# Driving the adoption of AI in the UK

Machine Intelligence Garage Impact Report 2021







To mark three years since Digtial Catapult's Machine Intelligence Garage launched, join us as we reflect on the impact of the programme and the startup success stories during that period.

Select one of the links below to jump to each section of the report.

Throughout the document, there are navigation tabs at the top of the page, so you'll be able to navigate through sections in the same way.







Delivered as part of a CAP-AI project and part-funded through the European Regional Development Fund, the programme was developed to address the problem of more than half of startups are constrained by computation power.<sup>1</sup>

By offering access to a range of computation resources, technical expertise and support with business, investment and applied AI ethics, the programme helps businesses overcome some of the major obstacles hindering their growth.

To date, Machine Intelligence Garage has supported more than 100 startups, which have raised a total of £52 million of investment. More than half of the participating startups have significantly increased their turnover, and roughly two thirds have grown the number of employees and introduced or significantly improved their products.

# A plan, an opportunity and an immediate need

Digital Catapult is the UK authority on advanced digital technology – through innovation we accelerate industry adoption to drive growth across the economy.

Through our acceleration programmes, we provide startups with access to expertise, experimentation space and the frameworks to accelerate the ethical development and application of their technology solutions. This includes applications across future networks (5G and IoT), immersive technologies, artificial intelligence and distributed systems.

As one of Digital Catapult's acceleration programmes, Machine Intelligence Garage provides the tools, resources and expertise needed to accelerate business growth and raise investment.

The programme offers startups access to computation power, specialist hardware and deep learning services, and provides workshops focused workshops, frameworks and relevant expertise. Together with our programme sponsors, we aim to enable the responsible development and use of AI directly into industry.

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With AI technologies continuing to transform the global economy, Machine Intelligence Garage offers an independent and provider-agnostic acceleration programme for startups and scaleups developing new and enhanced products and services.

In order to be selected, companies must be at early or very early stage and have:

- A business plan with a well-defined and viable product or service
- Assessed the ethical impacts of their solution
- The tech expertise, team and an implementation plan
- The necessary data at hand, ready to be used
- An immediate need to access computation power



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Machine Intelligence Garage has opened doors and helped us focus on key aspects of responsible use of AI and company development, enabling us to provide better value for clients, expand our business, and seek investment.

Áine Uí Ghiollagáin, Co-Founder and CTO, DeepMiner

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THE THREE PILLARS





## The three pillars of support

**Machine Intelligence Garage** provides programme participants with a broad range of support activities in three areas:

## **BUSINESS AND INVESTMENT SUPPORT**

The main purpose of our acceleration programmes is to provide startups with access to support that helps them break down commercial barriers. Through **Machine Intelligence Garage**, founders are introduced to large companies. Startups are supported in refining solutions for the market, and in de-risking corporate adoption of AI through mutual knowledge sharing and relationship building.

Each cohorts have access to business expertise on a range of AI-related topics to accelerate market growth and positioning, as well as connecting with other leading startups in the wider AI and ML ecosystem.

The programme also supports startups with workshops on a number of business topics, such as how to refine value propositions, strategic marketing, IP rights, service design and UX.

Naturally, investment is a key focus. In a (post) pandemic world, the competition for investors' attention has increased. There are more initiatives to open up access to investors and there is more available capital, yet, there is still an imperative to understand the investment landscape and what investors are assessing at different stages.

**Machine Intelligence Garage's** investor readiness programme allows founders to gain insight into the fundraising process and the variety of financing options available to them. It demonstrates how they can best position their business for investment, build their capitalisation table and negotiate term sheets. Founders learn how to set the valuation of the fundraising round, build the narrative for their startup and improve their entire investment strategy.

Throughout the programme, founders also are given access to a wide network of early-stage investors, including angel investors and syndicates, high net worth individuals, VCs, CVCs and family offices. Over the past year, the programme has worked with more than 200 investors, including Accel Partners, Balderton and Atomico, Notion Capital, Frontline VC, Amadeus Capital and Point Nine Capital.



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See how our business support helped Greyparrot raise a £2.7 million seed round on page 21.

Digital Catapult has supported us in many areas, including help to refine our pitch and introductions to key investors. Mikela Druckman, Co-founder and CEO, Greyparrot Recent successes:

# £3.7m "

£3.7 million series A raised for Al powered market research company techspert.io Being a member of the Machine Intelligence Garage cohort has been immensely beneficial for our growing business. We first met Nauta Capital at Digital Catapult's Investor Showcase and they went on to become the lead investor in our series A funding round. We would not have met them otherwise.

David Holden-White, Co-Founder and Managing Director, techspert.io

# \$1.3m *«*

\$1.3 million seed round raised by Aflorithmic with Crowd Media Holdings

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Read more about ho helped Aflorithmic L for its Al-driven audi



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## **TECHNICAL SUPPORT**

Thanks to the computation power available within the programme, participants have the opportunity to innovate, test and develop algorithmic proof of concepts. They are able to use new hardware and supporting technology solutions, accelerating the readiness of their AI solutions in a way that would not otherwise be possible at such an early stage.

Startups can leverage up to \$100,000 in cloud credits from our partners Amazon Web Services (AWS) and Google Cloud Platform (GCP), and access our on-site NVIDIA DGX-1 deep learning servers. This support is critical to relieving the compute constraint that so many AI startups experience. So far, cloud credits worth over \$10 million have been accessed through our programme.

**Machine Intelligence Garage** also operates as a conduit for startups to experiment with cutting-edge compute resources such as IPUs from Graphcore. Through partnerships with specialist HPC centres like the EPCC and the Hartree Centre, startups can also tap into world-leading supercomputer resources and associated technical support. Participants engage with the opportunity to engage with expert technical and product focused support activities, such as partner office hours, focused workshops and regular meetups. These activities are tailored to the needs of early-stage AI and ML startups and are delivered across technical and business domains.

For example, while our support has included technical workshops on topics such as computer vision and software architecture for machine learning, startups have also received one-to-one consultations from experts in product management and human centred design for AI. Delivered alongside our AI ethics support, these interventions go beyond purely technical topics to help startups to build responsible and human-centred solutions that are ready for adoption.

Startups on the programme are often at the cutting edge of AI, which is why **Machine Intelligence Garage** has partnered with leaders in AI and ML research, such as the Alan Turing Institute, to connect the best ideas from industry to top quality research talent. This primarily happens through funded data study groups. This primarily happens through funded data study groups, where participants can collaborate with some of the UK's top research talent to analyse real-world AI/ML challenges faced by industry.



See how our technical support helped Humanising Autonomy on page 17.

Digital Catapult gave us the freedom to be able to experiment and figure things out. Being part of a network meant that we could collaborate and talk through shared problems with others. Raunaq Bose, Co-founder and CTO, Humanising Autonomy

## **RECENT SUCCESSES:**

- Entale, an AI powered podcast app, was nominated for best AI product at CogX
   2021 following a successful Data Study
   Group collaboration with Digital Catapult
   and the Alan Turing Institute.
- Xentric, an AI solution for omnichannel communication, was able leverage NVIDIA DGX-1 deep learning servers to train and execute ambitious voice models, resulting in state-of-the-art voice generation and multilingual support models.





## **APPLIED AI ETHICS SUPPORT**

Importantly, Machine Intelligence Garage also works towards achieving the responsible and ethical adoption of AI alongside policymakers and academics as part of its Ethics Committee and Ethics Framework.

Established in 2018, the **Digital Catapult** AI Ethics Committee was formed to help translate responsible Al theory into practice. The Committee is chaired by Luciano Floridi, Professor of Philosophy and Ethics of Information, and Digital Ethics Lab Director at University of Oxford.

Digital Catapult's AI Ethics Framework is a highly practical tool for those individuals and organisations developing AI-enabled products and services that want to build value-aligned technologies without negative consequences. The framework is built around carefully tailored questions relating to seven ethical questions, and is designed to stimulate thoughtful and constructive discussion.

Each startup is introduced to the Ethics Framework through a facilitated process, provided by our Ethics Committee.

These ethics consultations use the framework as the basis for exploratory and reflective discussion, helping startups to explore the commercial value of responsible and ethical AI. They provide participants with a range of tools to help them use data and run operations more responsibly, while embedding good practice within the company and product.

Machine Intelligence Garage also offers participants the opportunity to take part in an AI Ethics Deep Dive. This 12-month collaboration includes several half-day workshops, the co-creation of an ethics roadmap, and additional support in actioning ethics recommendations and milestones.

Finally, our AI Ethics support is introduced alongside related assistance with legal and regulatory compliance issues, thanks to partnerships with relevant regulators including the Information Commissioner's Office (ICO) and experts in intellectual property. This ensures that startups on the programme are encouraged to think about not only current legal and regulatory risks, such as compliance with GDPR, but also deeper and broader ethical issues.

See how our AI Ethics Deep Dive helped Loomi on page 19.

One of the key things for us is the ability to build trust. Being part of the Ethics Committee deep dive was an imperative for us, as ethics forms a core part of the essential value of our product... The deep dive was a serious time commitment, so it's not right for every startup - but if this is likely to be a differentiator for your business, I'd recommend it. Al Ramich, Founder and CEO, Loomi





## **RECENT SUCCESSES:**

 Alchera Technologies delivers real time data about vehicle and pedestrian movements around cities and other large-scale infrastructures.
 Because it relies on data sources such as CCTV footage, its founders recognised the ethical implications of using this information beneficially, proportionately and responsibly.

Following an AI Ethics
Deep Dive, Alchera
Technologies was able
to clarify that its
commitment to ethical
obligations was equal in
importance to its legal.





 This had implications at both a cultural and strategic level, including its approach to working in countries with less robust legislation on data.

# Forging partnerships across the industry spectrum

Machine Intelligence Garage connects participants with some of the largest and most innovative companies involved in AI and ML development, including:

## **Creative cohort** partners and

- sponsors ■ BBC Northern Ireland
- Lewis Silkin
- DPP

## Cloud compute partners

- Amazon Web
  - Services (AWS)
- Google Cloud
  - Platform (GCP) Centre
    - EPCC
      - Cray

partners

NVIDIA

Graphcore

■ STFC Hartree

- SpiNNaker
- Cerebras Systems

Hardware and HPC

## Partners and

## sponsors

- Thales
- Analogue Devices
- Information
- Commissioner's Office (ICO)

## Academic and research partners

- The Alan Turing Institute
- Newcastle University
- Earlham Institute
- Bart's Health Trust

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# IMPACT AND PROGRAMME OUTPUTS

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# Supporting progress across the three pillars

In the three years since its inception, Machine **Intelligence Garage** has helped more than 100 startups over 12 cohorts. Participants have raised more than £52 million from private and public investors, with around 50% having accessed their investment after concluding the programme.

But the programme's impact reaches well beyond the financial. Following a survey for participants to assess the three pillars of support from its **Machine Intelligence** Garage, Digital Catapult found that:

# Access to the NVIDIA DGX-1 has been really helpful to develop our product. The AWS credit helps us preserve cash immediately The investment workshops have given new perspective on our pitch deck and how we phrase the conversation around our business. Kevin Lee, Co-Founder and CEO, Mobilized Construction

# 52%

of startups had increased their turnover, with an average increase of 150% when including pre-revenue startups and 311% for companies already generating revenue

## 61%

of participants had introduced new or significantly improved products

# 67%

had grown their number of employees, with an average of 2.5 jobs created per company surveyed - a significant increase for startups with only a small handful of employees

# 46%

had introduced new or significantly improved production or supply processes; Machine Intelligence Garage's compute power was rated by respondents as 4.2/5, in terms of its ability to unlock new innovation and optimisation opportunities

# 50%

of all respondents rated compute power as 5/5, with more than £7.2 million of compute delivered in total

# 76%

startups said ethics is a critical and consistent aspect of their decision making process as an organisation

were either satisfied or very satisfied with their involvement.



## 94%

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# Increasing diversity in access to capital

Diversity is hugely important to the Machine Intelligence Garage programme. According to the <u>Diversity Beyond Gender</u> (2020) report, entrepreneurs who are not white or male experience poorer access to venture capital in the UK. The report finds that between 2009 and 2019:



11% of venture capital went to female founders



capital was invested in teams with at least one founder from an elite educational background

**0.24%** of funding was raised by black founders

Of all seed and early-stage venture capital funding raised in the ten years to 2019:

**2.4%** was by all ethnic teams

**17.1%** was by mixed gender teams

**2.5%** was by all female teams

**32%** was by mixed ethnicity teams From our surveys of Machine Intelligence Garage cohorts, we have found that:



73% were diverse in ethnicity

73

**46%** came from diverse socioeconomic backgrounds

**42%** were gender-diverse

**18%** were diverse in terms of disability

24% were neuro-diverse

Diversity, equality and inclusion are an intrinsic part of the Machine Intelligence Garage ethics framework. We believe that diverse teams that are representative and inclusive are smarter, provide higher returns, and help create products and services that work for a greater number of people in society.

As a result, we prioritise companies that can demonstrate that they value and actively seek these qualities in their own enterprise.



**15%** were diverse in terms of sexuality

**16%** of founders were female

# CASE STUDIES

For a more in-depth look at the support provided by Machine Intelligence Garage, here are four stories of how the programme helped startups adapt to new skills, objectives and industries.

To learn more about how these and many other startups have succeeded through **Machine Intelligence Garage**, visit our <u>programme highlights</u>.





# Humanising Autonomy

## Forging links, finding resources, uncovering new industries

Humanising Autonomy's technology defines how autonomous systems interact with people, making autonomous vehicles safer and more efficient in a range of culturally specific urban environments.

Through the application of AI, Humanising Autonomy has created models that capture the complexity of human behaviour in urban locations around the world, allowing mobility solutions of the future to predict and react to the way people behave in different cultural and physical environments.



## Needed to:

- Train complex models
- Grow its business
- Explore new use cases in adjacent industries

## Key acceleration resources:

- Computational power through Google Cloud credits and NVIDIA DGX-1
- Salary subsidy help to hire first employee
- Connect and collaborate with other startups
- Forging links through industry-specific scoping workshops
- Help identifying expansion opportunities

## Results

- Recently raised \$5.3 million seed round
- Shortlisted for Digital
   Catapult's 2019 Platinum
   Awards
- Currently recruiting





## TEACHING TECHNOLOGY TO ANTICIPATE HUMAN ACTION

While human drivers can swiftly adapt to changing circumstances, autonomous vehicles need to learn how context shapes behaviour, and how to predict and react to the actions of the people around them.

Machine learning algorithms need to be trained and validated using huge data sets, which meant that Humanising Autonomy needed access to a significant level of computational power, as well as expertise for how to best use such resources. This was their main reason for joining Machine Intelligence Garage in 2018.

Humanising Autonomy joined one of the early cohorts of Machine Intelligence Garage, through which Digital Catapult provided access to both computational resources and technical talent to optimise usage of the resources, including data storage, training models and client access via API.

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# "

Digital Catapult gave us the freedom to be able to experiment and figure things out. Being part of a network meant that we could collaborate and talk through shared problems with others.

Raunaq Bose, Co-Founder and CTO, Humanising Autonomy

## PROVIDING ACCESS TO POWERFUL RESOURCES – HUMAN AND COMPUTING

Having credits for access to Google cloud services meant that Humanising Autonomy could train its models using technology that would have otherwise been unaffordable.

Although Humanising Autonomy was looking for support in terms of computational power, they found that the benefits of working with Digital Catapult extended much further. As an early startup, being given access to a salary subsidy meant that the co-founders could take the first step towards growing their business by hiring their first employee, a valuable addition to their team.

As a member of the Digital Catapult community, the Humanising Autonomy team can now connect, collaborate and discuss challenges with other startups, a significant benefit that continues over the longer term. And through participation in industry-specific scoping workshops, the team has been able to forge links in manufacturing – a sector which the Digital Catapult team identified as a potential future opportunity for expanding the use and application of Humanising Autonomy's innovative predictive platform.

Humanising Autonomy was shortlisted for Digital Catapult's Platinum Awards in 2019, which celebrate the most innovative advanced digital technology startups and scaleups in the country. The founders recently raised a \$5.3 million seed round, and they are currently recruiting.

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# Loomi

## Using ethics as a key differentiator

Unlike most existing AI helpers, Loomi isn't just another voice search engine. As an AI personal assistant platform it automates the tasks that a real personal assistant would carry out, making a high level of personalised service available, and helping to manage information better.

Loomi connects with the individual's user data (calendars, email, diaries and so on) via APIs and extracts intelligence to use and self-train. In the organisation environment, Loomi enables secure on-premise aggregation of internal data, building of custom ontologies, and ultimately more accurate personalisation of data and tasks for internal users.

## Needed to:

- Improve data security
- Handle user data
- Provide transparency
- Evidence integrity
- Grow functionality

## Key acceleration resources:

- Ethics deep dive
- Helped to meet needs of different users
- Establishing policies
- Training, comms and marketing strategies
- Learning from industry and academic research

## Results

- Repositioning of product using ethics as a key differentiator
- Identifying and completing product development actions for enhancement pre-launch
- Now able to share learnings with peers





## THE BENEFITS OF DIGITAL CATAPULT'S ETHICS COMMITTEE 'DEEP DIVE'

Because Loomi is a complex and highly technical product, a focus on security, how to handle user data, and providing transparency around how the product works was required - evidencing integrity to be able to earn user trust.

The initial focus was on functionality and being able to reflect the Loomi core values within the products and the business as a whole. Being part of the Ethics Committee deep dive proved to be a significant benefit. It enabled Loomi to go into unprecedented detail and explore a wide range of relevant aspects of product development, including meeting the needs of different types of users and establishing relevant policies, training, communications and marketing strategies.

As well as learning from industry and academic research, the deep dive enabled Loomi to focus dedicated time and expertise on this all-important area of the business. It facilitated questioning, reflection and identifying priorities more clearly, and resulted in new actions being added to the product roadmap (such as relabelling functionality to make it more user- intuitive, and finding different ways to evaluate sources of news content).

One of the key things for us is the ability to build trust. Being part of the Ethics Committee deep dive was an imperative for us, as ethics forms a core part of the essential value of our product...The deep dive was a serious time commitment, so it's not right for every startup – but if this is likely to be a differentiator for your business, I'd recommend it.

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## Al Ramich, Founder and CEO, Loomi

Loomi's launch was pushed back to accommodate the deep dive and its outcomes, giving the team more time for product development and addressing the new actions that had emerged. Now they had a structure for implementing and managing ethics, and this output would be used to influence and differentiate the way Loomi was to be marketed.

The Loomi team has continued to interact and network with others in the Machine Intelligence Garage cohort, and recently led a successful Digital Catapult workshop to share learnings on AI ethics and algorithm transparency.



## TURNING LEARNING INTO POSITIVE ACTION

# Greyparrot

## Growing investment and expanding into new markets

Greyparrot uses AI-powered computer vision to rapidly recognise and sort waste. It analyses waste streams, monitoring and automating operations to help drive efficiency and profitability for waste managers.

## Needed to:

- Develop essential machine learning algorithms
- Understand investment landscape
- Pitch to investors

## Key acceleration resources:

- Computational power through AWS credits
- Shared knowledge with AI companies facing similar challenges
- Office hours with investors
- Workshops on fundraising, pitch practice and storytelling
- Investor Showcase
   presentation to more than
   100 investors
- Investment round led by Speedinvest

## Results

- £2.75 million raised so far
- Growth from six to eight employees
- Investment will support product development and expansion in Europe and Asia





The solution can be incorporated into smart systems and hardware, such as bins, trucks and robotics.

Benefits of the solution include:

- Quality management of recycled materials, thanks to accurate measurement of purity levels
- □ Insight and analytics to support increased recycling and recovery rates
- Risk mitigation, through recognising and managing contaminants

The AWS credits provided by Digital Catapult were used to train Greyparrot's first waste recognition system. During the acceleration programme, the team completed three pilots, and developed a minimum viable product. Like most participants, the company valued the benefits of peer support and the importance of sharing knowledge and ideas with other AI companies facing similar challenges.

# "

Digital Catapult and the Machine Intelligence Garage team have been a fantastic support to us. The programme is competitive to enter into but completely free. I would highly recommend it to entrepreneurs. Alisa Pritchard, Marketing and Operations, Greyparrot

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## CREATING A COMPELLING INVESTOR PROPOSITION

Preparation for the Investor Showcase included office hours with investors and a session on fundraising, as well as pitch practice and storytelling workshops, which the Greyparrot team found to be both intensive and impressive. This work successfully focused efforts for the investor presentation, and had the secondary benefit of helping the company hone their narrative and sales pitch.

The team met lead investor, Speedinvest, through an introduction made by Digital Catapult after the showcase. A total of £2.75 million raised so far has enabled the Greyparrot to grow its workforce, supported further product development, and will fund its expansion across markets in Europe and Asia.





# Alice Camera

## Engaging creatives and content creators

For day-to-day images, a smartphone can easily snap a photo at a party or capture a beautiful view, but content creators need more. A professional in the film or creative industries could not arrive on set with just a smartphone in hand, nor can these devices meet the demands of social media influencers, often with followers reaching hundreds of thousands.

## Needed to:

- Train AI models at scale
- Build contacts to go to market
- Raise investment

## Key acceleration resources:

- Computational power through cloud credits and NVIDIA DGX-1
- Access to technical expertise
- Partnered with SMS
   Electronics, a fellow
   Machine Intelligence
   Garage participant
- Also partnered with Arrow Electronics, a technical partner of the programme
- Introduced to manufacturers
- Supported by Indiegogo

## Results

- Raised 720% of its investment goal
- £144,170 raised in total
- Pre-orders sold out
- Went on to join 5G Testbed Accelerator Programme
- £175,000 awarded from Innovate UK





Alice Camera offers all the quality of a professional DSLR camera without the excessive cost or bulk. Its solid aluminium frame attaches to a smartphone, advancing its photographic capabilities with added usability and control.

Alice Camera's high-quality optical system features a 4/3 inch sensor to capture high quality 4K photos and footage, which can instantly be edited, streamed and shared on social media. Powered by Google's Edge TPU (tensor processing unit) Alice Camera combines deep learning and artificial intelligence with all the advantages of smartphone technology.

One of the immediate benefits was the access to the talent and resources the programme has in terms of the technical team. Another big benefit was the cloud computing credits, which we've been making the most of to train our models in the cloud. Once we train them in the cloud. we wrap them up, compress them, and deploy them on Alice. So those cloud credits have come in really handy to allow us to train at scale

Vishal Kumar, Co-Founder and CEO, Alice Camera by Photogram

## **BUILDING INFLUENTIAL CONTACTS TO GO TO MARKET**

In the early stages of the business, Alice Camera joined Digital Catapult's Machine Intelligence Garage, recognising the impact the programme has on early stage businesses it's focus on the creative industries

Alice Camera also met a representative from the crowdfunding platform Indiegogo, which later became the primary sales channel for pre-orders. Launched in February 2021, the Indiegogo campaign far exceeded its £20,000 goal, raising £144,170: 720% of its target.

After completing the Machine Intelligence Garage programme, Alice Camera joined the 5G Testbed Accelerator Programme. With pre-orders sold out and 269 backers signed up, the Indiegogo funds will go towards manufacturing 300 units.

In addition, Alice Camera was granted £175,000 from Innovate UK, which will go towards salaries and hardware testing. The team credit their close association with Digital Catapult in helping the application.



During an event at the start of the programme, Alice Camera was introduced to Arrow Electronics, one of Digital Catapult's technical partners. This connection proved valuable by helping Alice Camera source necessary components. Another useful contact was SMS Electronics, a Nottingham-based company in the same cohort, which was tasked to manufacture the first units.

# CONCLUSION



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# A future of meeting broader needs

The inception of Machine Intelligence Garage came from a clear signal from startups that they lacked access to compute power. This need has continued to grow, and it has become clear that a far wider range of resources is also required.

The development of mentorship, bespoke business coaching and ethics guidance came in direct response to the requirements of startups progressing through the programme.

This flexibility, combined with a focus on robust technical development, has helped most participants to grow their turnover and staff, and significantly improve their AI and ML products, services and processes.

The priority of the programme continues to be to help startups overcome their barriers to market. At the same time, it supports them in pivoting to exploit opportunities in in under-served industries, such as manufacturing.

In addition, virtual delivery of the programme will become a permanent feature giving participants easier access to presources, regardless of their location.



Machine Intelligence Garage is not solely driven by a focus on investment or profit. Its first aim is to help startups build a desirable, ethical and robust deep tech solution. Nevertheless, its investor readiness programme and access to investors have resulted in millions in funding for participants.

During the first three years, programme resources became increasingly diverse. These are now being shaped into clear development pathways, with startups selecting the options to meet their particular needs.

Machine Intelligence Garage continues to evolve, in line with the challenges faced by AI and ML startups. Yet its mission remains unchanged: to provide early-stage machine intelligence companies with access to gamechanging computation power and technical expertise, business coaching and applied AI ethics consultation.

Many big ideas have started in garages.





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