing the possibility of many students from doing numerate degrees at top universities and being the top brains with AI. *“Without further maths you’re not getting the deep understanding which is going to enable you to get on to one of those courses”*, Wooldridge argues. Furthermore, Wooldridge offers a damning statistic. In the last year of records (2016), just **37 students who identify as Black (either, African, Caribbean or other) got a the top grade (A*) in A-Level further maths** – for A* and A, the number was still less than 100. This is a key area that Government have to address if diversity within AI is going to increase.

Wooldridge does contend that the UK’s R&D base is very strong and that **investment in R&D is extremely important if we want to innovate with new services and products**, of which AI is at the forefront. He gives the example of the creation of a COVID vaccine within 6 months of the pandemic, showing that the **R&D capabilities we have in the UK are strong**. This should be applied more to AI as the technology advances, to make the UK a truly world-leading entity in this aspect.

Scott Steedman CBE, Director General, Standards at the British Standards Institution, argues that **the UK requires a market structure that delivers public trust through assurance**, something that we are new to with AI, but will help enable the large-scale adoption of AI technology. Steedman contends that the National AI Strategy is leading us down this path path of a **progressive, pro-innovation market structure**, which will stimulate the scaling-up and adoption of AI technologies. This is a strong start for the UK to become a world-leader in the AI sector.

Steedman believes that the UK can demonstrate that we have a regulatory structure for AI, and he would like this have as **minimum regulation as possible, with the outcome focused on stopping and preventing harm to the public or environment**. This risk based approach is widely adopted in other sectors, where we regulate what is the minimum to protect the consumer. Additionally, Steedman, as Director General of Standards at BSI, states that the UK has *“great influence in shaping the standards that are going to drive the market forward”*. He contends that if the UK is to lead in this space, **the voice of UK stakeholders needs to be coordinated in the international standards structure**. The creation of the **Pilot AI Standards Hub** is important for this, not just to develop new standards, but to all understand together what standards are being developed and then bring the UK voice into those. **Stakeholders have to work together in this systems approach, this will then lead to greater assurance in the AI industry.**

Caroline Gorski, Group Director of the R² Data Labs at Rolls Royce, states that there has been a **significant increase in the speed and intensity of international efforts when considering AI governance**. In 2019, there were almost no commercial sector AI ethics frameworks, now (in 2022) there are hundreds. Gorski maintains that, *“such rapid growth is a*

good sign that the use of the technology is maturing”, but this does allow for enormous confusion and requires a “clear and directional vision, and planning from national governments”. Gorski believes that AI will obviously have an effect on the future economy, but does require a **governance framework that fosters trust, through AI being used in a transparent, ethical and safe manner.**

Summary illustration:

Important issues to consider when acting upon the National AI Strategy



Moreover, Gorski contends that **representatives from key sectors, such as defence, safety and industrial, should be included in the policy making process**, along with the AI Council, to allow for AI growth and innovation in such sectors. A regulatory framework, Gorski asserts, should “*encompass the development of AI beyond existing applications*”. Therefore, **delivering the National AI Strategy should not just be limited to its co-sponsoring departments**, DCMS and BEIS. Gorski wants to see departments such as Education, Defence, Transport and the Treasury involved in the delivery of the Strategy, ensuring “*joined-up government*”.

Gorski also would like to see **an integrated, holistic approach to digital skills**, that would be embedded within the UK's education and skills offering at all levels. This would help to realise the benefits of the growing digital economy, and **address the UK's digital skills gap**. Gorski wants this to be the case for sectors of education outside of tertiary education, such as **primary and secondary schools, apprenticeships and vocational training programmes**. She gives the example of Rolls Royce offering 75,000 hours of skills development in 2021 at all levels across the business, to more than 35,000 colleagues. Furthermore, this also includes **senior stakeholder education across the AI map which is critically important**. This allows *"Government and industry to move at speed"*.

4. Evidence statements

**Prof. Dame Wendy Hall, Regius Professor of Computer Science,
University of Southampton & AI Council**



I'm going to outline what the National AI Strategy is and what's been done since it was released. I just need to stress that I do not work for the Office for AI (part of UK Government); I was one of the co-authors of the initial AI Review in 2017, that went into the Sector Deal and then as part of that the Office for AI was formed in 2018, then the AI Council was formed in 2019. The Office for AI is split between DCMS (Department of Culture, Media and Sport) and BEIS (Department for Business, Energy and Industrial Strategy), and they're responsible for both outward facing, how Government is helping industry and society to adopt AI, and inward facing to help Government adopt AI – so they have a huge agenda.

After the Office for AI and AI Council were set up, in 2021, four years after the first review, we released The Roadmap of where we should go next, having spent the first billion pounds that was in the AI Sector Deal. The Office for AI then took that roadmap and developed that into a National AI Strategy, which was accepted by the Government. So, they're working on the development plan for the next 5 years at the moment.

The three pillars are:

- 1) Investing in long term needs the ecosystem
- 2) Governing AI effectively

- 3) Ensuring AI benefits all sectors and regions.

At the heart of all that, is diversity in public trust – that runs throughout the document.

This is what it's delivered so far, a snapshot of the various things:

- **AI and IP.** Launched a Consultation on copyright and patents through legislation for AI through the IPO (Intellectual Property Office).
- **Standards for algorithmic transparency.** The CDDO (Central Data Digital Office) published a pioneering standard for algorithmic transparency, making the UK one of the first countries to do so, strengthening our position as a world leader in AI Governance.
- **Funding Global Partnership on AI (GPAI) research on data governance.** £1m fund for Data Governance research; involving 12 pilots partners in low and medium income countries.
- **A roadmap on effective AI assurance ecosystem.** A roadmap to an effective AI assurance ecosystem sets out the steps required to build a world-leading AI assurance system here in the UK.
- **The AI standards hub pilot.** The Alan Turing Institute, supported by the BSI (The British Standards Institution) and NPL (National Physical Laboratory) - will pilot this Hub, aiming to increase UK contribution to the development of global AI technical standards.

Driving AI Adoption

These are some of the things that have been achieved since the since the first review in the first program of AI:

- **AI and Health** - healthcare has been a big priority. The AI in Health and Care Award aims to benefit patients by combining the power of AI with the expertise of the NHS to improve health and care outcomes. The award is making £140m available over 4 years to accelerate the testing and evaluation of technologies most likely to provide lifesaving treatment and care.
- **The growth program around Tech Nation Applied AI.** The programme helps nurture the UK's most talented entrepreneurs in AI. Out of the 32 companies chosen, 44% of the founders are female and 47% of the companies are based outside of London.
- **The establishment of the STFC (Science and Technology Facilities Council) Hartree Centre.** The Centre enables UK businesses and the public sector to explore and adopt innovative new digital technologies (including AI) for productivity, innovation and economic growth.
- **The AI Dynamic Purchasing system** has been another important area that they've been working on. This system connects teams in the public sector with private sector expertise and experience.

Skills

On the skill side, one of the first things to be announced was the amount of money that we could put in UKRI's way. We set up 16 UKRI Artificial Intelligence Centres for Doctoral Training (CDTs), this is funding for 16 students a year for five years, so that's an awful lot of PhD students. We're certain we're going to be able to do more of those, as a fabulous investment to fill the pipeline. If we're going to do anything in this space, we had to have the skills. I often say it takes a long time to train an AI Professor, however we lose a lot of those along the way to industry, so you have to constantly be filling the pipe for professors. If you want to do any sort of training at university level, then you've got to have professors to teach and supervise. Of course, not all these CDTs will go into academia, a lot of them will go into industry, which is good, but we have to keep filling that pipeline.

Turing AI Fellowships

Another part of this, for the AI review we recommended that we fund fellowships at mid-career and senior levels. So, it's not just training new people, saying come and have a career in academia, it's actually saying to recruit them and retain people at that mid-career and advanced level, really senior levels, so they can work with industry, but we don't want them to necessarily move to the west coast of the United States for example.

- In Phase One we funded five of those fellowships – this signalled the UK's ambition to maintain and grow its global leadership in the development of AI methodologies.
- In Phase Two we had the Turing Accelerated Fellowships and we funded 15 of those.
- Then, most recently, in Phase Three we had a call out for the highly prestigious Turing AI World-Leading research fellowships that was looking for people at the top of their career who wanted to build and continue to build their career in the UK at the very top of their game, and to build Centres of Excellence. 5 of these were awarded.

AI and Data Science Conversion Courses

We funded a number of scholarships for AI and data science conversion courses. For those scholarships 50% must go to underrepresented groups - these are Master's in AI, that take people from non-science backgrounds. In the first call it was women, black students, and disabled students. 76% have been awarded to women students, 45% to black students and 24% to disabled students. They have been an absolute game changer, it has really worked; the Chancellor of the Exchequer in his speech in September said we're going to do more of those and we're going to do more of the world's leading research. We had £23 million in February to do the master's courses, 2000 more scholarships for underrepresented groups. So, this is changing the dial in terms of diversity which I'm so passionate about. It's so much worse for AI than anything else. My usual mantra is that if it isn't diverse, then it isn't ethical.

They're currently working on the action plan, which is the development plan from the new strategy, which will take us beyond where I've been talking about, and this will be an AI-governance White Paper coming out this year.

**Sara El-Hanfy, Head of Artificial Intelligence & Machine Learning,
Innovate UK UKRI**



I'm Sara El-Hanfy Head of AI and Machine Learning at Innovate UK, the UK's Innovation Agency. Innovate UK is part of a larger organization called UK Research and Innovation or UKRI. UKRI was established in 2018 to bring together Innovate UK with the 7 research councils and Research England with the aim of creating knowledge with impact. It operates across the whole of the UK and invests more than £7bn a year in research and innovation by partnering with academia, industry, and Government to make the impossible, possible.

I will be focusing my comments on the contents of the National AI Strategy. But before I do, I'd just like to provide some context about what has been happening at UKRI (UK Research and Innovation). Prior to the publishing of the National AI Strategy, UKRI undertook an AI Review which was a wide-ranging exercise to understand our current and future role in supporting AI research and innovation in the UK. It was carried out by representatives from across UKRI and consulted with more than 300 external organisations including universities, business, industry bodies and government. The findings of the review were published in a Statement of Opportunity document in 2020 and informed our input into the National AI Strategy.

At UKRI, we welcome the strategy. It seeks to strengthen the UK's position as a global AI superpower and looks to seize the potential of AI technologies to improve people's lives and solve global challenges. At UKRI we've been supporting AI research and innovation for several years, so we know what a vibrant AI ecosystem the UK has, and the ways in which AI is already transforming our world and helping us to meet challenges in fields such as health, energy, and education, for example.

However, despite advances in AI research and the successes we are seeing in the UK AI

private sector, the potential of AI technologies is far from being realised. One example is the adoption of AI in the UK, which is behind where it could be and uneven across sectors.

Real opportunities lie at the interfaces between academia, Research and Technology Organisations and industry, both large corporates and SMEs. Stimulating engagement and partnerships between those that are developing AI and the end users, particularly the long tail of SMEs, and incentivizing the development of new trusted AI solutions, will be crucial in addressing information asymmetries and systemic barriers to adoption.

One such barrier that is limiting the adoption of AI by constraining both demand and supply of AI is the acute skills gap. The supply of skills is not keeping up with demand. The existing and continued investment in programmes such as the Turing Fellowships, Centres for Doctoral Training and AI Conversion Courses is crucial to providing the necessary pipeline yet do not solely address the immediate need in industry. Attracting international talent will play an important role, however AI skills have to be also woven into other skill areas and vice versa. Reskilling and upskilling the wider workforce could not only address the skills gap but also increase the diversity of the AI workforce. Finally, when it comes to skills more broadly, a greater focus is needed to improve general digital skills and digital literacy.

Increasing the UK's AI research and innovation capabilities will be key to unlocking the benefits that these technologies can drive across society. We need to foster a thinking and creating culture, where we bring different silos together ultimately bringing the knowledge together. Transdisciplinary approaches will be how we solve the big problems and challenges. UKRI plays a unique role to play convening and supporting cutting-edge AI research and innovation across disciplines, sectors and perspectives to ensure that the UK's AI R&I system is fit for the future and able to respond to environmental and economic change on a global scale.

To conclude, significant investment has been made by the UK to date but given the pace of technological development and the significant investments we're seeing from other AI-leading nations, we need to double down on our investment. Ultimately, I think two things are really crucial.

- Firstly, we need longer term funding and visibility of that funding if we want to really drive not only the rate but the direction of AI Research and Innovation.
- Secondly, we need to invest intelligently to compete against countries able to commit greater financial resources. A holistic approach can drive a more connected AI landscape and play to the strengths of the UK.

It's about balance. We must continue to fund fundamental discovery research, however it's also essential we're commercializing and adopting the current state of the art at pace and at scale to begin to reap the benefits of AI for both the economy and society. The strategy provides a good foundation for this, but continued engagement with the AI community will be essential for delivering on the strategy.

Prof. Michael Wooldridge, Professor of Computer Science, University of Oxford & The Alan Turing Institute



Before I come to my main comments, I just wanted to reflect a little bit on the journey that we've been on. I think it's really quite remarkable where we've been in the last few years. So the current AI boom really started around about 2012, that's when there were the first real breakthroughs of this famous system called AlexNet, which was to do with facial recognition, and that's when everything started to go really crazy. We started to really figure out that something was going on around about 2014 and exciting things were happening. In 2017 I remember the All-Party Parliamentary Group started to meet, and the same year, we saw Dame Wendy Hall's report with Jérôme Pesenti (called 'Growing the artificial intelligence industry in the UK'). I remember seeing that report and thinking well, this is all great stuff but I'll believe it when I see it.

I think what we've done nationally in the UK is genuinely quite remarkable, and by no means, am I a sort of a naive flag waver about all things UK, I think we've really genuinely responded in an extremely impressive way.

I very much welcome the National AI Strategy report, I was asked for some input on it, which I duly provided, and I was delighted to see that that was reflected. I think this is a very good report – I hear colleagues internationally holding this up and saying, we wish we had this in our country. I hear colleagues in Australia, for example, bemoaning the fact that their government doesn't seem able to do something similar. So we can afford to be genuinely proud of what we've done, but we're only at the beginning of this journey and there's a lot more work to be done to maintain that position.

I'm going to distil a few points that I think are important from the questions that you asked, and from the report itself.

What is included and what is missing?

For me, by far the single most important thing, and I said this right back in 2017 when I first gave evidence to the APPG was the importance of developing a skills pipeline. We will know we've succeeded in doing this, when AI practitioners are paid as much in industry as university professors are paid – we'll have succeeded when this is the market norm. We are a long way from that, let me tell you just how far we are from that. 30 years ago when I began as a researcher in AI, if I wanted to leave a university job and go and work in industry, I would expect to be paid one and a half times my university salary. The multiplier now is hugely more than that for researchers in machine learning, it's completely unprecedented. Really good people can sometimes get 10 times their university salary working in industry. Even for fairly ordinary researchers, the multiplier is far higher than it was 30 years ago. What this tells us is that the skills are still very, very scarce.

We need to keep working on that we're doing exactly the right things about Centres for Doctoral Training (CDTs) and so on, that's all good but we've got to maintain that pressure and keep going with that because we are a long way from succeeding there. I want to emphasize it isn't just programming skills that are important, it's not enough just to do programming. To be somebody who's developing new machine learning skills we need extremely sophisticated mathematical skills, we need to keep developing and working on those.

I think the investment in research and development is extremely important. If we don't just want to be a copycat nation, if we want to genuinely innovate, with new services and products, we need to keep doing that. I see lots of energy and enthusiasm from UKRI which is great, we need to maintain that, otherwise we will just be a copycat nation, we won't be able to innovate in this particular area.

One thing that I was extremely pleased to see in the report and I that I lobbied for, was the importance of data. Without data, current machine learning and AI techniques are absolutely nothing. We have huge national resources in terms of data and these resources have value, they have value for machine learning, the NHS is the example that's most obviously held up. Of course that's tied up with all sorts of issues around privacy and using that data responsibly with informed consent, but we should do everything we can to try to make sure that our national data resources are leveraged for the benefit of the nation.

How should the National AI Strategy be implemented?

Too often we've seen what are very well-meaning initiatives fail because they're just not quite joined up, I realize it's very easy to say it should be joined up. I would argue for the role of the Turing Institute, as the UK National Centre for AI and Data Science. I think the Alan Turing Institute is in a place to do a lot of the joining up and to help with that initiative.

Also, I think it's extremely important to emphasize we've got to be in this for the long haul. This isn't something that we can just issue a report about, or do one round of funding, and then

imagine that the AI policy issue has gone away. The rest of the world has also moved forward, perhaps not as dynamically as the UK has, but many other nations have moved forward as well, and so the game and goalposts have changed so we need to recognize that and to continue to move forward. We've got to be in this for the long haul. AI science, development and adoption is not something that we can just expect to fix and to maintain a leading position in or solve 'the problem' overnight.

What direction should regulation take?

There is an extremely important requirement for regulation. There are new technologies, of which AI is just one, and people are doing bad things with those technologies. Regulation is needed because self-regulation clearly isn't working in a number of areas. However, I am a sceptic of the current EU proposals that are out there, the idea of general AI regulation. Let me very briefly try to tell you why I'm a sceptic of those. They focus on the technology, how people are doing things, rather than what the technology is being used for. Focusing on the technology that you should stop people using neural networks for surveillance is the wrong way to think about things. The problem is that people are using technology to use surveillance, I'm not arguing for no regulation, but I think the emphasis of that regulation needs to be changed. Some more thought is required on that regulation

In a nutshell, I think we've done we've come a long way. I very much welcome this report, which I think is a thoughtful and well considered piece of work. I welcome the genuine moves that we've seen from Government to invest in AI, and I genuinely think those we needed. I think we've done a great job but we're at the beginning of a long haul.

Scott Steedman CBE, Director General, Standards, British Standards Institute



The role that we need to talk about here in the strategy, which is excellent, is how do we deliver diversity in public trust to enable the large-scale adoption of the technologies and to see the benefits delivered. Yes, we absolutely need the skills, we need the education and I'll come on to that, but fundamentally, we need a market structure that delivers public trust through assurance, which is something that we have already achieved in other sectors, but which were new to in the world of AI.

What I'm really excited about is that the National AI Strategy recognizes that we need to integrate the idea of stakeholder consensus standards in the model for AI governance and regulation. Now I'm not talking about standards as regulation. Standards are a consensus of a stakeholder viewpoint, and they may be used to support regulation, if you like in the sense regulation is a form of standard of course it's agreed by parliamentarians. However, the standards I'm describing a really the middle, the piece that the stakeholders, have been engaged with. In the BSI we have around 1200 committees and on those committees are everybody, we have an open participation policy, consumers are represented, along with industry, academics, regulators, this is the world of standards.

What is important here is governance. What we need to build, and the strategy is leading us down this path, is a progressive pro-innovation market structure in the UK which stimulates the adoption and scaling up of AI technologies. We can demonstrate that we have a regulatory structure delivered, with as minimum regulation as possible and I like the outcome focused on stopping and preventing harm to the public or to the environment, but allowing everything else. This is a risk based approach, which is adopted widely in other sectors.

The National AI Strategy covers all of this, it talks about the importance of UK influence in shaping the standards that are going to drive the market forward. We've done this in other sectors - nanotechnology was another interesting example, where the use of standards enabled science to be translated into industry very effectively without regulation or minimum. The strategy talks about the importance of UK leadership in this space, so convening and coordinating the UK voice of stakeholders in the international standard structure. The strategy talks about the open community for ethics, OCEANIS (The Open Community for Ethics in Autonomous and Intelligent Systems), which BSI (British Standards Institution) is the founder of, a few years ago. It talks about the wide set of stakeholders; this is the really important piece about bringing the public with you in any new technologies.

So here, we're talking about an engagement toolkit for UK stakeholders, something where we want to develop and educate UK stakeholders about AI technologies, most importantly, a pilot AI Standards Hub now. *(Government has launched a AI Standards Hub pilot as part of UK's National AI Strategy)*. This is not to develop new standards, it is to help us all understand together where these standards are being developed and hopefully to coordinate the UK voice into those. It is to ensure that we are educating people, we are mapping the landscape, we are showing thought leadership, - we are doing all these things. So the Pilot AI Hub, which is going to be led by the Alan Turing Institute, supported by BSI ((British Standards Institution) in our roles and national standards body, and NPL (National Physical Laboratory) in their role as the National Metrology Institute. We really want to make a success of it and to see that delivered in the long term.

However, there's a lot happening out there already and the UK is leading a number of novel areas on standards for AI technologies. In concepts and terminology, in data and bias, in governance, data life cycles, work that's happening in the International Standards Organisation (ISO) and the International Electrotechnical Commission (IEC) ISO, and in the European context in the European regional organizations, Where the UK voice is very strong indeed.

There are specific standards, like the risk management standard (ISO IEC 20 389), which is still out for public comment until March 16th - every comment is taken into account, we want you to do that. IT governance is another one seem to be published at the international level and your voice really matters, UK stakeholders participating more international standards work than any other country in the world.

Where are we going? Well, we want a progressive, flexible, proportionate, and a pro-innovation market that will really enable technologies to be to be taken up and used effectively. Regulation needs to be risk based and addressing very specific sectors where there is a high risk. This is quite normal, if you look at other sectors where we have a proportionate risk based approach, some facets of that sector require more prescriptive regulation, other facets can be either co-regulated or earned recognition, other tools or purely voluntary. This is the system's approach that I'd like to propose we take here, that we sit down and we work out the outcome that we want to achieve, what do we absolutely have to regulate, what's the minimum to protect the consumer, what can we manage through nudge and guidance, what can we allow the

industry to just to get on and do by itself? All of this requires stakeholders to work together in in that systems approach that I'm describing to what needs to be regulated, just delivered through guidance or left to the market.

I'm really excited about this strategy, I welcome it. I think it's excellent I'm delighted to hear the other speakers are on very similar lines but we've all picked up different themes in here, which is very reassuring.

Caroline Gorski, Group Director R² Data Labs, Rolls Royce



My name is Caroline Gorski, I am currently the Group Director of R² Data Labs, Rolls-Royce's advanced data analytics and artificial intelligence unit. I have held this post for the past five years, and across this time my team and I have delivered more than £400m in value to Rolls-Royce and our customers through the development of industrial machine learning and artificial intelligence, and the digital cultural transformation programmes needed to realise that value through deployment and adoption at scale. In late 2021 I also took on the role of CEO of the R² Factory through which Rolls-Royce now offers these same services to external customers.

I am also co-founder and inaugural Chair of the Emergent Alliance, a global data collaboration established in 2020 to help accelerate economic recovery from COVID-19. The Emergent Alliance (www.emergentalliance.org) is a group of more than 50 corporate entities and over 250 citizen data scientists and volunteers, supporting recovery decision-making by central and local governments and commercial strategic planners.

In December 2020 I led the publication of the Aletheia Framework™ - Rolls-Royce's Artificial Intelligence Ethics and Trustworthiness toolkit. This practical and operationally deployable toolkit allows AI developers and the organisations they work for to demonstrate trust in their algorithms, especially in safety-critical contexts where AIs deliver automation and decision-making in the physical world. In December 2021 Aletheia 2.0 was released including an extension to the framework covering data bias and assuring data integrity. The framework is available under creative commons licence.

In reviewing the UK's AI Strategy I would observe that there has been significant increase in the speed and intensity of international efforts around the strategic consideration of artificial intelligence and its governance from around the world over the past three years. Particular

focus is led by the EU, UNESCO, the Governments of Canada, France, Singapore, South Korea and Germany as well as the dominant position taken by the People's Republic of China in regards to AI research, state investment and data sequestration, and the market-led dominance of the technology companies in the USA.

When we first began investigation of commercial sector AI ethics and trustworthiness frameworks for Rolls-Royce in 2019 there were almost none available internationally - we found only two which is part of the reason we made the Rolls-Royce framework open source. Now there are hundreds. Such rapid growth is a good sign that the use of the technology is maturing, and that corporations and governments have realised the importance of developing good governance processes as they normalise AI into products and workflows, but it also creates the potential for enormous confusion and requires very clear and directional vision and planning from national governments to cut through what will otherwise could evolve into a highly complex international regulatory environment that may hold back the adoption of critical use-cases outside of certain geographic domains.

In this context - I offer the following observations:

Governance

Around governance, we see that AI will have a significant effect on the future economy but requires a governance framework that fosters trust by ensuring it is used in an ethical, safe and transparent way regardless of sector. Government could consider a kite-marking or BSI validation initiative in response to such frameworks so that SMEs and consumers can understand which frameworks are effective and can be adopted to help increase confidence and effectiveness of AI trustworthy deployment. For example, Rolls-Royce has developed the Aletheia Framework - an open source framework that provides assurance and evidence that safety, reliability and accountability have been considered.

Regulation

In terms of regulation, we see that AI can play a significant role in industrial, defence and safety critical sectors, so it is important that any regulatory framework encompasses the development of AI beyond existing applications. Currently the AI ethics debate still centres mostly around questions of bias and fairness in regards to the delivery of services to consumers using AI, although these are important questions, they are not the only questions. We do not have sufficient representation from the industrial use cases of AI where the essential question revolves around the safety of products delivered into the physical world for which AI has played a role in either design, manufacture, or in-life operation. We recommend including representatives from these sectors in the policy-making process, including the AI Council, to help unlock the innovation and growth opportunities in these sectors AI could bring.

Skills

We welcome the AI strategy's focus on skills but recognise that an integrated, holistic

approach to digital skills embedded within the UK's education and skills offer at all levels is required to realise the benefits of the growing digital economy and avoid a UK digital skills gap. This is especially true for sectors of the education system outside of tertiary education - so in primary and secondary schools, in apprenticeships, in vocational training programmes or in life-long learning or career-switching. At Rolls-Royce we're exploring how our workforce can operationalise AI across our processes, including delivering holistic digital cultural training all across our business at every level - in 2021 delivering more than 75,000 hours of skills development to more than 35,000 colleagues. In 2020 we made elements of this same curriculum available to the general public as part of our COVID-19 response, delivering more than 50,000 courses to people from 174 countries around the world via "Helping you Prepare".

Joined-up Government

The policy framework and industry application required to unlock the potential of AI cuts across the whole of government so it's imperative that delivering the AI Strategy must not be confined to its two sponsoring departments – DCMS and BEIS. We need to ensure joined-up Government. Taking the opportunities for Rolls-Royce as an example of just one company, maximising AI's potential for us would require: funding decisions through the Treasury, skills development from primary through to tertiary settings through the Department of Education, systems development through the Department for Transport, export opportunities through the Department for International Trade, defence capability through the MOD, and energy security through both BEIS and Department for Levelling Up, Housing & Communities – to name a few.

That's a complex pattern of integration integrated decision making that needs to happen, a government level to support the effective development of AI in those industrial contexts.

Recommendations

- Industry representatives from a broader range of sectors, including those in safety critical sectors, should be engaged as part of policy, governance and regulatory development.
- Government should look to increasing the flexibility of the apprenticeship levy to give companies more choice over how levy funds are spent to suit the training needs of their business

Government must ensure that a holistic approach to realising the opportunities of AI is embedded across all departments.

4. Speaker Bios



EVIDENCE MEETING:
AI, POLICY & REGULATION:
FEEDBACK ON THE NATIONAL AI STRATEGY / AI GOVERNANCE WHITE PAPER
MONDAY 14 MARCH 2022 5:30 PM LONDON TIME - GLOBAL WEBINAR



EVIDENCE GIVERS FROM LEFT TO RIGHT

- **Sara El-Hanfy**, Head of Artificial Intelligence & Machine Learning, **Innovate UK UKRI**
- **Prof. Michael Wooldridge**, Professor of Computer Science, **University of Oxford & The Alan Turing Institute**
- **Dr. Scott Steedman**, Director of Standards, **BSI (British Standards Institution)**
- **Prof. Dame Wendy Hall**, Regius Professor of Computer Science, **University of Southampton & AI Council**.
- **Caroline Gorski**, Group Director R2 Data Labs, **Rolls Royce**

<https://uk.bicpavilion.com/about/appg-artificial-intelligence>

Sara El-Hanfy, Head of Artificial Intelligence & Machine Learning, Innovate UK UKRI

Sara is Head of Artificial Intelligence and Machine Learning at Innovate UK. Sara works to identify, support and accelerate high growth-potential innovation in the UK, based on cutting-edge AI and data research and technology. She is passionate about diversity in STEM and digital inclusion. With a background in computer science, Sara has significant commercial digital experience working in the third and private sectors. Prior to joining Innovate UK, she worked as an AI consultant advising global organisations on AI development strategies and implementation.

Prof. Michael Wooldridge, Professor of Computer Science, University of Oxford & The Alan Turing Institute

Michael Wooldridge is a Professor at the University of Oxford, and a programme director for AI at the Alan Turing Institute. He has been an AI researcher for more than 30 years, and has published more than 400 scientific articles on the subject, including nine books. From 2014-16, he was President of the European Association for AI, and from 2015-17 he was President of the International Joint Conference on AI (IJCAI). He was a recipient of the Lovelace medal from the British Computer Society in 2020 – the premier computing award in the UK – and received the Outstanding Educator Award from the Association for Advancement of AI (AAAI) in 2021. He has published two popular science introductions to AI: The Ladybird Expert Guide to AI (2018), and The Road to Conscious Machines (Pelican, 2020)

Dr. Scott Steedman, Director of Standards, BSI (British Standards Institution)

Scott Steedman CBE is Director-General, Standards at BSI where he has primary responsibility for BSI's role as the UK National Standards Body and for its activity as a global standards organisation. BSI is a key partner on the AI Standards Hub led by DCMS and the Alan Turing Institute. Scott sits on the DCMS AI Expert Group set up by the government to help support the delivery of the UK's AI strategy and is also a member of the DCMS Telecoms Advisory Council, advising on the role of standards to support diversification, security and resilience. He is a former Vice President of the International Organization for Standardization (ISO) and the Royal Academy of Engineering.

Prof. Dame Wendy Hall, Regius Professor of Computer Science, University of Southampton & AI Council

Dame Wendy Hall, DBE, FRS, FREng is Regius Professor of Computer Science, Associate Vice President (International Engagement) and is an Executive Director of the Web Science Institute at the University of Southampton. She became a Dame Commander of the British Empire in the 2009 UK New Year's Honours list and is a Fellow of the Royal Society. Dame Wendy was co-Chair of the UK government's AI Review, which was published in October 2017, and is the first Skills Champion for AI in the UK. In May 2020, she was appointed as Chair of the Ada Lovelace Institute and joined the BT Technology Advisory board in January 2021.

Caroline Gorski, Group Director R2 Data Labs, Rolls Royce

Caroline has spent 25 years analysing, advising on and managing strategic change at the cutting edge of technology development, and leading the transfer of emerging technologies to the commercial market. Currently, she holds the role of Group Director of R2 Factory, the artificial intelligence and data analytics division of Rolls-Royce. In December 2020, Caroline led the publication under creative commons licence of the Aletheia Framework™ - Rolls-Royce's Artificial Ethics and Trustworthiness toolkit. This practical and operationally deployable toolkit allows AI developers and the organisations they work for to demonstrate trust in their algorithms, especially in safety-critical contexts where AIs deliver automation and decision-making in the physical world. Caroline is also a co-founder and inaugural Chair of the Emergent Alliance, a global data collaboration established with support from more than 60 corporate entities and over 250 citizen data scientists and volunteers to help accelerate economic recovery from COVID-19.

5. Contact

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