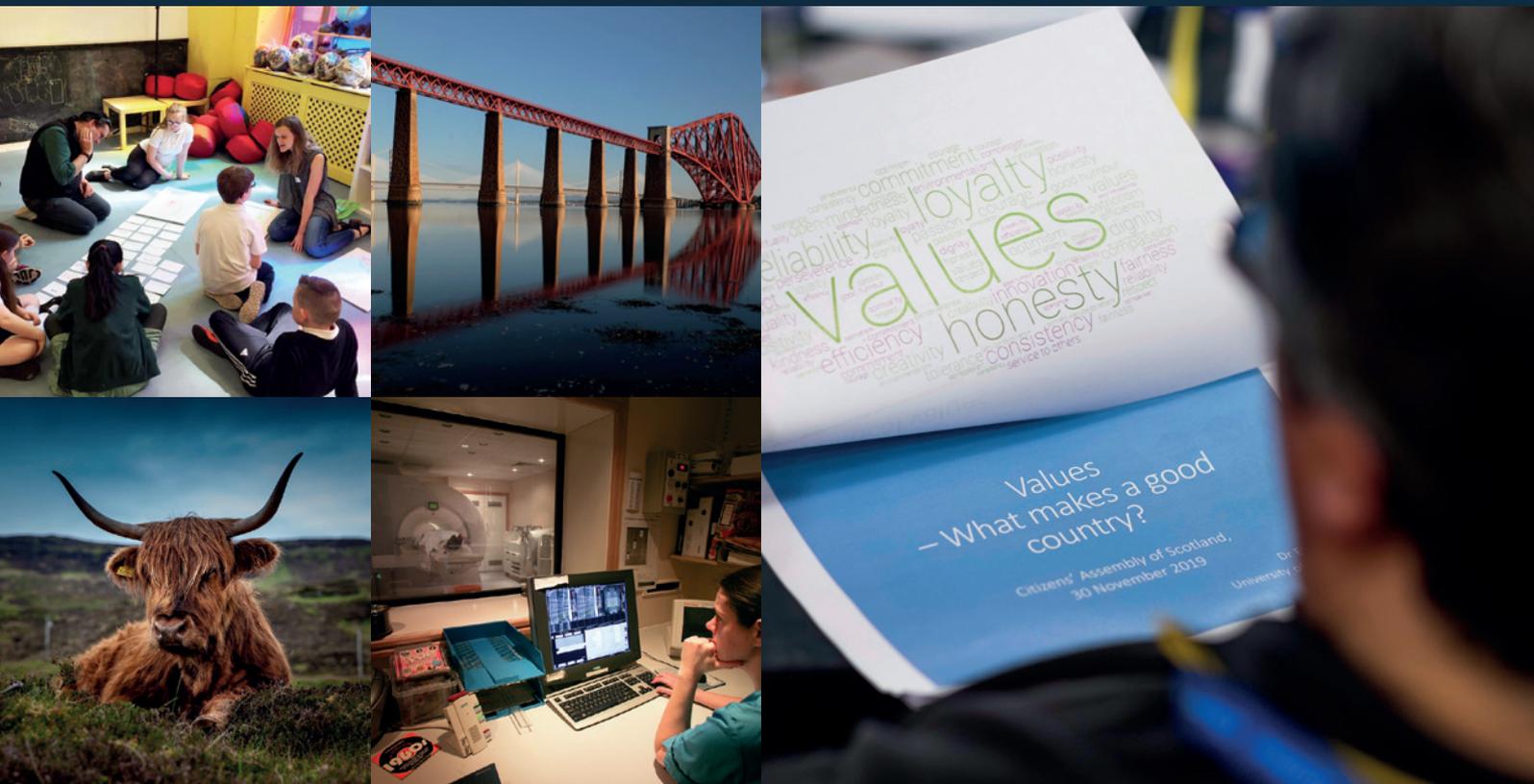


# Scotland's Artificial Intelligence Strategy

Trustworthy, Ethical and Inclusive

March 2021





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# Contents

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Welcome	4
Executive Summary	6
Introduction	8
What is AI?	10
Scotland and AI – The Case for Action	14
The Scottish AI Playbook	18
• A Vision for AI in Scotland	19
• The Principles for AI in Scotland	20
• Our Practices for AI in Scotland	23
The Actions We Will Take	26
• <b>Track 1:</b> Establish collective leadership through the Scottish AI Alliance	30
• <b>Track 2:</b> Create the Foundations for Success	34
• <b>Track 3:</b> Build an AI Powerhouse	36
Conclusion	37
Acknowledgements	38
Glossary	41
Annex – Summary of Actions	42

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# Welcome

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## Artificial Intelligence (AI) can transform the lives of people in Scotland for the better

AI is an important part of our lives. Many of the products and services we take for granted today rely on AI – where would we be without the smartphone? It’s also the catalyst for emerging technologies such as self-driving cars. More than that, AI is helping to keep us safe online<sup>1</sup>, save lives in healthcare<sup>2</sup> and improve our public services<sup>3</sup>.

This is a global phenomenon. A recent report showed that 44% of companies worldwide have already deployed AI, or are about to – that’s up from 25% only two years ago<sup>4</sup>.

So, where does Scotland stand on AI? There’s no doubt it can have a positive impact on society, however, we must be clear about the kind of AI we want to see in our country. We must acknowledge the risks if we don’t do this well, take action to address them and build the foundation for public trust<sup>5</sup> – this is essential if we are to realise AI’s potential benefits.

Our AI Strategy sets out a vision for AI in Scotland and the principles that will guide us, including the Organisation for Economic Cooperation and Development’s AI Principles, and UNICEF’s Policy Guidance on AI for Children. Also, it identifies the actions we’ll take to develop and strengthen our AI ecosystem over the next five years.

This is no standing start. We are building on strong foundations: a long history of academic excellence in AI development, a successful and well-connected AI community and a desire to adopt AI more fully across Scotland.

Scotland’s AI Strategy places people at its heart and will play a key role in delivering our National Outcomes<sup>6</sup>. It complements work to implement our Digital Strategy and the recommendations of the Scottish Technology Ecosystem Review and related initiatives.

I hope our Strategy inspires you to work with us to unlock the potential for AI in Scotland.



A handwritten signature in black ink, appearing to read 'Kate Forbes'.

**Kate Forbes MSP, Cabinet Secretary for Finance**  
Chair, Scotland’s AI Strategy Steering Committee

<sup>1</sup> Case Study 9: AI Chatbot to support mental health - Allii-chat

<sup>2</sup> Case Study 5: Industrial Centre for Artificial Intelligence Research in Digital Diagnostics (iCAIRD)

<sup>3</sup> Case Study 2: AI in the Public Sector - Data Science Accelerator Programme

<sup>4</sup> Gartner, Machine Learning Engineer – A Role That Bridges the Gap Between Data Science and IT, Figure 1, June 2020

<sup>5</sup> CDEI AI Barometer - GOV.UK ([www.gov.uk](http://www.gov.uk))

<sup>6</sup> National Performance Framework

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The Data Lab, Scotland's Innovation Centre for Data Science and AI<sup>7</sup>, has supported the Scottish Government to develop the AI Strategy. It is the result of an extensive consultation and engagement programme involving people and organisations from across Scotland. This inclusive, collaborative approach, with input from our people, our businesses, our public sector and our academics, helped to shape and set out a vision that will work for all of us.

I am delighted to be appointed the first Chair of the Scottish AI Alliance and to play my part in the delivery of our Strategy. I have a passion for innovation and how emerging technologies can make our lives better. We know that AI can contribute to our economic, social and environmental outcomes, helping to drive business growth and improve people's wellbeing. However, we can only do this by working together and providing opportunities for everyone in Scotland to engage, learn and contribute.

The publication of the Strategy gives us clear direction and I look forward to working with you all to help Scotland thrive through the use of AI.



A handwritten signature in black ink that reads "Gillian Docherty". The signature is fluid and cursive, with a large loop at the end.

**Gillian Docherty OBE, CEO of The Data Lab**  
Chair of the Scottish AI Alliance

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# Executive Summary

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Our Strategy marks a new chapter in Scotland’s relationship with artificial intelligence. It is the result of an extensive consultation and engagement programme involving academia, industry, the public sector and the people of Scotland who were generous with their time, contributing ideas, insights and opinion on AI. Their knowledge and expertise have helped to shape the Strategy and we’re grateful for the input of everyone who was part of this process.

We believe the significance of the Strategy lies in the fact that it looks beyond the technology itself to focus more closely on AI’s role in our society. Much of what we take for granted today happens because AI is working behind the scenes, driving change and technological innovation on an unprecedented scale. However, the use and adoption of AI should be on our terms if we are to build trust between the people of Scotland and AI.

**The purpose of this Strategy is to help us realise our vision:**

**Scotland will become a leader in the development and use of trustworthy, ethical and inclusive AI.**

Our Strategy makes a compelling case for sustained investment in Scotland’s AI ecosystem. Our universities, research institutes and tech businesses are world-class, however in the global race to adopt AI we can’t afford to fall behind. Scotland should be a leader in AI technologies and we have identified the actions we’ll take to achieve this:

- The collective leadership of the Scottish AI Alliance
- Creating foundations for success
- Building an AI Powerhouse

These key actions are set out in a detailed roadmap, which confirms immediate and longer-term priorities as the Strategy is launched and rolled out across Scotland. We are also introducing the Scottish AI Playbook – an open guide to the principles, practices and actions we will adopt to realise our vision. For the first time, everything you need to know about AI in Scotland can be found in one indispensable digital resource. Our Strategy makes it clear that when it comes to AI, Scotland means business.

If you work in AI, are involved in a business that is adopting AI technologies or would like to learn more about the role it plays in our lives, we hope you find our Strategy informative and inspiring.



Citizens Assembly 2019 - Credit: Chris Watt



# Introduction

## Scotland's National Performance Framework

### Our Purpose

- We are focused on creating a more successful country with opportunities for all of Scotland to flourish through increased wellbeing and sustainable and inclusive economic growth.

### Our Values

- We are a society that treats all our people with kindness, dignity and compassion, respects the rule of law and acts in an open and transparent way.

### National Outcomes

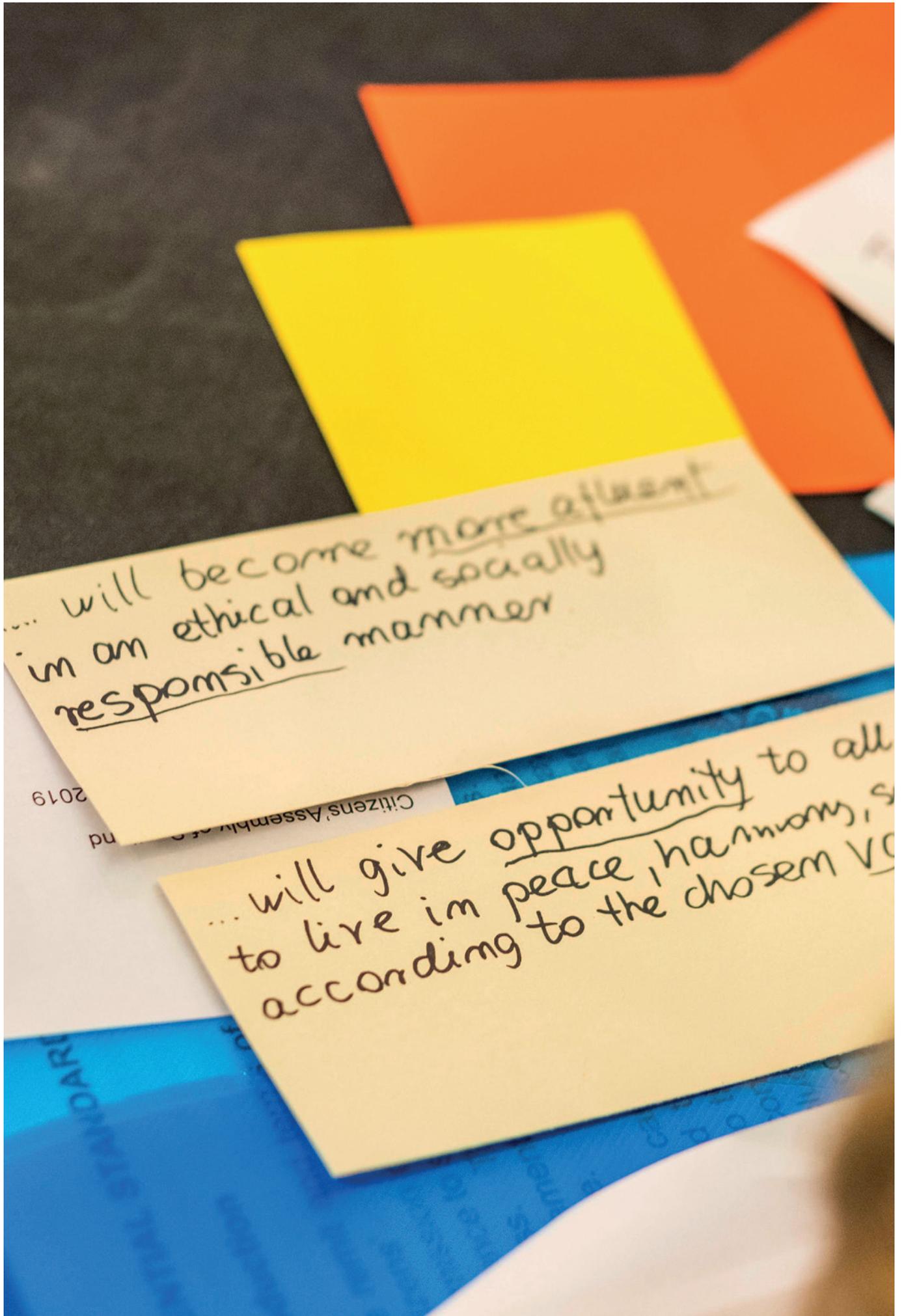
To help achieve its purpose, the framework sets out National Outcomes, which describe the kind of Scotland it aims to create and:

- reflect the values and aspirations of the people of Scotland
- are aligned with the United Nations Sustainable Development Goals
- help to track progress in reducing inequality

## Scotland's AI Strategy places people at its heart and will:

- Support and enable the adoption of AI to achieve our National Outcomes
- Encourage working together to accelerate AI activity
- Set a clear direction of travel that aligns AI with other strategic initiatives





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# What is AI?

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AI is not a new phenomenon. It can trace its origins to the early days of modern computing when the term was first coined in the 1950s – its mathematical and theoretical basis goes back even further.

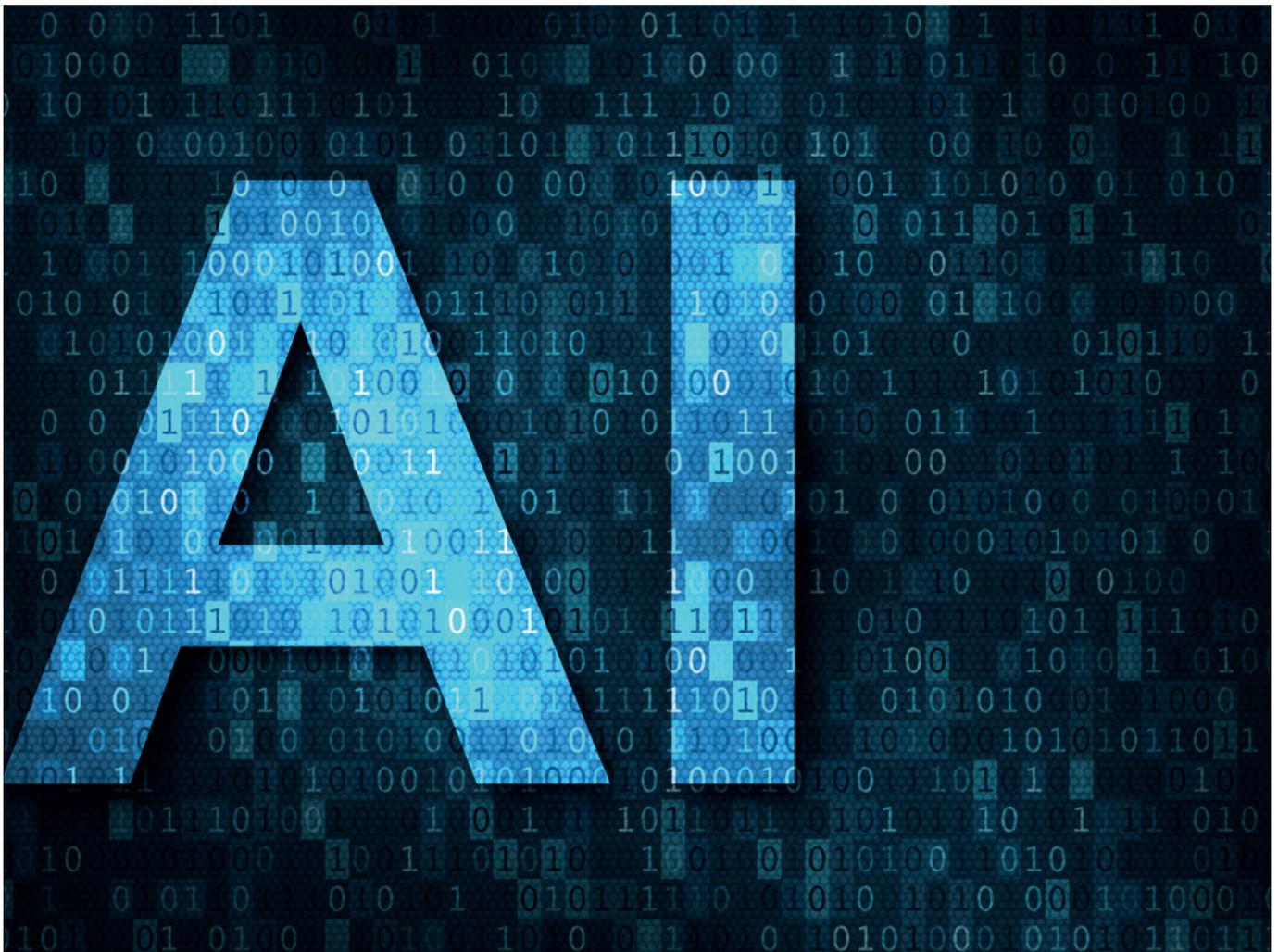
**While descriptions abound, we define AI as:**

Technologies used to allow computers to perform tasks that would otherwise require human intelligence, such as visual perception, speech recognition, and language translation<sup>8</sup>

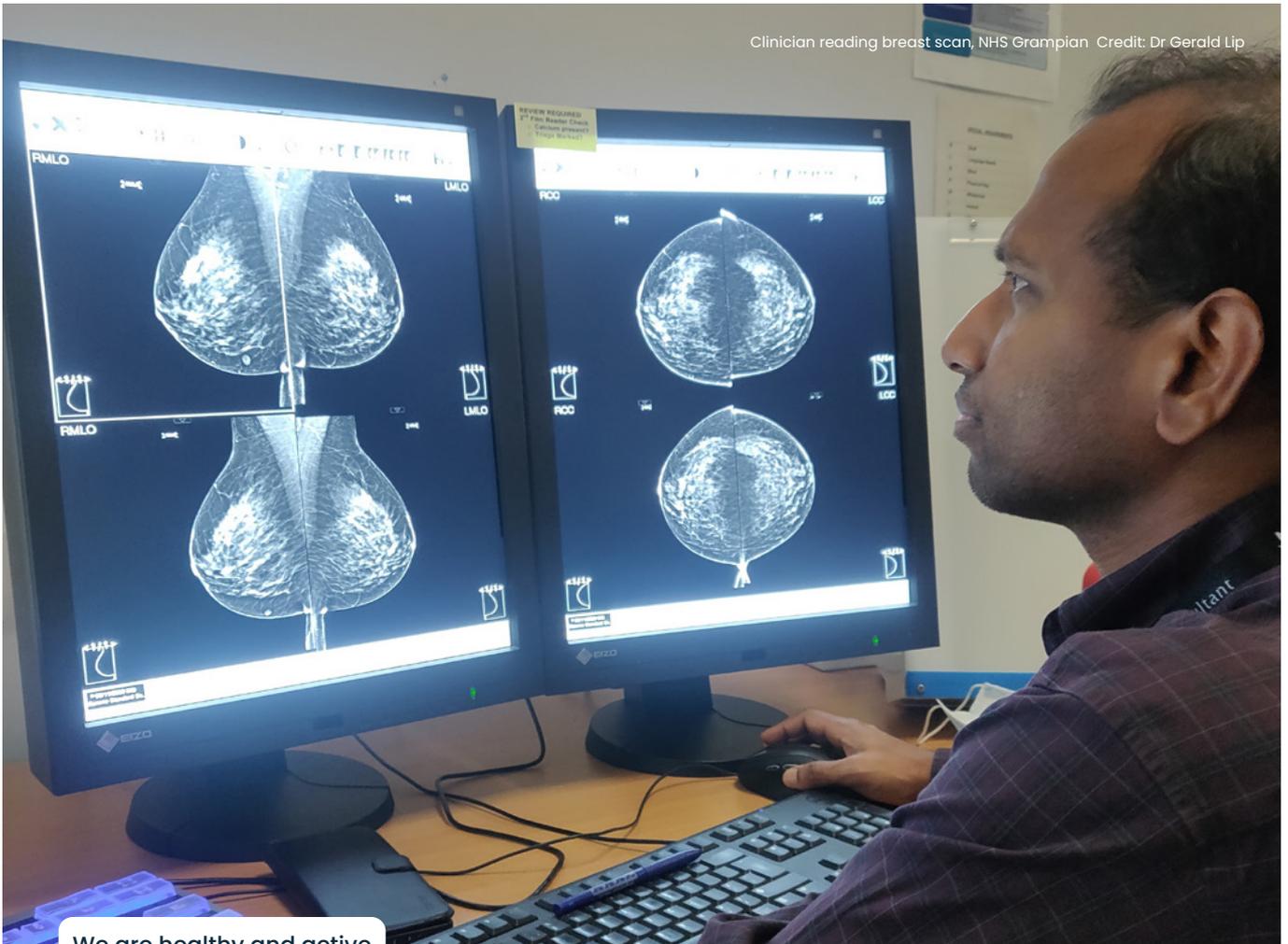
AI is a broad discipline. Think of it as a group of complementary technologies, including data-driven techniques, which are evolving constantly. For this reason, our Strategy does not focus on any individual

trends or innovations. Also, while automation and some aspects of robotics are connected to AI, they are not addressed directly in this Strategy.

Definitions of frequently used AI terms are provided in the Glossary at the end of this document.



<sup>8</sup> Definition adapted from the UK House of Lords' Select Committee on Artificial Intelligence report "AI in the UK: Ready, Willing and Able" (April 2018)



We are healthy and active

## North East Scotland Breast Screening Programme

### Using AI to improve accuracy and efficiency in breast screening

There is great interest in using AI to read mammograms in breast cancer screenings, support the work of radiologists and deliver better outcomes for women. Experts are keen to explore the potential for AI to further improve the already high standards of breast screening programmes in detecting cancers and turning around results more quickly.

The North East of Scotland Breast Screening Programme team is a partner in iCAIRD (Industrial Centre for Artificial Intelligence Research in Digital Diagnostics), one of five UK centres of excellence funded by Innovate UK. A collaboration between Canon Medical Research Europe and the NHS Scotland has constructed a platform for safe and secure AI research within the University of Aberdeen's

Safe Haven. This has enabled Kheiron Medical to develop an AI programme that learns from four years of anonymised breast screening images, comprising over 80,000 sets of mammograms. The project aims to establish how effectively the AI programme can augment human diagnosis, identify very small cancers that may be missed by human operators and reduce the number of women who are recalled because of equivocal results.

The Aberdeen team is now talking to patient groups across the country and developing plans to evaluate the AI programme more widely, prospectively across the Scottish Breast Screening Programme during 2021.

## Using AI to help young people manage their mental health

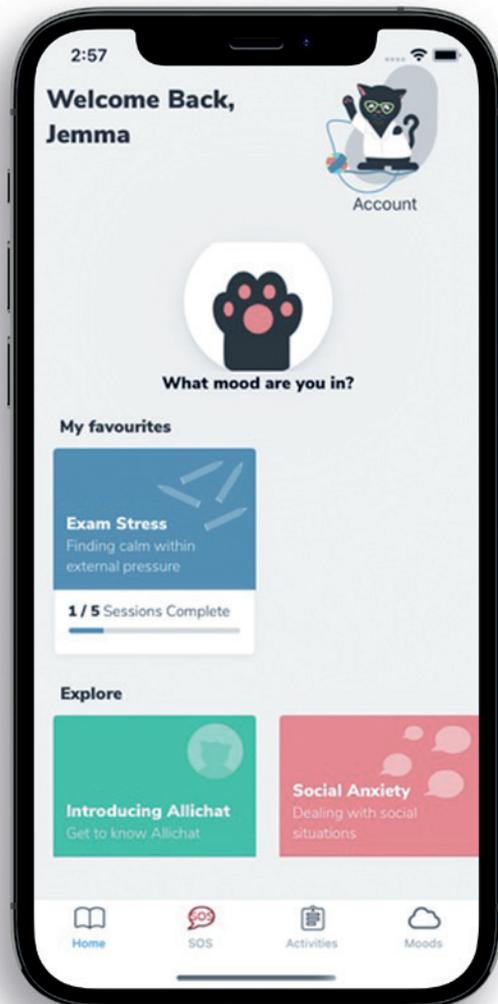
### Alli-chat by Voxsio

Alli-chat is an AI powered chatbot, delivered through mobile apps on iOS and Android, which helps young people manage their mental health. Developed by Voxsio in collaboration with young people, educational psychologists and the NHS, Alli-chat gives users a safe space to talk about their mental wellbeing – a place free from stigma, where they can open up about their feelings and emotions.

Alli-chat uses natural language understanding (NLU) to engage young people in interactive conversations, which are personalised to each user and based on their issues and circumstances. This resource helps young people understand their mental health and how it is affecting them. Alli-chat allows individuals to explore relevant information, drawn from trusted sources, to help them self-manage their mental wellbeing and provides access to tools and activities to help them build mental strength and resilience.

Engaging young people in conversations about their mental health has enormous benefits. Crucially, it is helping to develop a generation of young people who have the vocabulary and the tools to understand and manage their mental wellbeing.

[voxsio.com](https://voxsio.com)



**alli-chat**  
Powered by  
VOXSIO



We are creative and our vibrant and diverse cultures are expressed and enjoyed widely

## AI in Gaming

### Scottish Games Network

Scotland has been a leader in video game development since the early 1990s when a tiny line of lemmings put the country on the global games map. Since then, Scottish-based developers have continued to innovate, applying their expertise in AI to push the boundaries of possibility and transform the way games are developed and played.

AI is the driving force behind some of the world's most memorable gaming moments, from Pac-Man's ectoplasmic enemies in 1980, through to the epic living, breathing city in 1997's original Grand Theft Auto courtesy of Rockstar Games. AI allows gamers to pit their wits against computer-controlled opponents and makes it possible for developers to create complex ecosystems, from the deepest dungeons to an entire universe. From the simplest 'hyper-casual' mobile games to sophisticated

multi-player experiences, the use of AI in the industry continues to grow.

Today, two Scottish companies are among a thriving AI community at the forefront of video game technology.

**Kythera's** comprehensive AI platform supports many of the world's most popular development engines including Unreal and Lumberyard and provides the AI behind Wolcen Studios' bestseller *Lords of Mayhem*.

**Mercuna's** leading-edge navigation and route-finding technology supports both the Unity and Unreal engines and features in the 2020 RPG *Maneater* produced by Tripwire Interactive.

[scottishgames.net](http://scottishgames.net)  
[kythera.ai](http://kythera.ai)  
[mercuna.com](http://mercuna.com)

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# Scotland and AI – The Case for Action

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## The why, how, who, where and when

Scotland and AI go back a long way. It's an association that has proved successful across research and business, and one that has the potential to achieve even greater things in the years ahead. That's an exciting proposition and through the Strategy, there is an opportunity to strengthen our AI ecosystem further. We have our colleges and universities to thank for the thousands of talented individuals now skilled in AI<sup>9</sup>. The University of Edinburgh is home to the UK's longest-established AI research centre and its School of Informatics is one of the largest in Europe<sup>10</sup>. Together with Heriot-Watt University, it is a key player in the Data-Driven Innovation Programme<sup>11</sup>.

In the west of Scotland, Glasgow's Turing Institute was an early pioneer of AI development in the 1980s<sup>12</sup>. The baton has now passed to the University of Glasgow, which plays a key role in iCAIRD – the Industrial Centre for AI Research in Digital Diagnostics, a collaboration of 15 partners across Scotland including the universities of Aberdeen and St Andrews<sup>13</sup>, the NHS and industry.

Scotland is also home to several hundred businesses, from start-ups and SMEs to major corporations, actively developing, adopting and applying AI to identify new drugs<sup>14</sup>, diagnose disease<sup>15</sup> and improve animal health<sup>16</sup>. These companies have a global voice – the world listens to what we have to say about AI. Opportunities to collaborate with our international partners will only increase as our reputation grows.

Today, we have ambitions to use AI for positive effect across all society. The public sector is adopting AI to create better economic, social and environmental policy and interventions, and to provide more intelligent and targeted responses.

### In Scotland

**7 out of 16 universities offer AI degrees at undergraduate and postgraduate levels**

**2 offer it at undergraduate level (Edinburgh and Robert Gordon University)**

**7 offer it at postgraduate level**

**960 students are studying it at undergraduate and postgraduate levels**

**565 students study it at undergraduate level**

**395 students study it at postgraduate level**

Based on 2019–2020 admissions

**In Scotland, there are 2 dedicated AI Centres for Doctoral Training (CDTs) and an additional 3 that include elements of AI.**

<sup>9</sup> Table 49 – HE student enrolments by HE provider and subject of study 2019/20 | HESA

<sup>10</sup> Welcome | The University of Edinburgh

<sup>11</sup> Home – DDI

<sup>12</sup> Alan Turing and the development of Artificial Intelligence – S Muggleton

<sup>13</sup> Academic – iCAIRD

<sup>14</sup> Dundee drug discovery firm announces first ever clinical trials for AI-developed compound – The Courier

<sup>15</sup> Inverness firm to create artificial intelligence jobs | HIE

<sup>16</sup> SRUC bringing AI innovation to agriculture with NVIDIA (dgwgo.com)



We are healthy and active

## Industrial Centre for Artificial Intelligence Research in Digital Diagnostics (iCAIRD)

The Industrial Centre for Artificial Intelligence Research in Digital Diagnostics (iCAIRD) is a pan-Scotland collaboration of 15 partners from across industry, NHS and academia. With funding from Innovate UK and key industrial partners, iCAIRD is building a world-class centre of excellence focusing on the application of AI to the field of digital diagnostics. iCAIRD enables research-active clinicians and innovative SMEs to collaborate on key clinical questions and ultimately solve health and social care challenges more quickly and efficiently.

iCAIRD is initially focused on building infrastructure to host an AI development environment for radiology and pathology, starting with research hubs in Glasgow and Aberdeen, as part of a national platform for federated learning. This covers skills development in data and security governance processes and data extraction from local and national NHS archives. It also

creates platforms to facilitate AI training and experimentation and provides support for clinical evaluation and validation.

An important element of the infrastructure is the involvement of exemplar partners to help build AI capability in areas including radiology imaging (e.g. acute stroke, chest x-ray and mammogram) and digital pathology (e.g. gynaecological cancer screening). As the programme enters the sustainability phase, iCAIRD is examining ways of supporting new projects and model generalisation through its network of federated training sites. A key aspect of this work is patient and public engagement to address issues of trust and ethics which surround AI's place in healthcare.

[icaird.com](http://icaird.com)

While Scotland can look to the future with confidence, we recognise that AI brings with it serious challenges. For AI to be truly inclusive and benefit everyone, we need to secure people's trust in the technology and be clear on its role in our society. We need to address the real risks and concerns of bias arising from inadequate data or design or a lack of transparency of decision-making. This is an opportunity for Scotland to lead the world in ethical AI, building on work already happening. The Edinburgh Futures Institute<sup>17</sup> is focused on helping society navigate complex futures, and is investigating the ethical implications of advances in AI in applications spanning agriculture, education and

healthcare. It is developing frameworks for building trustworthy systems, and offers an online course on Data Ethics, AI and Responsible Innovation<sup>18</sup>.

As we come to terms with the socio-economic issues brought about by COVID-19<sup>19</sup> and the adoption of AI in our lives becomes more prevalent, our Strategy is designed to make it a force for good and a catalyst for positive change.

Our Digital Strategy sets out a path for us to address together the unique challenges that AI creates, and ensure Scotland fulfils its potential in a digital world.

We are well educated, skilled and able to contribute to society

## AI in the Public Sector – Data Science Accelerator Programme

The Data Science Accelerator Programme, part of the broader Scottish Public Sector Analytical Collaborative (SPACE) programme, is playing an important role in improving vital data science skills in Scotland's public sector. It allows analysts to develop their expertise in this area, under the guidance of an experienced mentor, using AI techniques such as machine learning and natural language processing.

The Scottish Government launched the scheme in 2018 in partnership with Public Health Scotland (then NHS National Services Scotland), the National Records of Scotland, Registers of Scotland and The Data Lab. It has since reached out to many more public sector organisations, such as Police Scotland and the Care Inspectorate, to make the programme available to all organisations across the country that produce and publish official statistics.

The programme has successfully taken forward a diverse range of public sector projects such as the use of machine learning techniques to determine whether satellite information could be

used to improve agricultural statistics. Another focused on the extraction of information from historical images using computer vision and machine learning techniques to generate valuable information on the built environment at that time.

The Care Inspectorate, in an innovative proof-of-concept project, explored the use of algorithms to identify poor quality care at an early stage, information that could then be flagged and passed to inspectors for further assessment and action.

And in a recent project, participants applied natural language processing techniques to develop an opinion tracking tool to monitor comments on social media relating to social security benefits in Scotland. A successful proof-of-concept has led to an extension of the project beyond the Accelerator Programme



<sup>17</sup>Activity and Partners – Edinburgh Futures Institute

<sup>18</sup>Data Ethics, AI and Responsible Innovation course on EdX

<sup>19</sup>Economic Recovery Implementation Plan: Scottish Government response to the Advisory Group on Economic Recovery – gov.scot (www.gov.scot)



A new land cover map of Scotland for 2020 produced through combining multiple different satellite datasets using Space Intelligence's advanced AI system

We value, enjoy, protect and enhance our environment

## AI and Satellite imagery to tackle climate challenges

### Space Intelligence

It's said that climate change is the main challenge of our lifetime. There's a greater need than ever to accelerate our zero-carbon transition and protect the natural environment before it's too late. AI is playing an important role in this race against time, providing scientists, governments and conservationists with the data they need to make informed decisions and develop progressive, net-zero strategies.

Significant biodiversity loss is occurring a result of human activity, specifically changes in land use. However, the emergence of Nature-Based Solutions (NBS) allows the environment to fight back by conserving and replanting forests and restoring our peatlands. However as the majority of NBS sites are large and often remote, the only cost-effective way to monitor them is by using satellites.

Space Intelligence is a specialist in satellite data analysis and undertakes projects around

the world, some of them close to home in Scotland. Supported by the Scottish Government through the Can Do Innovation Challenge Fund, Space Intelligence developed an AI system that runs on its satellite analysis platform to map Scotland's land cover on an annual basis. Partnering with NatureScot, the system identifies and tracks changes to the ecosystem year-on-year, providing stakeholders with evidence of environmental deterioration or recovery – information that confirms if Scotland is on track to meet its climate change targets. In a similar project, Space Intelligence was funded by NESTA to use AI to map riverine forests with the Scottish Wildlife Trust, to support planning a Nature Recovery Network. The company has also recently been awarded a place on the Data Driven Innovation (DDI) Post COVID AI Accelerator Programme.

[space-intelligence.com](https://space-intelligence.com)

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# The Scottish AI Playbook

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The Strategy is the result of extensive consultation with the public, industry, the public sector and academia on artificial intelligence and its place in our society. It gives us a roadmap detailing where we want to go and what we need to do to get there. Now we want to share our thinking with as many people as possible and make the Strategy work by publishing a Scottish AI Playbook.

The Playbook, an open and practical guide to how we do AI in Scotland, introduces our vision, our principles and the practices we will adopt to realise our vision.



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# A Vision for AI in Scotland

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Scotland will become a leader in the development and use of trustworthy, ethical and inclusive AI

By achieving this vision, we will enable AI to contribute to making Scotland:



## Fairer

Ensuring that our Values<sup>20</sup> are embedded in our approach to adoption of AI



## Greener

Enabling us to make better use of resources and develop new, low carbon industries



## More Prosperous

Empowering innovation with confidence building on a foundation of public trust, empowering our workforce and creating high value jobs



## Outward Looking

Engaging with global partners that share our values, forging partnerships and contributing to tackling shared challenges

<sup>20</sup> What it is | National Performance Framework

# The Principles for AI in Scotland

The actions we will take to realise our vision for AI in Scotland will be guided by a set of enabling principles. This is essential if AI is to earn people's trust and make us competitive in a global marketplace where AI ethics is emerging as a key consideration.

The principles will guide the AI journey from concept to regulation and adoption to create a chain of trust throughout the entire process.

Our principles will enhance Scotland's reputation as an ethical place to do business. This is in line with our recently published Vision for Trade<sup>21</sup> and reflects our values-led approach to investment outlined in Scotland's Inward Investment Plan: *Shaping Scotland's Economy*<sup>22</sup>. Also, they reflect our belief that everyone should contribute to and benefit from AI that is trustworthy, ethical and inclusive. We want the people of Scotland to have the skills and opportunities to play their part as part of a diverse workforce, and benefit from the transformations that AI will bring to our economy and ways of working.

We also need our people to be assured that the products, services and decisions enabled by AI are safe and secure and protect their rights and are free of discrimination that biased data or inadequate design or use might otherwise create.

These challenges require a response across government and for this reason we will focus on aligning our approach with the Digital Strategy<sup>23</sup> and other initiatives including the Review of the Scottish Technology Ecosystem<sup>24</sup>, the updated Cyber Resilience Strategy<sup>25</sup> and the Gender Pay Gap Action Plan<sup>26</sup>.

<sup>21</sup> The Scottish Government Vision for Trade – gov.scot ([www.gov.scot](http://www.gov.scot))

<sup>22</sup> Shaping Scotland's economy: inward investment plan – gov.scot ([www.gov.scot](http://www.gov.scot))

<sup>23</sup> A Changing Nation: How Scotland Will Thrive In A Digital World ([www.gov.scot](http://www.gov.scot))

<sup>24</sup> Scottish technology ecosystem: review – gov.scot ([www.gov.scot](http://www.gov.scot))

<sup>25</sup> Cyber Resilient Scotland: strategic framework – gov.scot ([www.gov.scot](http://www.gov.scot))

<sup>26</sup> A fairer Scotland for women: gender pay gap action plan – gov.scot ([www.gov.scot](http://www.gov.scot))

<sup>27</sup> OECD Principles on Artificial Intelligence – Organisation for Economic Co-operation and Development

We will be guided by the Organisation for Economic Cooperation and Development's (OECD) five complementary values-based principles for the responsible stewardship of trustworthy AI<sup>27</sup>:

- 1 AI should benefit people and the planet by driving inclusive growth, sustainable development and well-being.
- 2 AI systems should be designed in a way that respects the rule of law, human rights, democratic values and diversity, and they should include appropriate safeguards – for example, enabling human intervention where necessary – to ensure a fair and just society.
- 3 There should be transparency and responsible disclosure around AI systems to ensure that people understand AI-based outcomes and can challenge them.
- 4 AI systems must function in a robust, secure and safe way throughout their life cycles and potential risks should be continually assessed and managed.
- 5 Organisations and individuals developing, deploying or operating AI systems should be held accountable for their proper functioning in line with the above principles.

We recognise that AI presents specific challenges and opportunities for children. Our children interact with AI in many ways, but these systems are often not designed with their specific needs in mind. Today children live in a world where AI can help to improve their lives and, at the same time, has the potential to become a negative influence. The Scottish Government is working in partnership with UNICEF to support the Data Collaborative for Children<sup>28</sup> to make sure AI benefits children in Scotland and around the world.

Scotland is to become the first devolved nation in the world to directly incorporate the United Nations Convention on the Rights of the Child (UNCRC) into domestic law.<sup>29</sup> Recognising the specific challenges and opportunities AI presents for children, we will also adopt UNICEF’s policy guidance on AI for children<sup>30</sup> which draw on the UNCRC. AI policies and systems should aim to protect children, provide equitably for their needs and rights, and empower them to participate in an AI world by contributing to the development and use of AI. **We will consider its nine requirements in our work:**

- 1. Support children’s development and well-being**  
*Let AI help me develop to my full potential.*
- 2. Ensure inclusion of and for children**  
*Include me and those around me.*
- 3. Prioritise fairness and non-discrimination for children**  
*AI must be for all children.*

- 4. Protect children’s data and privacy**  
*Ensure my privacy in an AI world.*
- 5. Ensure safety for children**  
*I need to be safe in the AI world.*
- 6. Provide transparency, explainability, and accountability for children**  
*I need to know how AI impacts me. You need to be accountable for that.*
- 7. Empower governments and businesses with knowledge of AI and children’s rights**  
*You must know what my rights are and uphold them.*
- 8. Prepare children for present and future developments in AI**  
*If I am well prepared now, I can contribute to responsible AI for the future.*
- 9. Create an enabling environment**  
*Make it possible for all to contribute to child-centred AI.*

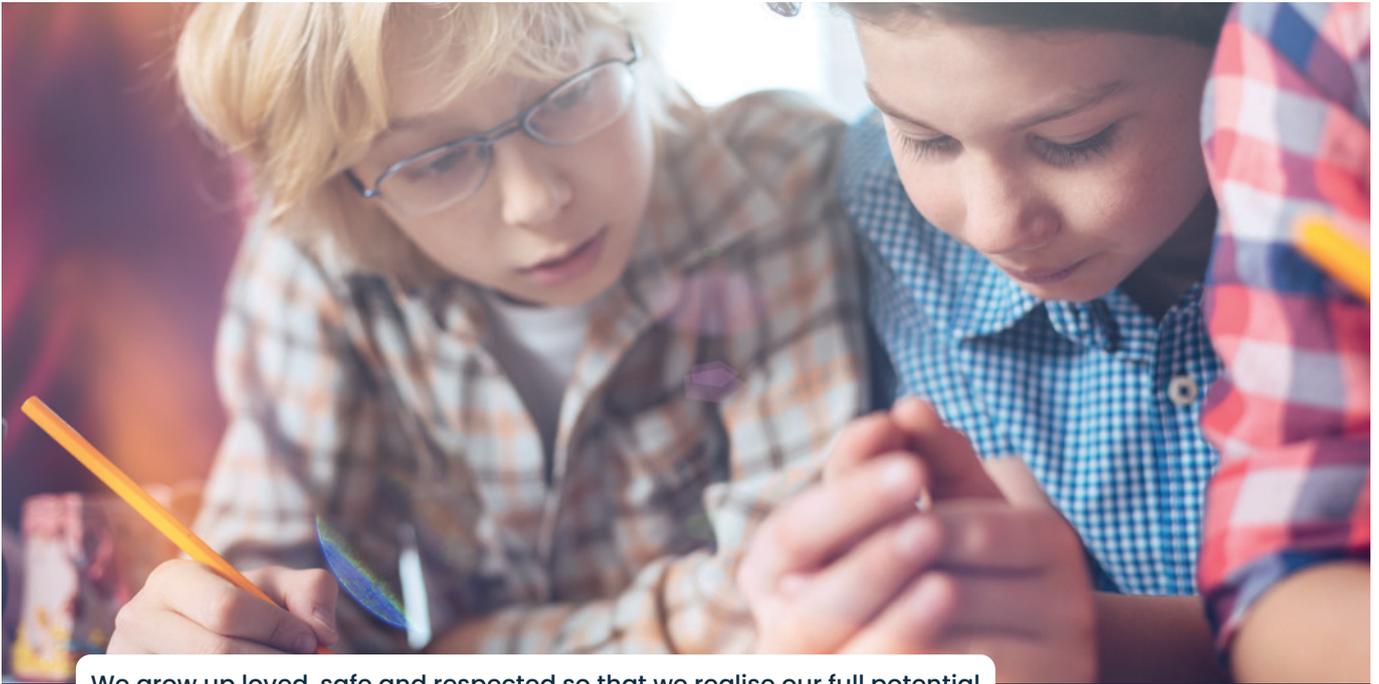
These principles reflect our values and the challenges and opportunities presented by AI. We will review them regularly to ensure they continue to do so.

In doing this, we will draw on outputs from the Ethical Digital Nation<sup>31</sup> work which is being taken forward as part of Scotland’s Digital Strategy, and engage with bodies such as the UK Centre for Data Ethics and Innovation<sup>32</sup> and the Information Commissioner’s Office<sup>33</sup>.



Make Children's Rights Real March November 2019 - Credit: The Children's Parliament

<sup>28</sup> Data for Children Collaborative with UNICEF - Using data to improve outcomes for children  
<sup>29</sup> Landmark of Children’s right - gov.scot  
<sup>30</sup> UNICEF-Global-Insight-policy-guidance-AI-children-draft-1.0-2020.pdf  
<sup>31</sup> Digital Join the conversation on digital ethics - Digital (blogs.gov.scot)  
<sup>32</sup> Centre for Data Ethics and Innovation - GOV.UK (www.gov.uk)  
<sup>33</sup> Home | ICO



We grow up loved, safe and respected so that we realise our full potential

## Data for children collaborative with UNICEF

### Using AI to develop sustainable census-independent population density estimation

The Data for Children Collaborative, a joint partnership between UNICEF, the Scottish Government and the University of Edinburgh's Data Driven Innovation Programme, was established to investigate ways of using data to improve the lives of children around the world.

The group is running a project in Mozambique that uses sustainable machine learning models to improve current population estimates. Census data is not collected frequently enough to account for rapid population change in many emerging economies and is also found to lack precision, particularly in semi-urban and rural areas. UNICEF needs a more accurate understanding of the number of children in each community to better plan and deliver key services, such as vaccination programmes. A multi-disciplinary team from the University of Edinburgh is using state-of-the-art machine

learning tools to extract features from satellite images that are relevant to population density estimation, such as building footprints. Micro census data from UNICEF is used to train and validate the machine learning models, providing a user's perspective on the sustainability of these tools. Ultimately, it is hoped that UNICEF will apply the optimal model identified from the project in other countries to improve their programming capabilities and provide better healthcare services to children.

By supporting UNICEF in this initiative, academics and researchers in Scotland are making a global impact by applying their expertise to solve a problem that has existed for decades.

[dataforchildrencollaborative.com](https://dataforchildrencollaborative.com)

# Our Practices for AI in Scotland

To achieve our vision for AI in Scotland, we will use the following practices to put our principles into action:

- **Collective Leadership** – This is central to the AI Alliance which will drive the successful implementation of the strategy. We will adopt the Team Scotland approach which places people first and is based on inclusion, co-production and collaboration.
- **Public Sector Leadership** – We will commit the public sector to lead by example and use AI responsibly to serve the public.
- **Open and Engaging** – We will strengthen our ways of working and advise developers

and users of AI, drawing on best practice worldwide (such as the European Commission Independent High-Level Expert Group on AI's Ethics Guidelines<sup>34</sup> and Assessment List for Trustworthy Artificial Intelligence<sup>35</sup>) and our own success stories in Scotland.

- **Adaptive Learning** – The AI Playbook will become a shared and living asset, which will evolve as society and technologies change and we learn what works best. Through the AI Alliance, everyone will have opportunities to contribute, develop their AI skills and receive the support they need.



DataFest Fringe Event, Aberdeen  
March 2020 – Credit: The Data Lab

<sup>34</sup> Ethics guidelines for trustworthy AI | Shaping Europe's digital future (europa.eu)

<sup>35</sup> Assessment List for Trustworthy Artificial Intelligence (ALTAI) for self-assessment | Shaping Europe's digital future (europa.eu)

## Scottish Informatics and Computer Science Alliance

**sicsa\*** The Scottish Informatics & Computer Science Alliance

The Scottish Informatics and Computer Science Alliance (SICSA) is the research pooling body for academic computer science in Scotland. Its membership comprises schools in 14 higher education institutions, representing around 600 academics and more than 800 research students. Research, teaching and knowledge exchange in AI is extremely active across SICSA, indicative of the long established track record of the field in Scotland.

The diversity and depth of AI research undertaken in Scotland gives us a global voice, with numerous high profile interdisciplinary and inter-organisational projects currently taking place across the country. These include the National Robotarium, the Trustworthy Autonomous Systems Node in Governance project, the Social AI Centre for Doctoral Training and the innovative AI research within the National Subsea Centre. Support from SICSA was a significant factor in securing funding from a range of sources for this important work.

This research has seen great impact, nationally and internationally: Heriot-Watt University has developed a strong reputation for producing

successful spin-outs in areas including spoken dialogue systems and de-carbonisation research; image forgery and intrusion detection systems using innovative machine learning techniques have been pioneered by Abertay University; the University of the Highlands & Islands has optimised tidal location renewables and tidal turbines; Stirling University's expertise helped the Scottish Curling Team win medals; Edinburgh Napier University is advancing fraud detection techniques using AI; Risk-Aware Automated Port Inspection Drones have been developed by the University of West of Scotland using AI to raise safety standards and save lives; and the University of Edinburgh's speech recognition software is used in parliaments around the world.

SICSA will work to retain Scotland's international standing in AI research through continued investment and strengthening of research pooling. It will also collaborate with other research pools and innovation centres to support the development and deployment of AI in new fields and applications.

[sicsa.ac.uk](https://sicsa.ac.uk)





Turing's Testers 2.0 Cyber Treasure Hunt Final - Women in Data Science Day, DataFest20. Credit: The Data Lab

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# The actions we will take

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Scotland can approach the future with confidence. We have a long history of AI research and development, a strong academic base and a successful tech business sector that uses AI to improve people's lives and power our economy.

However, we know that to realise our vision and remain competitive on the global stage, we must continue to strengthen our AI ecosystem.

**This means taking action in three areas – our three parallel tracks:**

**Track 1** – Establish collective leadership through the Scottish AI Alliance

**Track 2** – Create the foundations for success

**Track 3** – Build an AI Powerhouse

Each track has specific objectives and key actions to achieve them. These actions will form part of a detailed roadmap, setting out three timeframes starting from the launch of the Strategy:

**Initiation** – First 100 days

**Commence delivery and engagement** – Year 1

**Sustain and grow** – Year 2 and beyond

These actions are complemented by those of other strategic programmes and are part of the bigger picture. Scotland's Digital Strategy, published in March 2021, will establish the digital and data infrastructure foundations for our AI Ecosystem. It also commits us to incorporating green thinking into all our digital solutions and to taking action to establish Scotland as an attractive location for green data centres. Our AI Strategy builds on these actions, contributing to solving these complex challenges, as exemplified in our recent AI Challenge to Tackle the Climate Emergency<sup>36</sup>.

In parallel, implementing the recommendations of Mark Logan's Scottish Technology Ecosystem Review will see the creation of an innovation ecosystem in which AI can thrive. This was approved in our 2020–2021 Programme for Government<sup>37</sup>.

Because data powers AI, we recognise that our data infrastructure is crucial to Scotland's future. The Infrastructure Investment Plan<sup>38</sup> committed £110m to boost funding in this key area, helping to build the foundations of an AI ecosystem which will power our public services. Also, we know that AI only creates value when it's based on the right high-quality data. The creation of Research Data Scotland<sup>39</sup> is a major step forward in advancing ethical AI and securing access to data for the public good.

Unlocking AI's considerable potential will also help to realise wider ambitions for Scotland. For example, because our world-class research attracts global talent, AI is acknowledged to be a key driver of inward investment<sup>40</sup>. With significant investment in the development of AI from industry and research, we will develop a plan and support mechanisms to access research and development funding aligned to our vision.

<sup>36</sup> Satellite data company receives extra £100,000 to help tackle the climate emergency ([scottish-enterprise-mediacentre.com](https://www.scottish-enterprise-mediacentre.com))

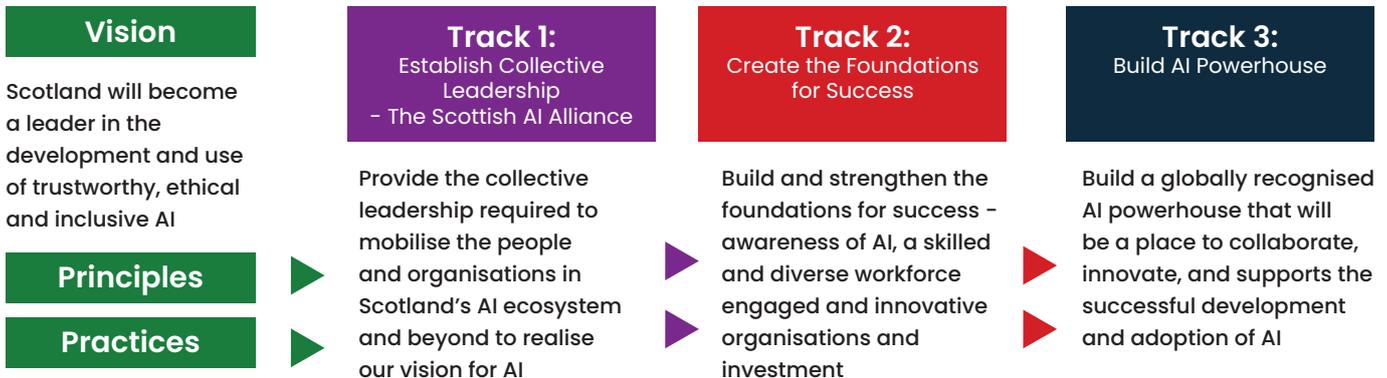
<sup>37</sup> Programme for Government – [gov.scot](https://www.gov.scot) ([www.gov.scot](https://www.gov.scot))

<sup>38</sup> A National Mission with Local Impact: Infrastructure Investment Plan for Scotland 2021–22 to 2025–26 – [gov.scot](https://www.gov.scot) ([www.gov.scot](https://www.gov.scot))

<sup>39</sup> Homepage | Research Development Scotland ([researchdata.scot](https://researchdata.scot))

<sup>40</sup> Shaping Scotland's economy: inward investment plan – [gov.scot](https://www.gov.scot)

# Scottish AI Playbook



We have a globally competitive, entrepreneurial, inclusive and sustainable economy

## AI in FinTech



### FinTech Scotland

The use of AI in finance technology (FinTech) across Scotland is helping people to manage their money. It generates insights and analysis that bring issues, options and opportunities into sharper focus and in doing so improve customer experiences and reduce risk in financial services.

AI combined with Open Banking is a powerful enabler and companies are using it to improve financial inclusion. Open Banking has created a regulated framework that allows a third party consented access to an individual's current account information and provide a wide range of services to help people maximise their income and better understand their spending behaviour. Crucially, it provides affordable lending to people who have previously been excluded from mainstream credit options.

AI in FinTech is generating the insights and intelligence needed to develop trusted new solutions and companies in Scotland are playing a part. In the lending market, DirectID is applying AI and Open Banking to determine if an individual can afford a loan and calculate the likelihood that they will default on the repayments. This helps the

lender assess its potential risk and opens the door to new lending options for people with little or no credit history who may have resorted to higher interest loan providers in the past.

Understanding spending behaviour is also becoming easier through the use of AI. For example, Money Dashboard categorises transactional information and tells users what they're spending each month and how this compares to others in their peer group.

InBest.ai encourages people to maximise their income by helping them understand the benefits and grants that are available. This application addresses the fact that many people don't claim the benefits they may be entitled to and instead resort to credit and debt to supplement their income.

- [fintechscotland.com](http://fintechscotland.com)
- [directid.theidco.com](http://directid.theidco.com)
- [moneydashboard.com](http://moneydashboard.com)
- [inbest.ai](http://inbest.ai)

To take one example, healthcare is the fastest-growing global market for AI and with our existing strengths and global trade links<sup>41</sup> Scotland is well placed to become a 'go to' location for the sector, creating new jobs and transforming health and social care delivery. We will accelerate AI development to prepare validated and regulated technologies for this market. A Scottish Life Science AI Investment Ecosystem, facilitated by the Scottish National Investment Bank<sup>42</sup>, will support access to infrastructure, business capital and supply

chains. Also, The Scottish Government's Health Industry Partnership will put in place the enabling policies and set up a Life Science AI Cluster Working Group to deliver an inception plan by autumn 2021.

AI also creates opportunities in diverse areas including secure by design for cyber resilience<sup>43</sup>, planning<sup>44</sup> and the future of Scotland's islands<sup>45</sup> We will ensure that work to deliver the Strategy actively complements these and other initiatives.

We have a globally competitive, entrepreneurial, inclusive and sustainable economy

## AI in High Performance Computing

### Codeplay Software

Edinburgh-based Codeplay is a specialist developer of software solutions for AI and supercomputers. This expertise is integral to creating the high levels of computing performance required to process 'big data' for the AI used in leading-edge applications such as self-driving cars and the scientific modelling of vaccines.

Surprisingly, many of the technologies used for AI and supercomputers today can be traced back to the videogames industry where huge amounts of processing power are required to create sophisticated graphics for today's best-selling games. Codeplay has pioneered the use of these powerful graphics processors for other applications, for example in AI and science.

For example, Codeplay software is helping USA's National Laboratories to build the next generation of supercomputers called 'Exascale'. Computer chips from three different suppliers

are being used to achieve this new milestone in performance and each of these chips is based on graphics technology from videogames and then supercharged to run complex scientific applications.

Codeplay is also developing software that enables car manufacturers to build self-driving vehicles that can monitor their surroundings, avoid hazards and make our roads safer. Building these systems requires the ability to convert high-performance graphics processors to specialist self-driving CPUs and deliver solutions that achieve optimal performance whilst being safe.

[codeplay.com](https://codeplay.com)



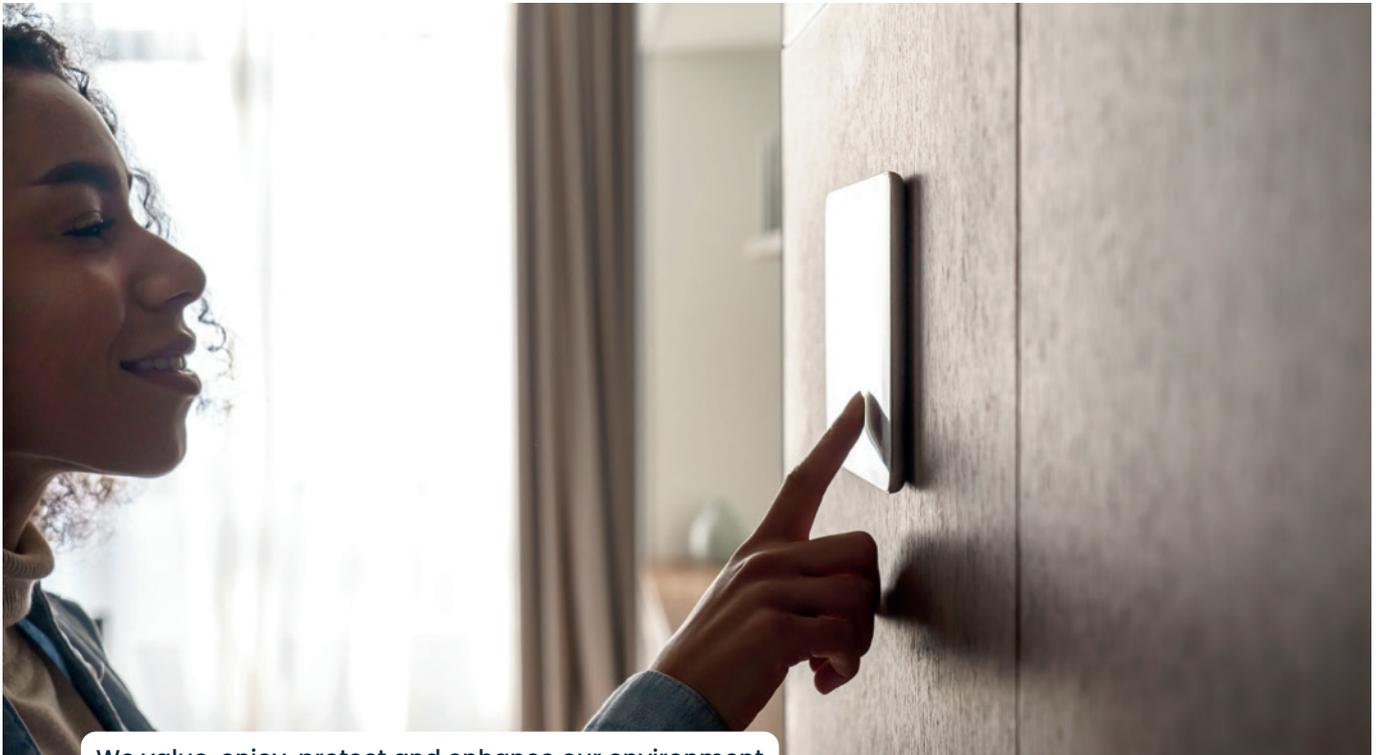
<sup>41</sup> The Scottish Government Vision for Trade - gov.scot ([www.gov.scot](http://www.gov.scot))

<sup>42</sup> Scottish National Investment Bank ([thebank.scot](http://thebank.scot))

<sup>43</sup> Cyber Resilient Scotland: strategic framework - gov.scot ([www.gov.scot](http://www.gov.scot))

<sup>44</sup> Transforming Places Together: digital strategy for planning - gov.scot ([www.gov.scot](http://www.gov.scot))

<sup>45</sup> The National Plan for Scotland's Islands - gov.scot ([www.gov.scot](http://www.gov.scot))



We value, enjoy, protect and enhance our environment

## AI and Energy Management

### U-LEARN – Integrated Environmental Solutions (IES)

**Integrated Environmental Systems (IES)** is a specialist in integrated performance-based analysis and home to the world's largest building analytics team. The company is leading a project to develop U-LEARN, a unique web-based command centre that helps facility and energy managers monitor, analyse and predict the performance of their buildings portfolio. IES was awarded funding from the Scottish Government's **Can Do Innovation Challenge Fund** as part of an AI challenge to tackle the climate emergency.

Using a combination of live measured building data, AI, predictive analytics and simulation of a building's thermal and physics properties, the U-LEARN command centre will respond to end

users' actions and feedback to produce real-time smart alarms and customised reports. U-LEARN applies the company's decarbonisation platform capability to generate intelligent data insights for efficient building management, helping businesses save energy and reduce greenhouse gas emissions and operational costs.

U-LEARN is one of many climate change initiatives that are helping Scotland meet its net-zero target by 2045 and it provides a model which can be adopted by other countries.

[iesve.com](https://iesve.com)

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# Track 1: Establish collective leadership – The Scottish AI Alliance

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## Objectives

We believe success can be best achieved through collective leadership and the involvement of the people and organisations in our AI ecosystem. We will realise our vision for AI by creating:

- Inspirational leadership that provides clear direction to accelerate progress
- An environment where ideas are shared to stimulate innovation across sectors
- Opportunities for everyone to learn from and contribute to the growth of AI
- Strong connections allowing Scotland to contribute to the global development of AI

This will be achieved under the leadership of the Scottish AI Alliance, an open-to-all stakeholder group with representation from across society. The group will provide a focus for dialogue, collaboration and, above all, action on all things AI in Scotland, allowing businesses, economists, trade unions and our UK and international partners to come together and help to shape our AI future. Above all, we'll adopt the 'Scottish Approach'<sup>46</sup> and create a vehicle for everyone to have their say and be heard – and this includes children. As this is a national strategy, Scottish Ministers will be accountable for its delivery, and report on its progress in an annual State of AI Report.

The Alliance will make sure that we work efficiently across the AI ecosystem to deliver the strategy, aligning our efforts with those of other key initiatives such as Scotland's Digital Strategy. If it needs a task force to get

something done, the Alliance will take the necessary action. It will also be responsible for the continuous development of the Scottish AI Playbook.

The Alliance will welcome all people and organisations to contribute their voice and expertise, and it will facilitate partnership-building to pursue specific opportunities. We will put in place appropriate measures to ensure diversity throughout the Alliance, including its leadership. And we will specifically seek out meaningful participation from groups whose voices are essential but are not always heard, including children.

We will be outward-looking to the UK and the world, building on the Scottish Government's existing dialogue with UK partners, including the Office for AI and AI Council, and with international partners such as our response<sup>47</sup> to the consultation on the European Commission's White Paper on Artificial Intelligence: A *European approach to excellence and trust*<sup>48</sup>.

## Key actions

### First 100 days

We will establish the Scottish AI Alliance including board members and start building an effective mechanism to ensure civil society's full participation. We will work with partners to ensure wider strategic alignment complementing the Digital Strategy and Scottish Technology Ecosystem Review (STER).

<sup>46</sup> The Scottish Approach to Service Design (SATSD) – gov.scot ([www.gov.scot](http://www.gov.scot))

<sup>47</sup> European Commission white paper on artificial intelligence: our response – gov.scot ([www.gov.scot](http://www.gov.scot))

<sup>48</sup> White Paper on Artificial Intelligence: a European approach to excellence and trust | European Commission ([europa.eu](http://europa.eu))

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## Year 1

In the first 365 days, we will confirm our priorities and establish Task Forces and Communities of Practice to lead our work in these areas. We will identify the regulatory and financial levers Scotland has to realise the vision, such as funding and procurement and where we need to influence nationally and internationally. Other actions will include:

- Develop horizon-scanning capability to identify high growth companies, opportunities and key international benchmarks
- Initiate a communications programme to promote the Alliance
- Establish a community engagement and participation strategy to encourage non-tech businesses and the people of Scotland to adopt and engage with AI
- Publish a State of AI report to review progress at the end of Year 1 (and in subsequent years)

## Year 2 and beyond

The Alliance will evolve. We will review our performance regularly and adapt to create sustainable growth and continued innovation.



### The proposed structure of the Scottish AI Alliance

Through the Scottish AI Alliance, we will build partnerships to achieve the vision set out in this strategy. We propose that the Alliance consists of four Circles: Leadership, Delivery, Community and Support. These are explained below:



## Leadership Circle

The Leadership Circle will oversee:

- all work required to deliver the Strategy, to be taken forward by the Delivery Circle
- the communication and engagement programme, managed by a partnership of the Delivery and Community Circles
- the development of the Scottish AI Playbook, working in conjunction with the Delivery and Community Circles.

Members will comprise senior figures from Scotland's AI community and related industries, who will be recruited through an open call, with representation from the broader community. The Chair of the Alliance will be appointed by the Scottish Government. The Leadership Circle will report directly to Ministers, who will advise the Scottish Parliament on the delivery of the Strategy.

## Delivery Circle

The Delivery Circle will:

- take forward programmes of work to deliver the Strategy, ensuring it is aligned with other strategic initiatives
- support the Leadership Circle to develop the Scottish AI Playbook
- plan and implement a communications and engagement programme in partnership with the Community Circle

Key figures with an interest in contributing actively to achieve our vision, from Scotland's AI community and from related business sectors will be invited to become members of the Delivery Circle.

## Community Circle

The Community Circle will:

- in partnership with the Delivery Circle, implement a communications and engagement programme including spaces to discuss the delivery of the AI Strategy and wider issues relating to AI technologies
- provide feedback on this work to the Leadership and Delivery Circles
- support the Leadership and Delivery Circles to develop the AI Playbook

We will seek membership through an open process from all individuals and groups with an involvement or interest in AI.

## Support Circle

The Support Circle will:

- provide support functions, including administration, finance and resource management
- manage internal and public communication channels, including the website and social media feeds

Members will include the Scottish Government and Data Lab staff.

## Terms of Reference

Draft Terms of Reference for the Alliance will be published as part of our open call to join the Leadership Circle. This document is intended to stimulate dialogue on the subject and contribute towards a finalised version which will be published within the first 100 days of the Strategy.

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# Track 2: Create the foundations for success

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## Objectives

We believe the long-term future of AI in Scotland can be assured if we act now to build strong foundations. This means reinforcing our existing AI ecosystem: developing a skilled and diverse workforce, supporting organisations to be innovative and providing the right investment. Partnership working can make this happen by creating the necessary skills, data infrastructure and access to funding, as well as influencing national and international policy and regulation to enable AI technologies to thrive in Scotland. At the same time, we must work to raise awareness of AI and tell the world about our success stories.

## Key actions

### First 100 days

- Begin work on the Scottish Playbook for AI
- In collaboration with Research Data Scotland, initiate a programme to unlock the value of data through trustworthy innovation for the benefit of everyone
- Work with partners to align the AI Strategy with other national technology initiatives and programmes

## Year 1

We will build strong foundations, create a sustainable infrastructure and promote Scotland as a global leader – a great place to work and invest in AI. This will include a national and international engagement plan targeting future talent, businesses and potential investors. In parallel, we will:

- Develop a plan to better leverage investment, research and development funding
- Encourage the public to develop their understanding of AI using open online resources
- Determine the steps we will take to make sure everyone in Scotland benefits from AI and exercises their rights
- Develop Framework proposals to unlock the value of data, which will be informed by public and stakeholder engagement
- Develop a plan to influence global AI standards and regulations through international partnerships<sup>49</sup>
- Expand international collaboration on AI and children

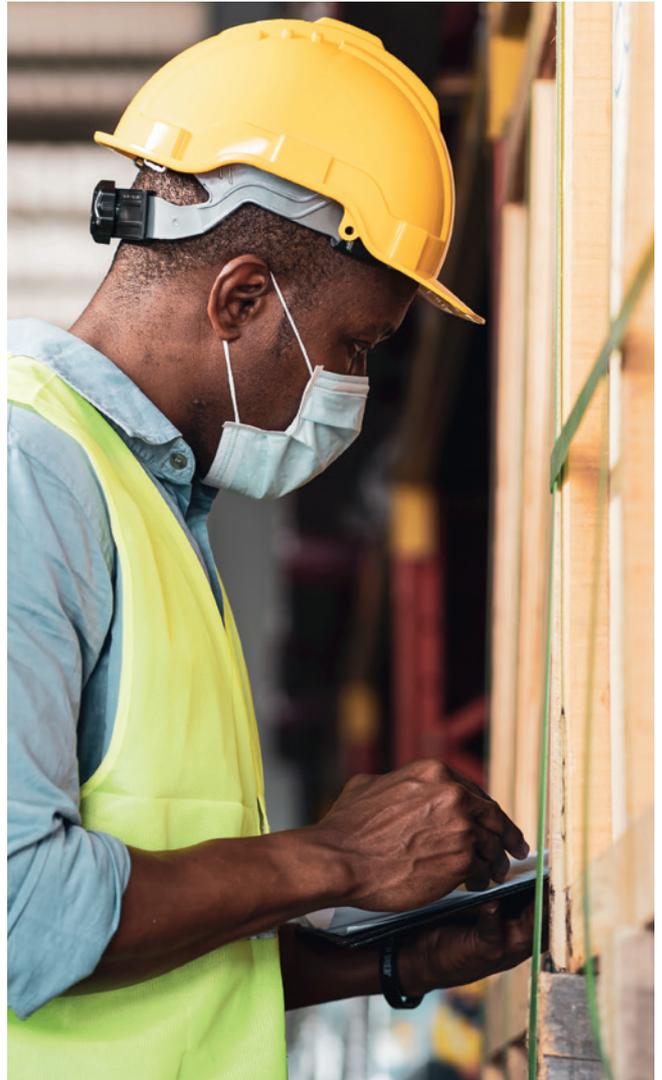
<sup>49</sup> Global Partnership on Artificial Intelligence – GPAI

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## Year 2 and beyond

We know that to enhance our AI capability, we must continue to improve our skills and infrastructure. We will lead a skills plan to ensure everyone has access to AI learning opportunities in our education system and improve the way businesses use, develop and adopt AI. Related activity will:

- Support upskilling and reskilling displaced workers and people vulnerable to exclusion
- Specify data and wider digital infrastructure requirements
- Scale the development of data platforms to meet the needs of the public sector, academic and third sector analysts (led by the Scottish Government and delivered in partnership)
- Secure safe, proportionate and privacy-preserving access to data for research and innovation in the public interest, including Open Data and Research Data Scotland
- As part of the Digital Strategy, accelerate the use of common digital and data standards across the public sector
- Implement the Framework for unlocking the value of data



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# Track 3: Build an AI Powerhouse

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## Objectives

With solid foundations in place, we can now look to create momentum and accelerate growth and global influence. Scotland will become an acknowledged AI powerhouse, a country that sets standards in collaboration and innovation - one that leads the way in adopting AI technologies. We will achieve this by:

- Creating a dynamic and accessible environment where innovative thinking thrives
- Adopting AI technologies to make Scotland a greener, fairer and more prosperous country
- Using the Scottish AI Playbook to guide the way we develop and adopt AI
- Establishing a reputation for doing AI for the social good
- Developing an industry where the public sector leads by example

## Key actions

### First 100 days

- Refresh the AI and Data Technologies Capability Directory to drive engagement between AI consumers and AI creators (in collaboration with ScotlandIS and partners)
- Expand on our AI CivTech Challenge on ethical and explainable AI in the public sector<sup>50</sup>

## Year 1

- Building on the success of our AI Climate Emergency Challenge<sup>51</sup>, establish an AI for Good Programme to help solve some of the most significant challenges facing our society
- Accelerate and scale the availability of knowledge and enablement services from the Data Lab and other partners to help businesses adopt AI
- Develop the AI Playbook to address challenges and pursue opportunities for academia, industry, public and third sector to adopt AI-enabled solutions
- Create opportunities for people, businesses and organisations to get hands-on experience of AI
- Reach agreement on the development of a public sector AI Charter (including a mechanism for feedback from the public)
- Conduct an audit of Scotland's AI Ecosystem, across industry, academia and public sector identifying strengths and opportunities

## Year 2 and beyond

- Create a register of trusted algorithms used in the Scottish public sector, learning from best practice around the world
- Improve the capacity of the public sector to adopt AI through innovative procurement, support of CivTech and technology pilots
- Review and adapt the AI Playbook based on feedback and results
- if appropriate, establish an advocacy and recourse service for the people of Scotland

<sup>50</sup> CivTech Sprint – Explainable, Ethical AI – The CivTech Alliance

<sup>51</sup> Satellite data company receives extra £100,000 to help tackle the climate emergency ([scottish-enterprise-mediacentre.com](https://scottish-enterprise-mediacentre.com))

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# Conclusion

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The world of AI is changing at an unprecedented rate. Nothing stands still and as AI technologies evolve, so must we. To create long-term value from AI, we will review our Strategy regularly to be certain it reflects current best practice and is in line with the latest innovations impacting AI and how it is adopted.

Scotland is not alone in prioritising AI. The UK Government's AI Sector Deal<sup>52</sup>, the UK's upcoming AI Strategy in late 2021<sup>53</sup> and the EU's Co-ordinated Plan on AI<sup>54</sup> recognise the vast potential of AI to drive growth across business and the economy and this is reflected in similar initiatives in countries around the world.

The publication of our AI strategy is a pivotal moment for AI and Scotland and a reminder of what can be achieved when we work together towards a common goal - industry, public sector, academia and the people of Scotland. You can read more about the background to the Strategy on our website [www.scotlandaistrategy.com](http://www.scotlandaistrategy.com)

The collective vision we have developed, the principles we have adopted and the practices we put into action will enable us **to make Scotland a leader in the development and use of trustworthy, ethical and inclusive AI.**

<sup>52</sup> AI Sector Deal - GOV.UK ([www.gov.uk](http://www.gov.uk))

<sup>53</sup> - New strategy to unleash the transformational power of Artificial Intelligence - GOV.UK

<sup>54</sup> - EU Co-ordinated Plan on AI

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**Ethical & Regulatory Frameworks**  
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**\*in these roles when appointed but have moved on since**

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SICSA

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## Animation

Backing track: Lives Are Getting  
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# Glossary

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The definitions below are adapted from those provided in the UK House of Lords' Select Committee on Artificial Intelligence report "AI in the UK: Ready, Willing and Able"<sup>55</sup>.

## Algorithm

A series of instructions for performing a calculation or solving a problem, especially with a computer. They form the basis for everything a computer can do, and are therefore a fundamental aspect of all AI systems.

## Deep Learning

A more recent variation of neural networks, which uses many layers of artificial neurons (forming a "deep neural network") to solve more difficult problems. Its popularity as a technique increased significantly from the mid-2000s onwards, as it is behind much of the wider interest in AI today. It is often used to classify information from images, text or sound.

## Expert system

A computer system that mimics the decision-making ability of a human expert by following pre-programmed rules, such as 'if this occurs, then do that'. These systems fuelled much of the earlier excitement surrounding AI in the 1980s, but have since become less fashionable, particularly with the rise of neural networks.

## Machine Learning

One particular form of AI, which gives computers the ability to learn and improve at a task from experience, without being explicitly programmed for that task. When provided with sufficient data, a machine learning algorithm can learn to make predictions or solve problems, such as identifying objects in pictures or winning at particular games, for example.

## Neural Network

Also known as an artificial neural network, this is a type of machine learning loosely inspired by the structure of the human brain. A neural network is composed of simple processing nodes, or "artificial neurons", which are connected to one another in layers. Each node will receive data from several nodes "above" it, and give data to several nodes "below" it. Nodes attach a "weight" to the data they receive, and attribute a value to that data. If the data does not pass a certain threshold, it is not passed on to another node. The weights and thresholds of the nodes are adjusted when the algorithm is trained until similar data input results in consistent outputs.

<sup>55</sup> House of Lords – AI in the UK: ready, willing and able? – Artificial Intelligence Committee ([parliament.uk](http://parliament.uk))

# Annex – Summary of Actions

	Track 1 : AI Alliance	Track 2: Foundations for Success	Track 3: AI Powerhouse
First 100 Days	<p><b>1.1</b> We will establish the Scottish AI Alliance including board members and start building an effective mechanism to ensure civil society's full participation.</p> <p><b>1.2</b> We will work with partners to ensure wider strategic alignment complementing the Digital Strategy and Scottish Technology Ecosystem Review (STER).</p>	<p><b>2.1</b> Begin work on the Scottish Playbook for AI</p> <p><b>2.2</b> In collaboration with Research Data Scotland, initiate a programme to unlock the value of data through trustworthy innovation for the benefit of everyone</p> <p><b>2.3</b> Work with partners to align the AI Strategy with other national technology initiatives and programmes</p>	<p><b>3.1</b> Refresh the AI and Data Technologies Capability Directory to drive engagement between AI consumers and AI creators (in collaboration with ScotlandIS and partners)</p> <p><b>3.2</b> Expand on our AI CivTech Challenge on ethical and explainable AI in the public sector</p>
First Year	<p><b>1.3</b> In the first 365 days, we will confirm our priorities and establish Task Forces and Communities of Practice to lead our work in these areas.</p> <p><b>1.4</b> We will identify the regulatory and financial levers Scotland has to realise the vision, such as funding and procurement and where we need to influence nationally and internationally.</p> <p><b>1.5</b> Develop horizon-scanning capability to identify high growth companies, opportunities and key international benchmarks</p> <p><b>1.6</b> Initiate a communications programme to promote the Alliance</p> <p><b>1.7</b> Establish a community engagement and participation strategy to encourage non-tech businesses and the people of Scotland to adopt and engage with AI</p> <p><b>1.8</b> Publish a State of AI report to review progress at the end of Year 1 (and in subsequent years)</p>	<p><b>2.4</b> Develop a national and international engagement plan targeting future talent, businesses and potential investors.</p> <p><b>2.5</b> Develop a plan to better leverage investment, research and development funding</p> <p><b>2.6</b> Encourage the public to develop their understanding of AI using open online resources</p> <p><b>2.7</b> Determine the steps required to make sure everyone in Scotland benefits from AI and exercises their rights</p> <p><b>2.8</b> Develop Framework proposals to unlock the value of data, which will be informed by public and stakeholder engagement</p> <p><b>2.9</b> Develop a plan to influence global AI standards and regulations through international partnerships</p>	<p><b>3.3</b> Building on the success of our AI Climate Emergency Challenge, establish an AI for Good Programme to help solve some of the most significant challenges facing our society</p> <p><b>3.4</b> Accelerate and scale the availability of knowledge and enablement services from the Data Lab and other partners to help businesses adopt AI</p> <p><b>3.5</b> Develop the AI Playbook to address challenges and pursue opportunities for academia, industry, public and third sector to adopt AI-enabled solutions</p> <p><b>3.6</b> Create opportunities for people, businesses and organisations to get hands-on experience of AI</p> <p><b>3.7</b> Reach agreement on the development of a public sector AI Charter (including a mechanism for feedback from the public)</p> <p><b>3.8</b> Conduct an audit of Scotland AI Ecosystem, across industry, academia and public sector identifying strengths and opportunities</p>

	Track 1: AI Alliance	Track 2: Foundations for Success	Track 3: AI Powerhouse
Year 2 and Beyond	<p><b>1.9</b> The Alliance will evolve. We will review our performance regularly and adapt to create sustainable growth and continued innovation.</p>	<p><b>2.10</b> Expand international collaboration on AI and children</p> <p><b>2.11</b> We will lead a skills plan to ensure everyone has access to AI learning opportunities in our education system and improve the way businesses use, develop and adopt AI.</p> <p><b>2.12</b> support upskilling and reskilling displaced workers and people vulnerable to exclusion</p> <p><b>2.13</b> specify data and wider digital infrastructure requirements</p> <p><b>2.14</b> scale the development of data platforms to meet the needs of the public sector, academic and third sector analysts (led by the Scottish Government and delivered in partnership)</p> <p><b>2.15</b> secure safe, proportionate and privacy-preserving access to data for research and innovation in the public interest, including Open Data and Research Data Scotland</p> <p><b>2.16</b> as part of the Digital Strategy, accelerate the use of common digital and data standards across the public sector</p> <p><b>2.17</b> implement the Framework for unlocking the value of data</p>	<p><b>3.9</b> Create a register of trusted algorithms used in the Scottish public sector, learning from best practice around the world</p> <p><b>3.10</b> Improve the capacity of the public sector to adopt AI through innovative procurement, support of CivTech and technology pilots</p> <p><b>3.11</b> Review and adapt the AI Playbook based on feedback and results</p> <p><b>3.12</b> If appropriate, establish an advocacy and recourse service for the people of Scotland</p>

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