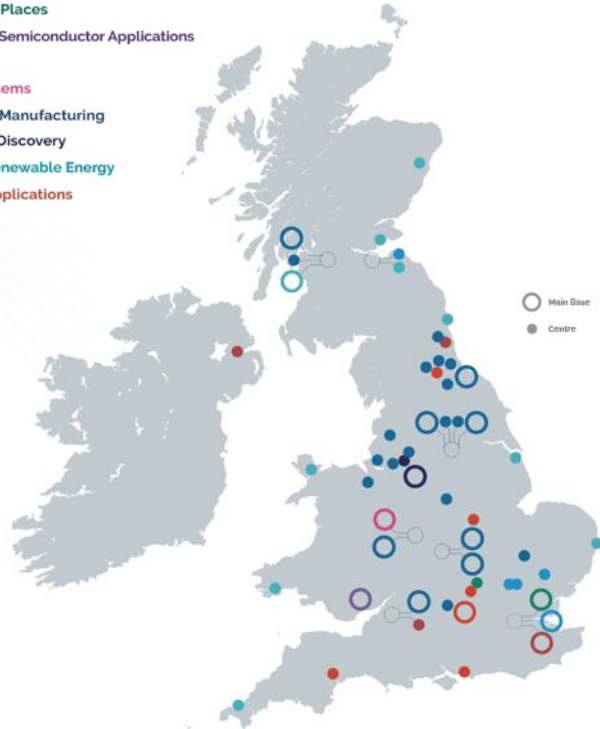


Technology at the edge

Joe Butler

Digital Catapult

Cell and Gene Therapy
Connected Places
Compound Semiconductor Applications
Digital
Energy Systems
High Value Manufacturing
Medicines Discovery
Offshore Renewable Energy
Satellite Applications



Our vision is to maximise UK productivity and global competitiveness in key industries, and to create the markets of tomorrow

Advanced Networks

Quantum

Immersive

Artificial Intelligence

Distributed Systems

IoT

280+

Staff across
the UK

4

Local
Centres

35+

Projects, Labs &
Facilities

- Established in 2013
- UK's advanced technology innovation centre
- Neutral and independent
- Accelerating adoption of advanced digital technologies across the economy.
- Trusted advisor and delivery partner for the UK Government

6G Networks and edge cases

Uses cases and images by 6GSNS, 6GForum



CATAPULT Digital

IMMERSIVE EXPERIENCE

Immersive Experience use cases are based on an evolving XR technology.

Immersive Experience is all about meeting the fundamental human need of "experiencing" a now digitally extended or virtual environment to understand and to act.

Use Cases

Seamless Immersive Reality | Immersive Enterprise & Industry | Immersive Education | Immersive Gaming | Live and Interactive Immersive Content Creation

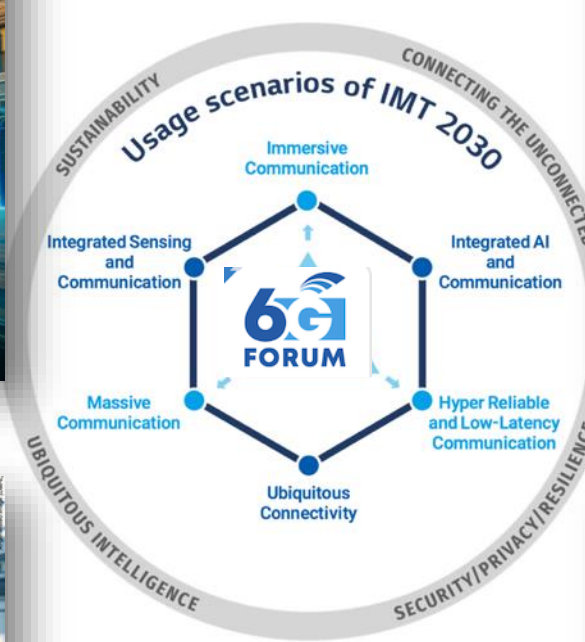


PHYSICAL AWARENESS

Physical Awareness use cases build on beyond-communication capabilities in networks: sensing, positioning, compute, and AI. By gathering 3D data about physical scenarios and situations, efficiency and safety can be improved.

Use Cases

Network Assisted 3D Mobility | Network Physical Data Exposure | Wide-area surveillance/Smart Crowd Monitoring | Environmental Radio Sensing



COLLABORATIVE ROBOTS

The network's main users are machines.

Emphasis lies on task-specific local connectivity. Depending on the task or needs, the network topology may undergo frequent changes. The level of machine autonomy determines the communication requirements.

Use Cases

Cooperating Mobile Robots | Autonomous Embodied Agents with Flexible Manufacturing | Mesh Embodied Intelligence



DIGITAL TWINS

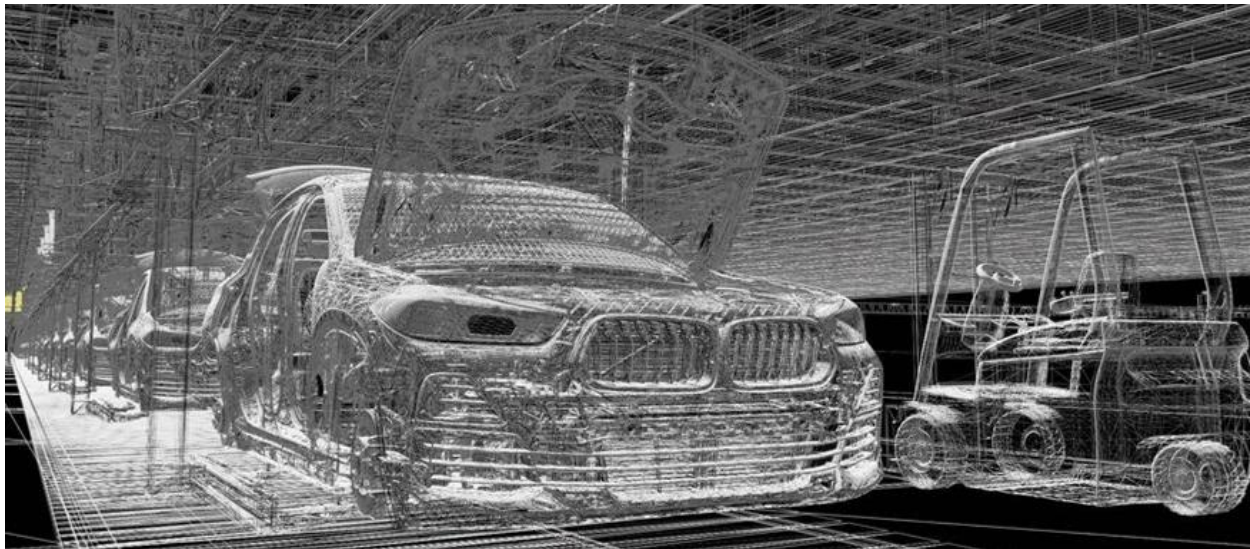
Digital Twins is a set of use cases where digital equivalents of the real world are created and displayed for interaction, control, maintenance, as well as process and component management.

Use Cases

Realtime Digital Twins | Cloud Continuum | Smart Maintenance | Digital Twins (Building Model) | PPP Digital Twin



An Intelligent Cyber Physical Future



Advanced Media Production Studios



5G Festival

CATAPULT
Digital

SENNHEISER
Audiotonix

Sonosphere

mativision

Telefonica | O₂

Metropolis
Studios

DF

WARNER MUSIC GROUP

LIVE
FROM

Brighton Dome



- Brighton Dome is the South East's leading arts and entertainment venue
- It is Grade I listed with three distinct performance spaces including its 1,800 seat Concert Hall
- Pink Floyd first performed Dark Side of the Moon and Abba won Eurovision in 1974



O2 Arena



- The O2, has been the world's top arena for ticket sales since 2008 with a capacity of 20,000.
- 2m tickets sold in 2018, 0.8 million more than its closest rival Madison Square Garden
- More than 60 million people have visited the O2 since it opened



Metropolis Studios

- Europe's #1 independent recording studio and home to the best mastering engineers in the world
- The Power House, is a prestigious Grade II listed building used as an intimate event space



BridgeAI

£100m **Innovate UK** national programme jointly delivered by **Digital Catapult**, **Innovate UK KTN**, **The Alan Turing Institute**, **BSI** and **Hartree Centre**.

Stimulate the adoption of Artificial Intelligence and Machine Learning technologies in sectors of the UK economy that currently demonstrate low AI maturity but have high potential for growth – **Agriculture, Creative, Transport, Construction**. Building the bridge between supply and demand of these technologies.

6 Ensure all areas of the UK economy can benefit from productivity gains and increase in gross value-added, supporting the **transition to an AI-enabled economy**.



CATAPULT
Digital



Collaboration

We foster partnerships between supply and demand for AI solutions and cross sector collaboration



Connecting businesses in key target sectors with AI experts



Responsible Technology

We build the foundations for digital and data and responsible technology readiness



Driving responsible AI adoption: AI Ethics, Data Maturity and Data Readiness



Scaling

We encourage private investment to help scale solutions



Providing access to a network of investors and insight into the fundraising process



VEUNEX

Harnessing the capabilities of AI to revolutionise safety in the realms of Health, Safety, and Environment

Veunex, aims to revolutionize safety, using AI and big data. Their core mission is to transform occupational and process safety, integrating all risk sources and response mechanisms with AI and Generative AI.

They work across sectors like construction, refineries, and manufacturing to reduce major accidents. Veunex envisions a world where AI prevents disasters, creating a safer and more resilient future through technology, data, and human innovation.

- Veunex not only monitors, analyses, and responds to potential risks in real time but also proactively equips organisations to identify and mitigate risks long before they materialise.

Veunex Global



Company size

Team of 5



Headquarters

London, England



Funding stage

Seed



Business

B2B

Data type used

- Images/Video; Text
- Sensor
- Behavioural
- Tabular

Self-assessed TRL

- TRL 6-8

More information

- [Veunex Global Website](#)
- [LinkedIn](#)

Interested in using

- Cloud Compute
- AI specialised hardware

Sustainability contribution

Economic

Environmental

Social









Advancing user-centric products through brain-computer interfaces

NeuralEcho Labs pioneers an immersive virtual experience through brain-wave communication, blending brain-computer interfaces, VR, and AI in their Neurogamer headset. Their team applies validated medical research to create user-centric products, spanning from gaming to everyday life. By implementing Neural Control, Neural Emotions, and Neural Vision, they enhance user experiences and interactions.

- The company aims to empower the human mind with technology while aiming to uphold ethical and responsible principles, envisioning a future where mind and machine advance humanity together.

NeuralEcho Labs

	Company size	Team of 9
	Headquarters	London, England
	Funding stage	Pre-seed
	Business	B2B / B2C

Data type used

- Images/video
- Speech/sound
- Sensor
- Tabular

Self-assessed TRL

- TRL 5-6

More information

- [NeuralEcho Labs Website](#)
- [LinkedIn](#)

Interested in using

- Cloud Compute
- AI specialised hardware

Sustainability contribution

Economic

Environmental

Social



MindEye2:

Shared-Subject Models Enable fMRI-To-Image With 1 Hour of Data

Paul S. Scotti^{1,2}, Mihir Tripathy^{1,2}, Cesar Kadir Torrico Villanueva^{1,2}, Reese Kneeland^{1,3}, Tong Chen^{4,2}, Ashutosh Narang², Charan Santhirasegaran², Jonathan Xu^{5,2}, Thomas Naselaris³, Kenneth A. Norman⁶, Tanishq Mathew Abraham^{1,2}

¹Stability AI, ²Medical AI Research Center (MedARC), ³University of Minnesota, ⁴The University of Sydney, ⁵University of Waterloo, ⁶Princeton Neuroscience Institute.
(† indicates core contribution)



arXiv
Preprint



Source Code
GitHub



Results

Abstract

Reconstructions of visual perception from brain activity have improved tremendously, but the practical utility of such methods has been limited. This is because such models are trained independently per subject where each subject requires dozens of hours of expensive fMRI training data to attain high-quality results. The present work showcases high-quality reconstructions using only 1 hour of fMRI training data. We pretrain our model across 7 subjects and then fine-tune on minimal data from a new subject. Our novel functional alignment procedure linearly maps all brain data to a shared-subject latent space, followed by a shared non-linear mapping to CLIP image space. We then map from CLIP space to pixel space by fine-tuning Stable Diffusion XL to accept CLIP latents as inputs instead of text. This approach improves out-of-subject generalization with limited training data and also attains state-of-the-art image retrieval and reconstruction metrics compared to single-subject approaches. MindEye2 demonstrates how accurate reconstructions of perception are possible from a single visit to the MRI facility. All code is available on GitHub.



From Twitter/X

Seen image



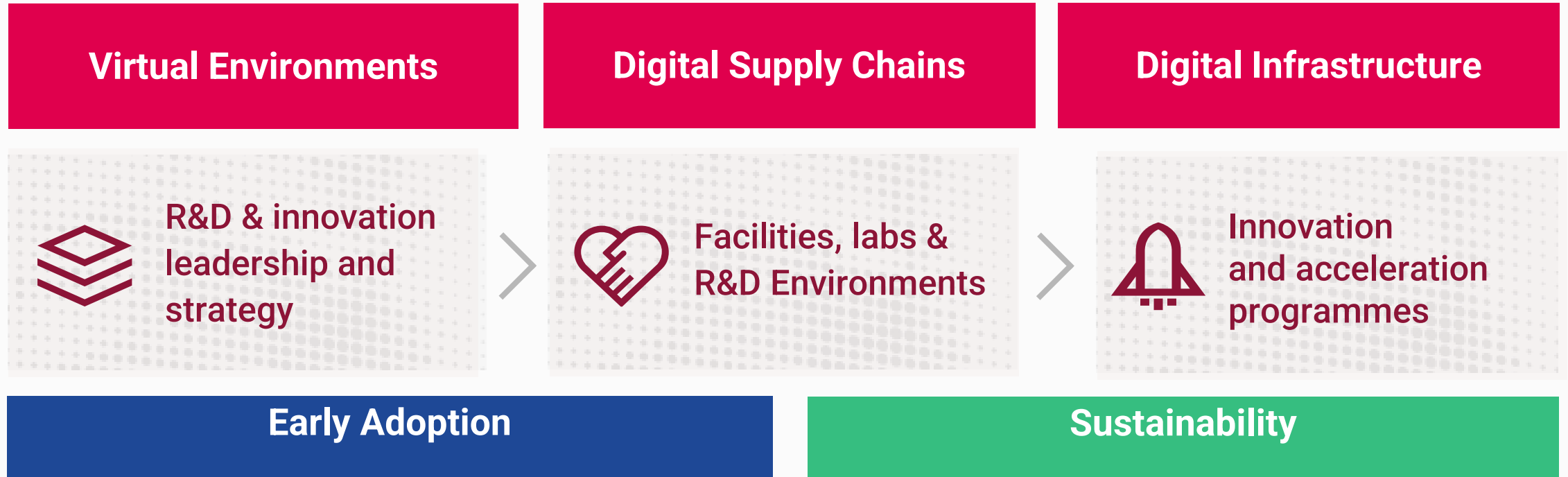
MindEye2



Thank you!

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Digital Catapult: What do we do?



Digital Catapult Accelerators

Machine Intelligence Garage (MIG)

The MIG was an acceleration programme, supported by CAP-AI and European Regional Development Fund, to provide early stage AI companies access to computation power, technical expertise, and industry-leading support on applied AI ethics

Project Overview

- **>150 Startups** supported through the programme.
- **Over £52M** raised as investment by alumni of the programme
- **Improved performance:** More than half of alumni have significantly increased turnover, and roughly two thirds have grown the number of employees and introduced or significantly improved their products.
- **Industry connections:** connected participants with some of the largest and most innovative companies involved in AI/ML development, including, NVIDIA, Graphcore, AWS, GCP and Thales.

Digital Catapult Role

DC lead all activities, but with support from a panel of external experts on AI ethics, compute service providers Amazon Web Services and Google Cloud Platform.

Project Impact

-  Over 150 SMEs supported on the programme across 17 cohorts
-  £7.2M of compute and optimisation opportunities delivered across all cohorts
-  76% of SMEs said responsible AI is a critical and consistent aspect of their decision making process as an organisation
-  £52M+ investment raised by participants during and after the programme

Partners



Digital Catapult: FutureScope

Enabling UK deep tech companies to scale faster.

2018 -To Date

- Supported 3,000+ companies
- 600+ startups accelerated
- £555M raised by 174 startups since 2018
- 2,000+ high value high tech jobs created
- 100+ VCs deal flow boosted
- 52+ accelerator cohorts
- £10M+ Computation Power Credits
- April 2022 - March 2023: £172M raised



FutureScope
Support

TECHNOLOGY

AI, IMMERSIVE, DLT, IoT,
QUANTUM, ADVANCED
NETWORKS & 5G

INVESTMENT

INVESTMENT READINESS,
ESG VC, PITCH TRAINING

BUSINESS

PRODUCT, ETHICS,
FOUNDER SUPPORT,
BUSINESS ANALYSIS

ASSETS & FACILITIES

TESTBEDS, STUDIOS &
LABS, COMPUTE POWER
& HARDWARE

BridgeAI

As the UK's national innovation programme (with a total budget of £75M) for Artificial Intelligence, BridgeAI will enable adoption and diffusion of AI technologies in UK priority sectors and places by creating new market opportunities.

Project Overview





- **Ecosystem mobilisation and upskilling:** stimulating demand in AI adoption and business opportunities for AI developers
- **Underpinning technical and innovation services:** Enabling adopters and developers to collaborate effectively and build scalable solutions
- **Focused business and technology acceleration:** Growing capabilities within AI supply chain with sector-focused, themed cohorts for business acceleration/scaling

Digital Catapult Role

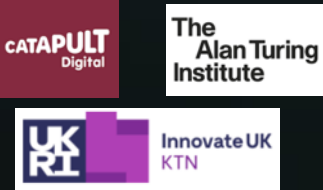
In partnership with KTN and Alan Turing Institute, DC will play a leading role in all of the activities.



Project Impact

-  Increased investment into emerging AI applications
-  AI adoption across broader swathe of industries & regions
-  Enhanced data plumbing / ML Ops capacity
Increased diversity in applied AI
-  Increased Gross Value Added generation within involved industries & regions

Partners



Edge AI Companies from BridgeAI Accelerator

opencapacity







Computerised systems for AI-driven capacity analytics, forecasting and visualisation for public transport

Utilising Digital Twin technologies, OpenCapacity enhances insights for operators to better understand the conditions and content of their rolling stock assets in real-time and future states. This information enables passengers and operators to make strategic and informed decisions.

OpenCapacity offers multiple products to help better understand the usage of the public vehicles, such as how vehicles are used, for how long and under what conditions.

These all play a critical part for delivering a Digital Twin to help enhance the customer experience and operational performance.

OpenCapacity

	Company size	Team of 4
	Headquarters	London, England
	Funding stage	Seed
	Business	B2B
	Self-assessed TRL	TRL 7
	More information	Website

Sustainability contribution

Economic

Environmental

Social

Data type in use/planned

- Images/Video
- Behavioural
- Sensor
- Tabular

Compute resource preference

- Cloud Compute
- AI Specialised Hardware









PODTECH.io
Engineering . Consultancy . Support

Bespoke software solutions focusing in power management and real-time monitoring

PODTECH's LifeSafety.AI is an in-house transformative AI-driven computer vision solution initially designed to detect PPE compliance in construction sites, now being adapted to improve accessibility in public transportation.

By leveraging advanced machine learning for real-time object detection and edge computing for immediate data processing, PODTECH can adapt their solution to detect different occupants (wheelchairs, prams, luggage) in priority spaces, ensuring accurate, real-time updates.

Podtech IO

 Company size	Team of 10
 Headquarters	Milton Keynes, England
 Funding stage	Not a startup
 Business	B2B
 Self-assessed TRL	TRL 4
 More information	Website

Sustainability contribution

Economic

Environmental

Social

Data type in use/planned

- Images/Video

Compute resource preference

- Cloud Compute
- Edge Computing
- AI Specialised Hardware

Material Index





Revolutionising building material reuse with a tenfold enhancement

Material Index digitises construction projects and real-estate assets to deliver 10x improvement in reuse rates, by closing the loop between deconstruction and construction.

Material Index helps decision-making for building owners by providing insights on properties such as embodied carbon, ease of extraction, and exchange value.

- Material Index uses AI to increase the speed, safety and accuracy of digitisation. MI is exploring the ability to extract metrics from segmented Neural Radiance Field (NeRF) models. This enables audit data to be captured using standard phone cameras and automates the classification, counting and measuring of elements.

Material Index

	Company size	Team of 3
	Headquarters	London, England
	Funding stage	Pre-seed
	Business	B2B

Data type used

- Images/video

Self-assessed TRL

- TRL 3

Interested in using

- Cloud Compute
- High Power Computing

More information

- [Material Index Website](#)
- [LinkedIn](#)

Sustainability contribution

Economic Environmental Social





Powering reliability and ensuring peace of mind in electrical distribution monitoring

TagnTell Technology is a pioneer in AI-powered electrical distribution monitoring. Their product, Attent not only predicts potential power disruptions but also instantly alerts the responsible person in case of outages, ensuring exceptional safety and responsiveness.

- Attent's vision is to create a future where reliability is the norm, eliminating the stress of unexpected power failures. Attent offers secure, reliable, and predictive electrical monitoring, promising peace of mind.

TagnTell Technology

	Company size	Team of 5
	Headquarters	Liverpool, England
	Funding stage	Pre-seed
	Business	B2B

Data type used

- Speech/Sound
- Sensor

Self-assessed TRL

- TRL 6

Interested in using

- Cloud Compute
- AI specialised hardware

More information

- [TagnTell Technology Website](#)

Sustainability contribution

Economic

Environmental

Social



Benefits and Risks of AI at The Edge

Benefits of AI/Compute at the Edge are Substantial

- **Speed** advantage of inference closer to the required action point (e.g., self driving cars doing complex object recognition in order to avoid collisions, etc.)
- **Potential cost/sustainability savings** versus cloud, due to lower powered devices and less cost of data transfer
- **Privacy**. Private data can be maintained at the point of action, with only necessary updates to cloud AI transmitted.

However, each of these comes with caveats, and there are additional risks to consider



Risks

For each benefit, there is an associated perverse risk:

- An explosion of devices at the edge could mean an explosion of required central compute
- The cost/sustainability advantages are complex, and require consideration of whole lifecycle costs of edge devices
- Exponential growth of edge compute exponentially expands the security and privacy attack surface
- As with all AI, there is a need for verifiability of components. In complex systems of systems, this is a challenge.
 - **Digital Catapult are exploring this challenge in their REASON project, and in a Verifiable AI in Trusted Infrastructure programme**
- Despite efforts to establish standards, expanding devices at the edge will always lead to issues of interoperability.
 - **Digital Catapult are developing new tools for AI Powered Interoperability, led by our Digital Supply Chain Hub Interoperability Flagship project**



The Future of Edge AI

Case Study – Kelp Technologies

The Context

High Growth AI Accelerator for BridgeAI

Cohort 1

From Creative Industries – Kelp Technologies, an UK-based startup led by a core team of four young entrepreneurs. They provide data-powered market-wide solutions in the second-hand fashion market. Based in London – B2B / B2C

The Intervention

Kelp Technologies' innovation was to deliver "AutoID" in the programme: a large-scale information processing and retrieval system to locate the same garments across various online stores.

A solution that reduces market asymmetry, saves time for fashion resellers, enhances profit margins, and offers data insights into trends patterns in resale.

Their key challenges were around scaling their business and the time investment needed in building and training the large model, as well as enhancing the buying experience on their consumer-facing app Truss.

The Impact

Kelp Technologies:

- Commercialised AutoID with Entrupy, that provides the technology capable of authenticating luxury products
- Funding received: **Partnered with Depop and Selfridges** for the CR&D BridgeAI competition and **won £1.1M grant** to develop a multimodal catalogue search for second hand apparel valuations
- Creation of jobs: Currently hiring new 2 full-time job roles in the team: Product Owner and Full-Stack Developer
- Raised awareness of product/service: Reached 10,000 followers on Instagram in March with their consumer-app Truss (a 30% growth in February, and a 150% increase in last quarter)

Case Study – NeuralEcho Labs

The Context

Cohort 1

From Creative Industries – **NeuralEcho Labs**, an UK-based startup with 3 co-founders. They provide immersive virtual experience through brain-wave communication, blending brain-computer interfaces, VR, and AI. Based in London – B2C

The Intervention

NeuralEcho Labs' innovation is Neurogamer, a VR neuro headset with a Brain-Computer interface implementation that uses AI, to be used by engineers / creators and end-users such as gamers.

Their goal is to make joysticks and keyboards obsolete by reading the brain's electrical activity and turning it into commands, which has implications for both the gaming experience but also accessibility and inclusion.

Their key challenges were their extensive experimental work and constraints about the compute-intensive training processes, as well as the development of their hardware

The Impact

NeuralEcho Labs:

- Identified risks regarding product and user data safety, clarified the product's features, explored its technical foundation
- Adopted a more agile approach, which allowed team to create a better business strategy and articulate their vision to investors and partners
- Supported them in making their product - both hardware and software - compliant with regulations + more ethical and human-centered
- New collaboration: Started a long-term mentorship with the Information Commissioner's Office (ICO)

Identified gaps in policy & guidance: Through the accelerator, the Information Commissioner's Office highlighted a huge amount of high-risk processing in NeuralEchoLabs' product and discovered that the office is currently lacking policy and guidance around neurotechnology. As a result, the policy officer is in discussion to developed these regulations at higher organisational levels.

What to expect in Edge AI's Future

- Generative AI at The Edge
- Computer Vision at the Edge
- Data Efficient AI and Distributed AI Enabled by The Edge
- Edge AI fully integrated in 5G and 6G
- Cloud-Edge Hybrid Solutions
- Sectors with (continued) High Impact of AI at The Edge:
 - **Healthcare**
 - **Manufacturing**
 - **Built Environment**
 - **Customer Experience**
 - **Energy and Sustainability**
 - **Automotive and Transportation**