The Discovery Accelerator

Fifteen European cases at the frontier of AI-powered scientific discovery

An Implement Consulting Group study commissioned by Google

November 2025

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Fifteen European cases at the frontier of AI-powered scientific discovery

Technological breakthroughs have long driven scientific progress - the foundation of prosperity, health, and human advancement. Yet over the past 75 years, the pace of discovery has slowed. Research has become more complex and costly, and new ideas increasingly harder to find.

In recent years, advances in artificial intelligence (AI), building on decades of research and global collaboration, have opened new possibilities for accelerating discovery across scientific domains. Europe's research institutions and innovators are already applying AI to tackle major challenges in health, climate, and the natural sciences. This report showcases how AI is already delivering tangible impact across a multitude of fields of science today.

The 15 cases in this report demonstrate how AI is accelerating scientific discovery and innovation across Europe - offering tangible evidence of progress and early lessons for policymakers seeking to harness the full potential. They highlight how AI-enabled breakthroughs can help realise Europe's scientific ambitions - from faster drug discovery and more carbon-free energy systems, to improved environmental monitoring and a deeper understanding of our universe.

Across the 15 cases, five success factors emerge:

- **Collaboration:** Cross-sector and cross-border partnerships between public institutions, private firms, and researchers
- **Long-term commitment:** Sustained investment in both workforce upskilling and AI development - over years, not quarters
- **Compute capacity:** Access to powerful, state-of-the-art infrastructure for AI development and scientific simulation
- **Advanced models:** Leveraging the latest AI research and tools to solve complex scientific problems
- **Data foundations:** Availability of high-quality, structured data from diverse and interoperable sources

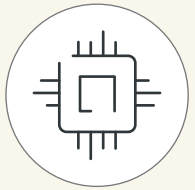
Together, these cases show how AI can invigorate Europe's scientific productivity - turning today's technological advances into tomorrow's discoveries.

Collaboration & partnerships

Collaboration spanning across both private and public sectors as well as continents

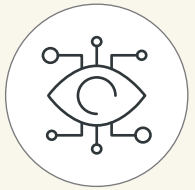
Long-term commitment

Long-term investments and perseverance in AI projects and workforce upskilling



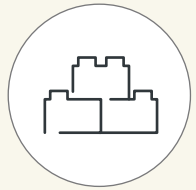
Compute capacity

Access to powerful, state-of-the-art infrastructure



Advanced models

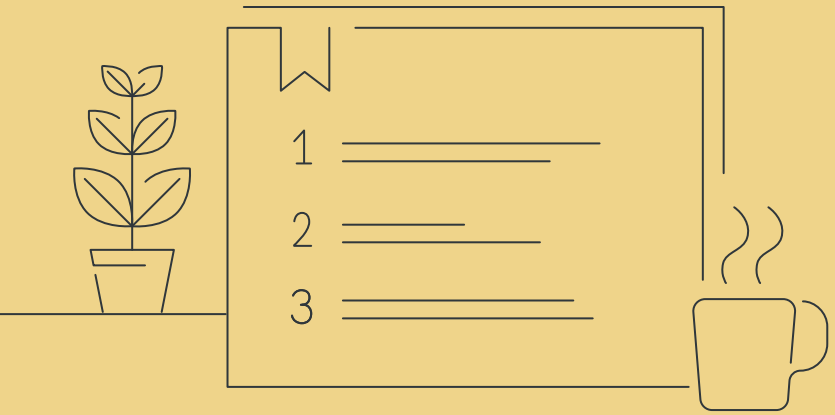
Leveraging the latest global AI research and tools



Data foundations

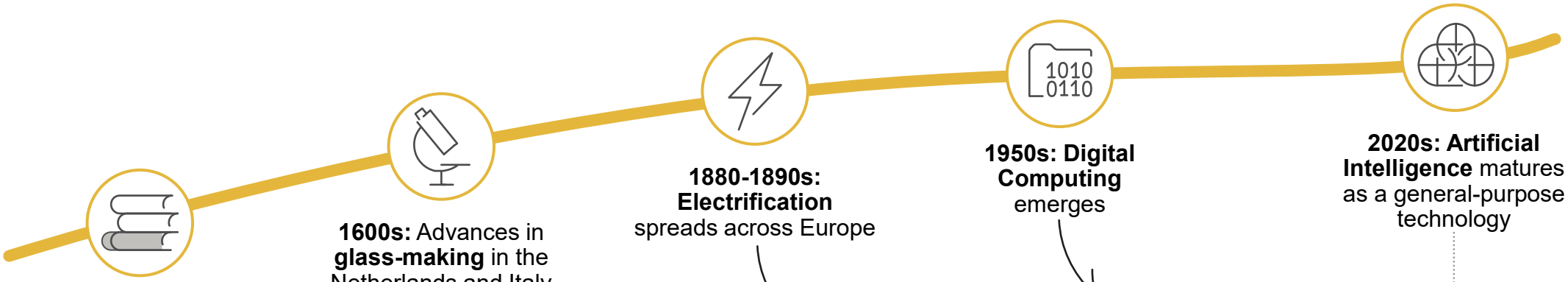
High-quality and consistently structured datasets across many sources

Contents



Technological breakthroughs have accelerated scientific discovery throughout history — a cornerstone of prosperity and human progress

General-purpose technological breakthroughs and their impact on scientific discoveries



Technological breakthroughs

1440s: The **Printing Press** is invented in Germany

1600s: Advances in **glass-making** in the Netherlands and Italy

1880-1890s: Electrification spreads across Europe

1950s: Digital Computing emerges

2020s: Artificial Intelligence matures as a general-purpose technology

Derived scientific innovations

Scientific journals and texts lay the foundation for modern science

The microscope transforms medicine and public health

Spectroscopy enables identification of chemical elements and matter in space

Data-driven science enables complex modelling across disciplines

With widespread adoption, the EU could boost its GDP by over EUR 1.2 trillion

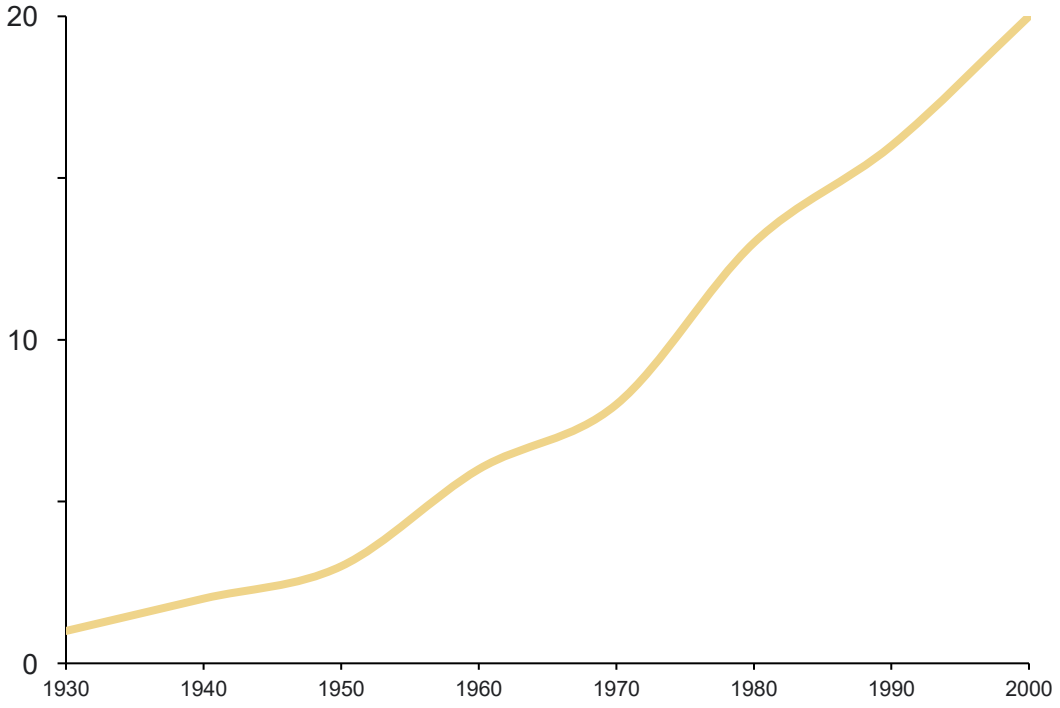
And by accelerating existing innovation efforts, the EU could unlock an additional EUR 450 billion

Source: Implement Economics based on The economic opportunity of generative AI in the EU The economic opportunity of generative AI in the EU; The European AI innovation opportunity

Scientific progress has slowed over the past 75 years, with ideas getting increasingly harder to find

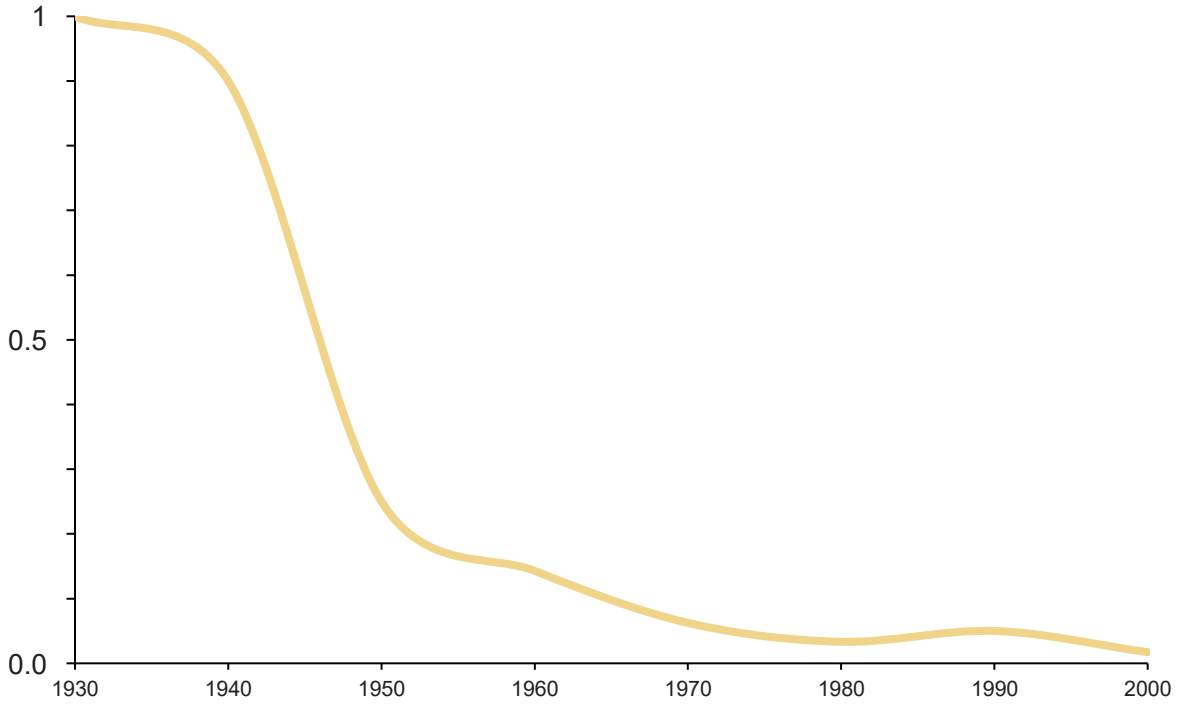
More and more researchers…

Effective number of researchers
Index (1930 = 1)



… are producing less and less innovation per dollar spent

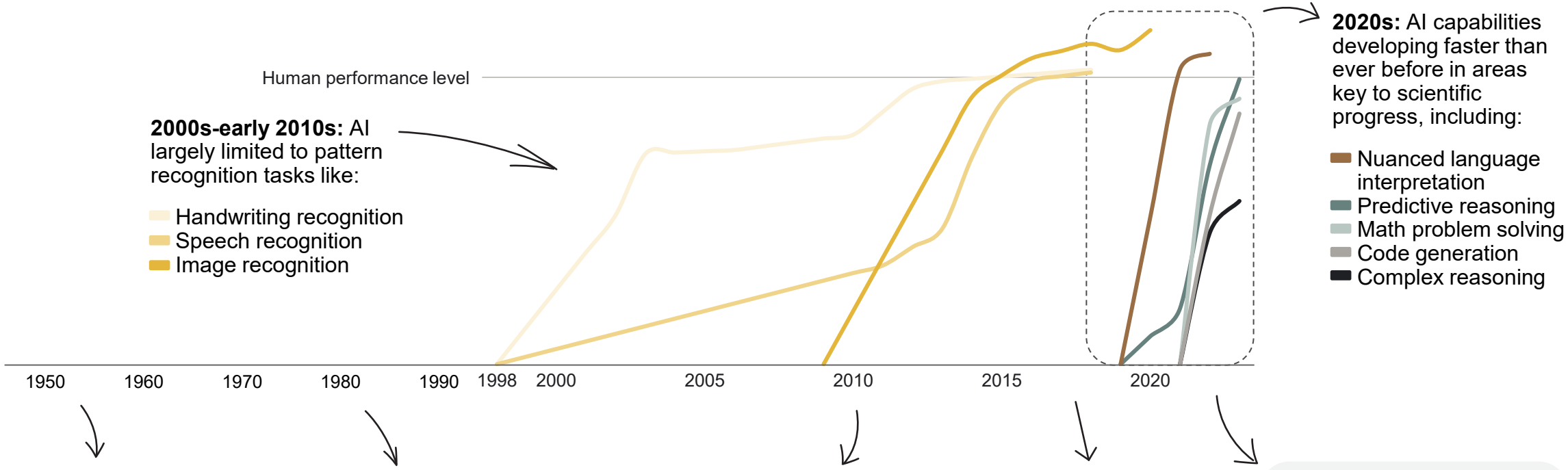
Research productivity
Index (1930 = 1)



Note: Figure from Bloom et. al. “Are Ideas Getting Harder to Find?“ (2020). Research productivity is the ratio of idea output, measured as TFP growth, to the effective number of researchers, based on US data.
Research productivity and number of researchers have been normalised to 1 in 1930.
Source: Implement Economics based on OECD, the EU Industrial R&D Investment Scoreboard, Bloom et al. (2020), and European Federation of Pharmaceutical Industries and Associations (EFPIA).

Recent AI breakthroughs are a major turning point, with the potential to reverse the long-term decline in the pace of scientific discovery

Performance of AI systems relative to human capabilities[1]



1940s-1950s: Birth of neural-network theories

First theories developed in the US and UK

1969–2000s: Early research limitations slow progress

Industry use continues in Europe, Japan and the US

2010s: Deep learning era begins

Breakthroughs from Canadian and French researchers unlock complex pattern recognition

2017: Transformer paper

International Google Research team introduces the architecture behind today's AI models

Today: AI has matured

AI has become a widely used general-purpose technology, and is already accelerating progress on some of the hardest problems in science

Note: The figure shows indexed system-performance of various AI benchmarked against human capabilities within different key areas.
Source: Implement Economics based on Kiela, D., Thrush, T., Ethayarajh, K., & Singh, A. (2023)

Across Europe, scientists are already using AI to advance science

This report presents 15 European cases, within health, climate and natural sciences, showcasing how AI is accelerating science and offering early lessons

Eurocontrol: Reducing aviation emissions by 20% using AI

Google Research: Accelerating breakthroughs with AI co-scientist

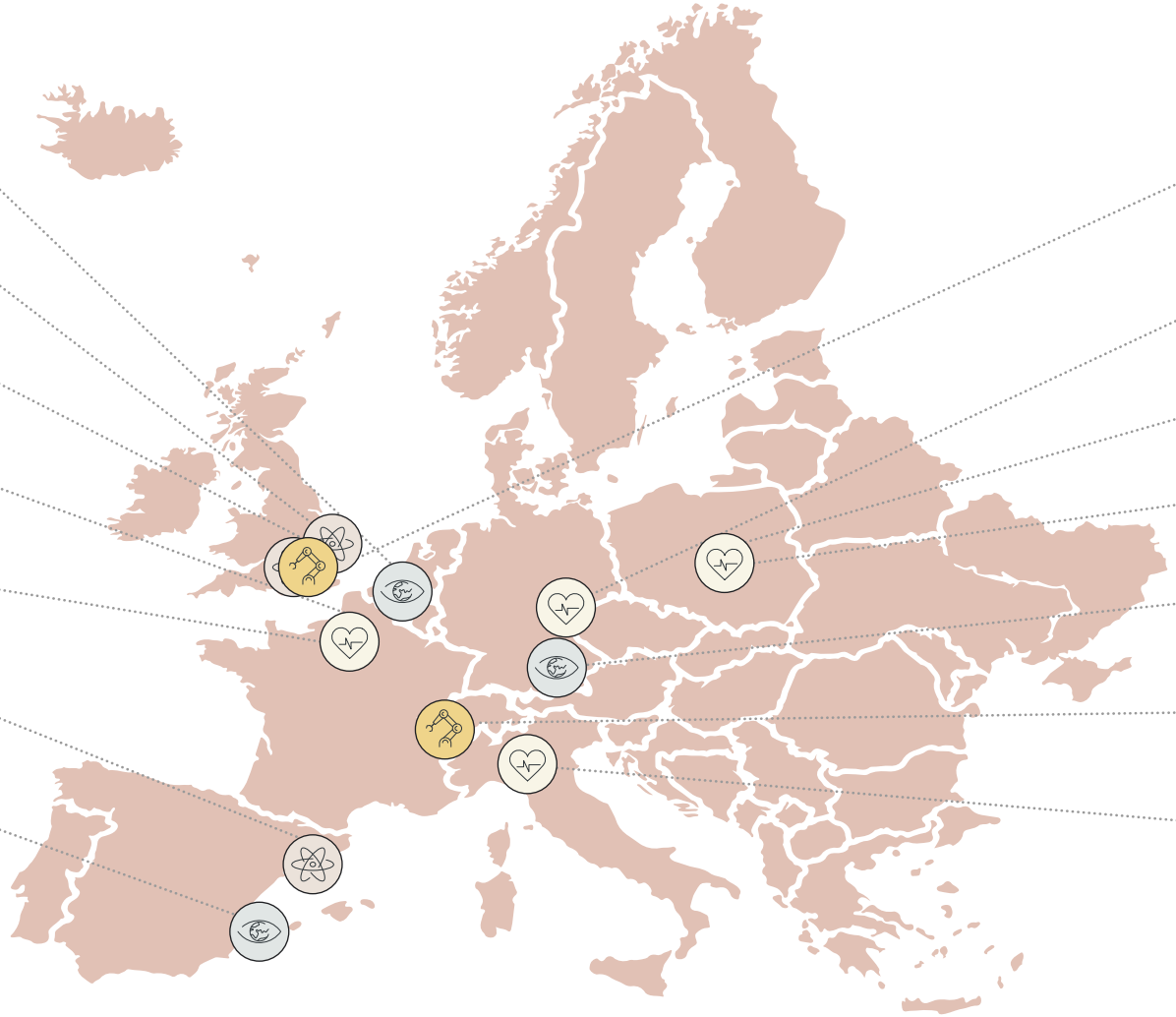
Google DeepMind: 200 million protein structures predicted

Gleamer: Accurate AI-assisted radiological diagnosis

Klineo: Improving access to clinical trials and cancer care

University of Barcelona: Using AI to map the galaxy's billions of stars

Global Omnium: AI monitoring Posidonia meadows



Google DeepMind: Achieving gold at the International Mathematical Olympiad

University Medical Center Freiburg: Driving medical innovation & protecting patient data

Infermedica: 23+ million AI-powered health checks

BioCam: AI-powered capsule accelerates gut diagnosis

OroraTech: Using AI to detect and monitor wildfires

Swiss Plasma Center: Accelerating fusion science via AI for plasma control

IEO-Monzino: Structuring clinical data for better patient outcomes

Google Quantum AI: Quantum computer capable of supercharging AI

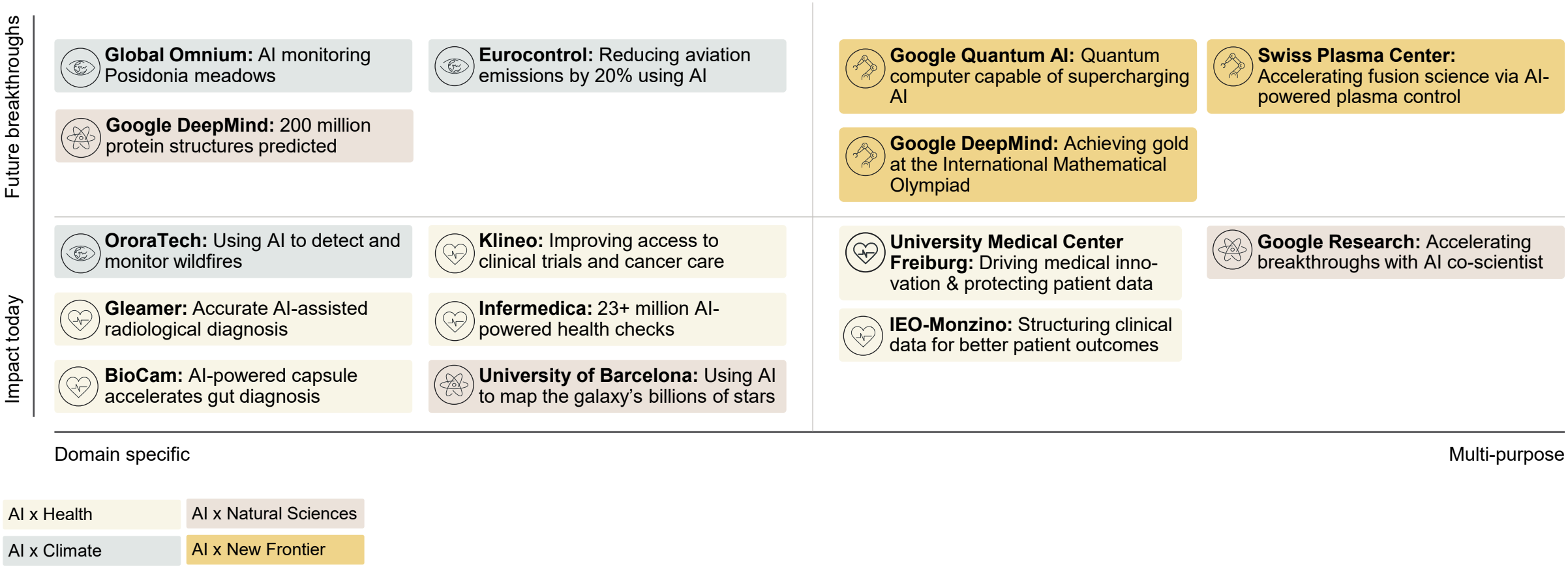
AI x Health | AI x Natural Sciences

AI x Climate | AI x New Frontier

The 15 cases illustrate the breadth of AI – from showcasing the domain-specific impact from AI today, to the multi-purpose scientific discoveries of tomorrow

As a general-purpose technology, AI is advancing science across a spectrum of impact. On one end, domain-specific applications are delivering results in fields like health and climate today. On the other, multi-purpose AI breakthroughs are unlocking new frontiers in physics, computing, and fundamental research — paving the way for discoveries and applications (e.g. quantum computing) that could transform society in the decades ahead.

The report's 15 cases range from innovations delivering domain-specific impact today to multi-purpose breakthroughs of the future



Across the 15 cases in this report, we've found five common success factors

Common success factors

Collaboration & partnerships

Spanning across both the public and private sector, as well as continents

Long-term commitment

Long-term investments and perseverance in AI projects and workforce upskilling

Compute capacity

Access to powerful, state-of-the-art infrastructure

Advanced models

Leveraging the latest global AI research and tools

Data foundations

High-quality and consistently structured datasets across sources

Case examples

- **OroraTech:** Using AI to detect and monitor wildfires
- **Eurocontrol:** Reducing aviation emissions by 20% using AI
- **Google Quantum AI:** Quantum computer capable of supercharging AI
- **Swiss Plasma center:** Accelerating fusion science via AI-powered plasma control
- **Google DeepMind:** 200 million protein structures predicted
- **Barcelona University:** Using AI to map billions of stars in our galaxy
- **Google Research:** Accelerating breakthroughs with AI co-scientist
- **Google DeepMind:** Gold medal at the International Mathematical Olympiad
- **University Medical Center Freiburg:** Driving medical innovation
- **IEO-Monzino:** Structuring clinical data for better patient outcomes

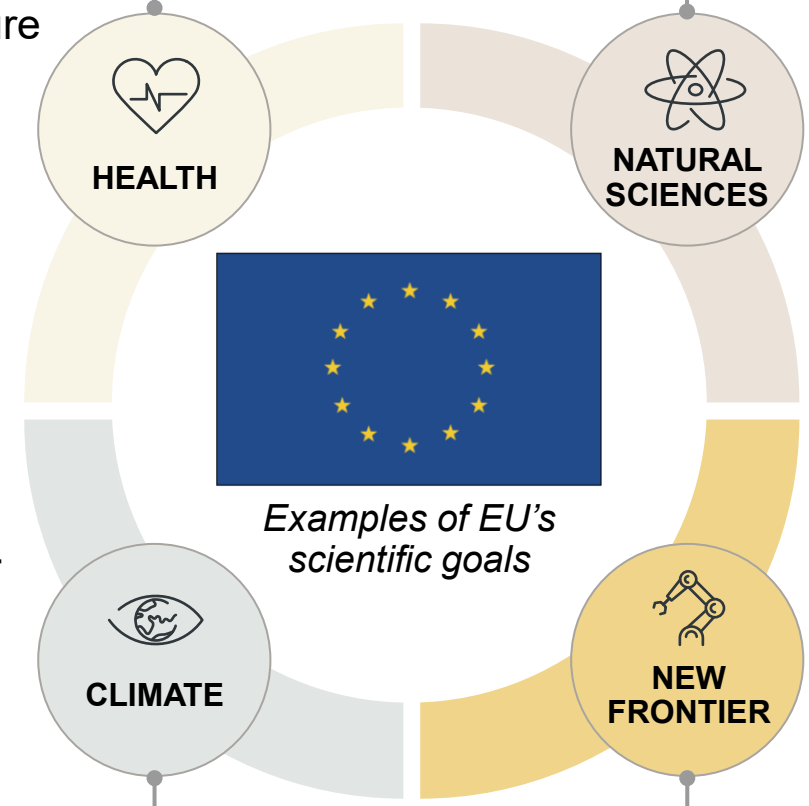
AI-driven breakthroughs like the 15 cases in this report will further help realise Europe's scientific goals

EU goal: Improve the lives of over 3 million people by 2030 through prevention and cure

- **Gleamer** - AI improves cancer detection in radiology, helping doctors diagnose earlier and more accurately
- **BioCam** - Capsule endoscopy speeds up gastrointestinal screenings, making diagnosis less invasive and more accessible
- **Klineo** – AI models match cancer patients with relevant clinical trials, improving access to cancer care

EU goal: Become the world's first climate-neutral continent by 2050

- **Eurocontrol -** Collaborates with **Google** on using AI to predict and reroute flights, cutting aviation emissions by 20%



EU goal: Strengthen Europe's space science and Earth observation capabilities

- **University of Barcelona – Institute of Cosmos Sciences** – Uses AI to scale and enable space mapping mission
- **OroraTech** – Satellites detect wildfires and feed data into EU's Copernicus Earth observation programme

EU goal: First demonstration of net fusion electricity to the grid by 2050

- **Swiss Plasma Center** – **EPFL** collaborates with **Google DeepMind** to develop AI systems that can stabilise fusion plasma, a critical step on the path toward stable fusion

Source: Implement Economics based on the European Commission, EU Space Programme
Note: The OroraTech case is marked as AI x Climate throughout the deck, as it contributes to both EU's climate goals (wildfire monitoring, climate impact mitigation) and Copernicus programme (earth observation)

02

AI x Health

AI applications already create real-world results in Europe within health

The six cases of AI in health shows how AI is already contributing to EU realising its health goals

The promise of AI in health…	… is already materialising today…	…contributing to Europe's health goals
Faster, more accurate diagnosis across imaging and other specialties	**Gleamer:** Improves diagnostic speed and accuracy in radiology while reduces patient waiting times	**EU Mission on Cancer:** Improve the lives of >3 million people by 2030
Personalised treatment and monitoring (precision medicine)	**Klineo:** Improves access to clinical trials and improves patient cancer care with the power of AI	
Acceleration of drug design and biomedical research	**IEO-Monzino:** Digitises clinical data to advance scientific research **University Medical Center Freiburg:** Driving medical innovation whilst protecting patient data	**Digital Decade target:** Online access to electronic health records (EHRs) for 100% of EU citizens by 2030
Novel and patient-friendly diagnostic methods	**BIOCAM:** Improves access to gastrointestinal screenings	**Europe's Beating Cancer Plan:** 90% of eligible citizens offered breast, cervical, colorectal screening by 2025
A more efficient healthcare system that help doctors focus on patients	**Infermedica:** Improves accessibility of diagnostics – reduces load on staff by helping with first-line symptom assessments and directing patient to appropriate care	**European Health Union:** Address health-workforce challenges through digital tools

Source: Implement Economics based on the European Commission

Radiologists achieve 30% more accurate diagnoses with AI assistance

>65%

of French university hospitals using Gleamer

27%

Patient time saved at hospital emergency department

Overview of collaborators

- Gleamer
- Rennes University Hospital
- Google Cloud

+ used by over 2,500 institutions worldwide

French company Gleamer has used AI to transform radiology - providing faster diagnostics and better patient care

The challenge

- In emergency hospital departments around the world, many trauma cases need rapid and accurate analysis to treat patients as soon as possible
- Radiologists need tools that provide fast, precise and consistent diagnostics

The solution

- Gleamer has developed AI-powered tools that automatically detect trauma and other findings in radiology scans, helping radiologists provide faster, more consistent diagnoses
- The system integrates into clinical workflows, offering immediate AI-assisted reports. Partnering with Google Cloud further ensures the solution can scale to hospitals worldwide

The impact

- Across France, 65% of university hospitals now use Gleamer's AI tools
- At Rennes University Hospital, Gleamer's trauma detection tool BoneView has cut emergency department waiting times by 70 minutes (from 4h45) — improving patient experience and easing staff workload
- Validated by over 30 scientific publications, Gleamer's AI shows an average 30% improvement in lesion detection accuracy, allowing general radiologists to reach the level of specialists — and ensuring consistent diagnostic quality 24/7
- Globally, Gleamer's AI is now deployed in more than 2,500 institutions across 45 countries, processing over 35 million scans each year

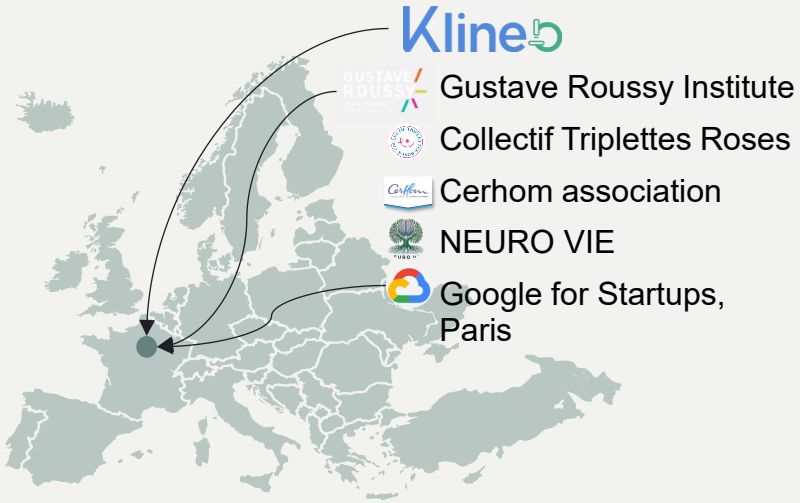
Source: Implement Economics based on Google, Gleamer

Improving access to clinical trials and cancer care with the power of AI

+70%
Patients that are ready to participate in clinical trials

20%
Trials that fail due to insufficient recruitment

Overview of collaborators



French startup Klineo uses AI to match cancer patients with relevant clinical trials, improving access to cancer care

The challenge

- Clinical trials for cancer patients are critical to develop scientific studies and test new treatments, while also offering a chance for advanced-stage cancer patients to benefit from new therapeutic innovations
- Despite +70% of patients being ready to participate in a clinical trial, only <5% of cancer patients do so, and 20% of trials fail due to insufficient recruitment

The solution

- Klineo, a startup originating from Institut Gustave Roussy (a French cancer research hospital), are transforming access to cancer care through the power of AI
- Their free, fast and intuitive digital platform uses AI to help patients find the most relevant clinical trials, and then directly contact the doctors in charge of the trial
- The solution is developed in collaboration with a range of cancer patient associations, such as the Collectif Triplettes Roses, an association for women with breast cancer, and Neuro Vie, an association for patients with brain cancers

The impact

- Klineo's AI-based platform connects doctors and patients directly with relevant trials in less than a minute, democratizing access to new treatments for patients
- The platform lists all clinical trials open in France, and is working on expanding the platform across Europe, having recently joined the Google for Startups Academy's AI for Health programme to help scale their impact

Source: Implement Economics based on Google, Klineo

AI digitises medical records to improve care for 1.7 million patients in Italy

76,000
Medical reports standardised using AI

2 months
Time spent to process reports (vs >50 years)

Overview of collaborators

- The European Oncological Institute (IEO); Monzino Cardiology Center
- Google Cloud

Milan's IEO-Monzino uses AI to get better research and patient insights from their clinical data

The challenge

- IEO and Monzino in Italy treat 1.7 million cancer and heart patients every year
- Their work generates vast unstructured data that is hard to use in applications ranging from day-to-day care to clinical research
- Selecting suitable patients for clinical trials is one example of a complex task without structured data, as it depends on matching detailed clinical inclusion criteria with each patient's profile

The solution

- IEO-Monzino built a secure data platform with Google Cloud's AI solution to collect and structure their data
- Staff can now apply this data for many purposes from monitoring care to identifying the most suitable patients for clinical trials

The impact

- Using AI, the team structured data from 76,000 medical reports in just two months – whereas a similar project without AI spent 6 months processing 500 reports
- Staff can now identify suitable candidates for clinical trials faster and more effectively, giving eligible patients quicker access to innovative treatments
- Other solutions include dashboards to monitor patient outcomes and analysing medical records and reports — giving staff and researchers easier access to information and freeing more time for care

Source: Implement Economics based on Google, IEO-Monzino

A swallowable, AI-powered capsule accelerates gut diagnosis for patients

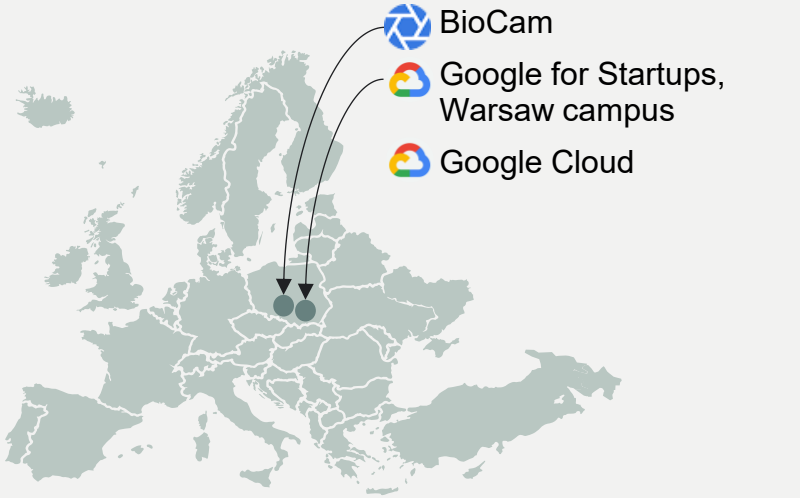
44,400

Annual gastrointestinal (GI) cancers in Poland[1]

30 minutes

Analysis turnaround time (vs 6-12 hours)[2]

Overview of collaborators



Polish start-up BioCam uses AI-powered capsules for endoscopic examinations – improving diagnosis time and patient experience

The challenge

- Digestive diseases, including cancer, are often detected too late; many people avoid endoscopy due to discomfort, cost and hospitalisation needs
- Across Europe, countries like Poland face a high gastrointestinal (GI) cancer burden, making prevention and earlier detection important for public-health

The solution

- BioCam has developed a small capsule that images the whole GI tract, which patients can use at home without anaesthesia or a hospital stay
- Collaborating with Google's Growth Academy, the company's solution uses AI to detect and flag potential lesions, allowing clinicians to quickly review results via BioCam's platform

The impact

- BioCam's at-home capsule reduces barriers to screening and enables earlier and more accessible detection and treatment
- The solution reduces analysis time to ~30 minutes (from 6–12 hours) and the capsule is ~2–3x cheaper than alternatives, improving clinician throughput, treatment quality and system efficiency
- The impact is not limited to helping human patients, with BioCam's solution also being used to support veterinary efforts

Source: Implement Economics based on Google, BioCam, We Did it in Poland, Global Cancer Observatory

23+ million successful health checks conducted using Infermedica's AI tool

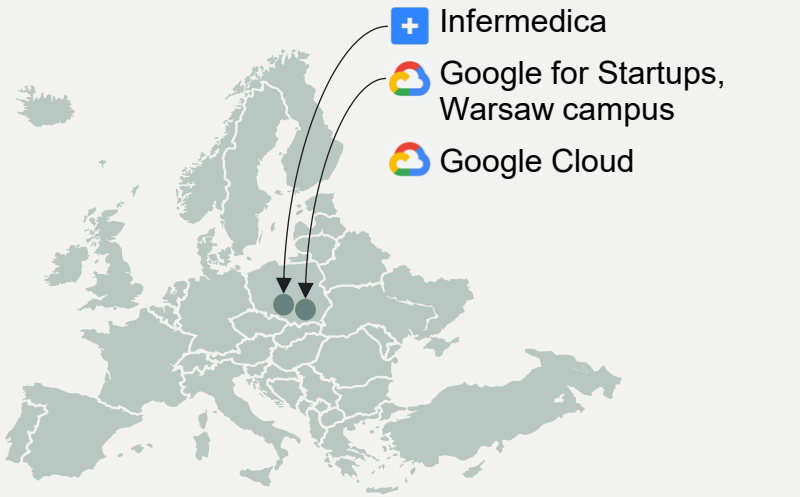
95%

Accuracy rate in pre-diagnosis and triage

30+ countries

Using Infermedica's AI-powered platform

Overview of collaborators



Polish start-up Infermedica uses AI to pre-diagnose and triage patients, ensuring timely access to the right care

The challenge

- >50% of the global population lack access to basic healthcare, leaving millions without timely or accurate medical support
- Even where services exist, many patients do not receive the right care at the right time, straining patient well-being and the workload on healthcare systems

The solution

- Google for Startups graduate Infermedica has created an AI-powered healthcare platform built on ~97,000 hours of work from doctors and medical specialists
- The system combines symptom checking, medical history and AI reasoning to pre-diagnose, triage, and guide patients to the support they need

The impact

- The AI solution achieves a 95% accuracy rate in pre-diagnosis and triage
- It has performed over 23 successful million health checks, and is used by 100+ healthcare providers and insurers across 35 countries and 24 languages
- Originating from Warsaw's Google for Startups Accelerator, Infermedica demonstrates how European innovation can create impact and scale globally through secure and responsible AI

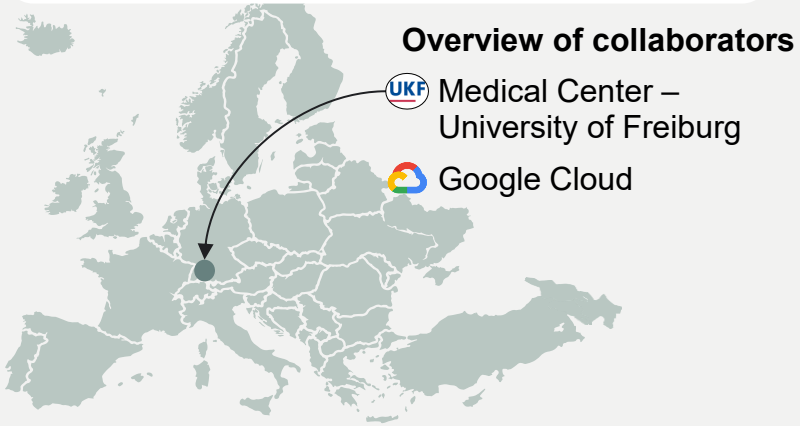
Source: Implement Economics based on Google, Infermedica

German data digitised to enable better healthcare whilst retaining full sovereignty of their data

Assisting surgeons with digital tools

Enhancing genomic use-case evaluations

> *"The high security and performance of the cloud solution enables us to drive patient-oriented innovations faster and thus increase the quality of care."*
> **Prof. Dr. Frederik Wenz, Chief Medical Director**



Medical Center – University of Freiburg is driving medical innovation whilst protecting patient data with Google Cloud

The challenge

- The digitisation of university hospitals has the potential to both elevate patient care and reduce the strain on staff
- At the same time, it must be implemented with the utmost care to prevent security breaches and protect sensitive patient data

The solution

- The University Medical Center Freiburg partnered with Google Cloud and their sovereign cloud solution to power their digitisation journey with cloud
- This cloud-based solution will allow the medical center to drive innovation and progress in multiple areas while retaining full sovereignty of their data

The impact

- The impact areas range from enhancing the speed and scalability of genomic use case evaluations to leveraging AI to improve website accessibility and building digital surgical assistants
- This cutting-edge solution also has scope for groundbreaking future applications, such as eliminating training bottlenecks by substituting in-demand emergency and operating rooms for realistic virtual versions to seamlessly train the next generation of medical practitioners

Source: Implement Economics based on Google

03

AI x Climate

AI is already helping combat climate change and improve sustainability

The three cases of AI in climate show how AI helping EU reach its climate goals

The promise of AI in climate…	… is already materialising today…	…contributing to Europe's climate goals
Reducing emissions from transport	**Eurocontrol:** Using AI to reduce aviation related emissions by 20% at low cost	**2050 long-term strategy:** Become the world's first climate-neutral continent by 2050
Mitigate and adapt to extreme weather events	**OroraTech:** Uses AI to detect and monitor wildfires, helping protect the environment and society	**Biodiversity strategy for 2030 & Climate Resilience and Risk Management Framework:** Build EU's resilience to future threats such as climate change, forest fires, food insecurity, disease outbreaks (incl. wildlife protection); Establish a larger EU-wide network of protected areas on land and at sea
Protect our environment and wildlife from climate change	**Global Omnium:** Uses AI to analyse underwater videos, protecting Posidonia meadows in the Mediterranean by tracking 450 thousand water meters	

Source: Implement Economics based on the European Commission

AI can help reduce aviation emissions by 20% at low cost

35%
Share of aviation's global warming from contrails

54%
Reduction in contrails in live airline trial

Overview of collaborators

Eurocontrol, the European Organisation for the Safety of Air Navigation, is partnering with Google to reduce contrails using AI

The challenge

- Aviation is a major contributor to global warming, and contrails formed by aircraft exhaust are responsible for around one-third of aviation's total warming effect
- Reducing the effect of contrails has long been a priority for Europe
- Since 2020, Eurocontrol's work on contrail prevention has been supported by the German Aerospace Center (DLR) and the German parliament Group AKKL[1]

The solution

- Google Research developed an AI solution that analyses satellite imagery to detect contrails and forecast where they are likely to form
- In 2021, Eurocontrol began collaborating with Google to incorporate this AI solution into its research and joint trials with European airlines
- These joint trials show how AI forecasting can help airlines avoid contrail-forming areas with minimal added fuel use

The impact

- Live trials with airlines showed a 54% reduction in contrails with only 2% additional fuel use – leading to a total reduction of aviation's warming impact by up to 20%
- This avoidance is estimated to cost around €5-20/ton CO2e – a very cost-efficient ways of reducing carbon emissions, in other words
- This suggests that contrail avoidance seems to be a cost-effective, scalable warming reduction measure

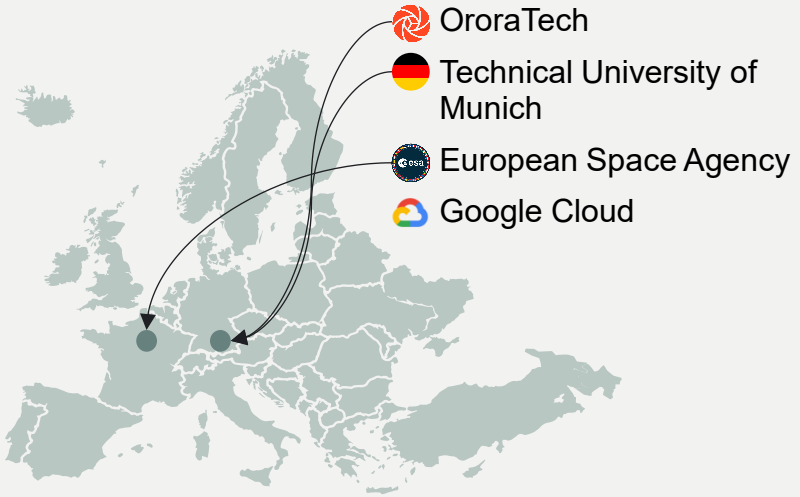
1. ArbeitsKreis Klimaneutrale Luftfahrt - Climateneutral Aviation Working Group
Source: Implement Economics based on Google, Eurocontrol

Using AI to detect and monitor wildfires across Europe

5 million km²
Forests monitored worldwide

1.8 petabytes
Of wildfire data collected per year

Overview of collaborators



German wildfire intelligence firm OroraTech partners with Google Cloud to detect fires in real time, covering 5 million km² of forests worldwide

The challenge

- Wildfires intensify with climate change, threatening lives, ecosystems, and infrastructure
- Traditional detection is often too slow for response times to be sufficiently fast
- Europe can benefit significantly from satellite-based monitoring to strengthen its climate resilience

The solution

- German satellite company OroraTech has developed thermal infrared nanosatellites, sensitive enough to detect hotspots as small as a single tree
- By processing wildfire data directly in orbit and using direct downlink, the system delivers alerts within minutes instead of hours
- Their Wildfire Solution runs on Google Cloud with Vertex AI, and contributes data to the European Space Agency's Copernicus programme for EU-wide climate monitoring

The impact

- The solution enables governments, forestry services, and NGOs to respond to wildfires faster and more effectively
- They constantly monitors wildfires from orbit at scale – for example, in Germany, OroraTech identified destructive wildfires in Brandenburg two hours before official alerts, leading to a faster response, protecting nearby communities and infrastructure
- Worldwide, OroraTech monitors and helps protect 5 million km² of forests, with just 30-minute intervals between satellite scans

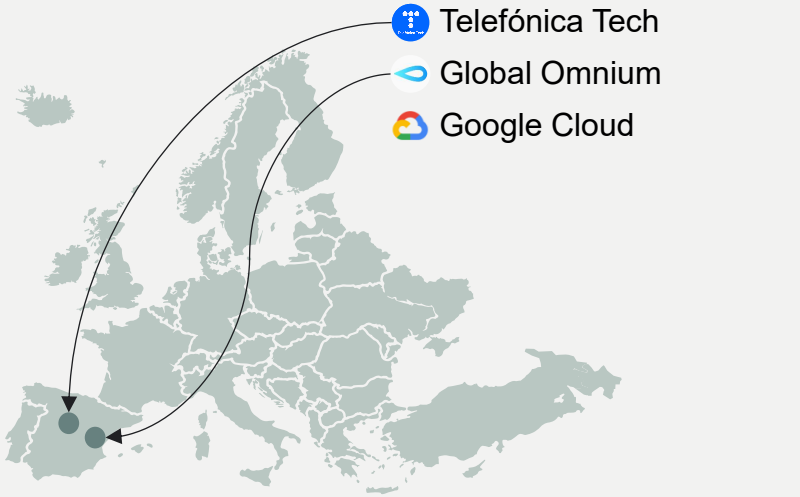
Source: Implement Economics based on Google, OroraTech

Analysing underwater videos with AI to protect Posidonia meadows

450 thousand

Water meters tracked

Overview of collaborators



Spain’s Global Omnium and Telefónica Tech team up with Google to protect Posidonia seagrass meadows in the Mediterranean

The challenge

- The Mediterranean hosts Posidonia seagrass meadows that both store carbon for millennia and enable biodiversity
- The meadows are sensitive to disturbance (climate change, pollution, anchoring), risking loss of stored “blue carbon” and general environmental damage
- Monitoring is fragmented, making it harder to act early and protect

The solution

- Global Omnium has partnered with Telefónica Tech and Google Cloud to use AI for automated and scalable surveillance
- A live AI system tracks underwater video to monitor the condition of Posidonia meadows and flag potential threats
- Cloud scalability enables future expansion (more sites, integration with water-quality and operations data) to make widespread use possible

The impact

- Monitoring deployed on Spain’s Mediterranean coast will provide early warnings on environmental health and risks
- Live and decision-ready data will underpin conservation measures that safeguard long-lived carbon stores in Posidonia meadows

Source: Implement Economics based on Google, Telefónica Tech

04

AI x Natural Sciences

AI is boosting Europe’s strong
natural and formal science tradition

The three cases of AI in natural sciences show how AI can boost Europe's strong natural and formal science tradition

The promise of AI in natural sciences…	… is already materialising today…	…contributing to Europe's scientific goals
Accelerate discovery across the research cycle	**Google DeepMind:** AlphaFold has been used to predict hundreds of millions of protein structures, which would have taken millions of researcher years at the current rate of experimental structural biology	**Future European Strategy for AI in Science:** Make science in the EU more impactful and productive by fostering responsible adoption of AI[2]
Foster new, interdisciplinary, blue-sky thinking	**Google Research:** Enables scientific breakthroughs with an AI co-scientist that processes information across scientific fields and helps discover novel hypotheses	
Boost data-intensive science through pattern detection and simulations	**University of Barcelona, ICCUB:** Processes vast amount of data to map the billions of stars in our galaxy	**EU Space Programme:** Strengthen Europe's space science and Earth observation capabilities[3]

Source: Implement Economics based on OECD, the European Commission

Using AI to map the billions of stars in our galaxy

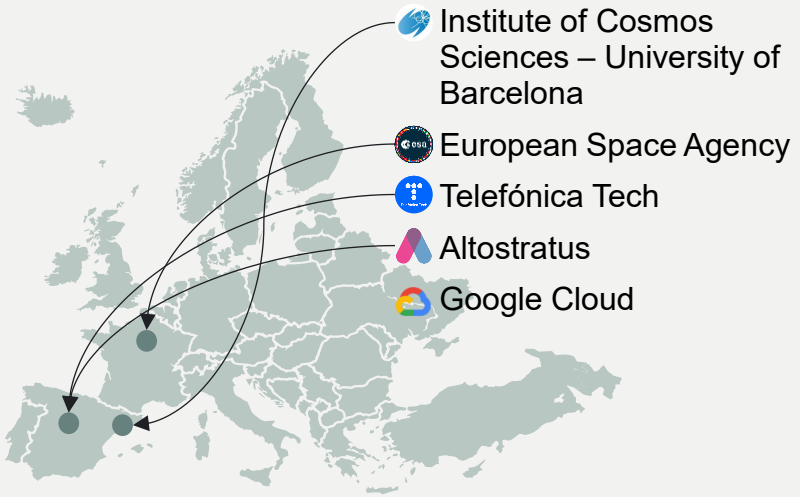
2 billion

Stars analysed in ESA's Gaia catalogue

>95%

Computation reduced (Machine vs Cloud)

Overview of collaborators



University of Barcelona's Institute of Cosmos Sciences is using AI and Cloud to create an accurate and detailed map of our galaxy

The challenge

- The European Space Agency's (ESA) Gaia mission aims to create the most accurate and detailed map of the milky way yet
- The mission captures ~70 million images of the galaxy each day amounting to 45–100 GB of data
- Storage and analysis at this scale was beyond conventional computation capacity, with on-premise costs potentially running into tens of millions of euros

The solution

- The Institute of Cosmos Sciences at the University of Barcelona (ICCUB) used Google Cloud's infrastructure to process and store massive data streams from ESA's Gaia satellite
- Cloud tools such as Compute Engine and BigQuery allow researchers to run large-scale simulations, eliminating the need for expensive, on-premise servers

The impact

- ICCUB researchers now analyse data on two billion stars, enabling one of the most precise 3D maps of the Milky Way ever produced
- Google Cloud's infrastructure has cut processing time from over a year to three weeks, making large-scale space simulations feasible for the first time
- The project has strengthened Europe's role in global astrophysics and demonstrated how cloud computing can accelerate fundamental research while reducing infrastructure costs

Source: Implement Economics based on Google, Altostratus

200 million protein structures predicted, accelerating biology breakthroughs

>3 million
Users of AlphaFold worldwide

>190 countries
Researchers using AlphaFold database

Overview of collaborators

Google DeepMind

European Molecular Biology Laboratory

+ used by millions of researchers worldwide

Nobel prize-winning AlphaFold enables scientists worldwide to predict protein structures with unprecedented accuracy and speed

The challenge

- Proteins are the building blocks of life — they drive every biological process, from fighting infection to repairing cells
- Each protein's unique structure determines how it works, but uncovering these shapes can take years and cost hundreds of thousands of dollars per protein
- This made understanding disease mechanisms and developing new treatments slow, expensive, and often out of reach for researchers

The solution

- Google DeepMind developed AlphaFold, an AI system that can predict a protein's precise 3D structure in minutes, giving scientists immediate insight into how proteins function and interact
- The AlphaFold Database (AFDB) was made freely and openly available to the global research community in collaboration with the European Molecular Biology Laboratory (EMBL)

The impact

- AlphaFold has predicted over 200 million protein structures – nearly all catalogued proteins known to science – and made them freely available through the AFDB
- So far, it has over three million users from over 190 countries, and has been used to predict hundreds of millions of structures, which would have taken hundreds of millions of researcher-years at the current rate of experimental structural biology
- The technology is already accelerating breakthroughs in drug discovery and disease research, supporting progress on malaria, cancer, antibiotic resistance and neurodegenerative conditions such as Parkinson's

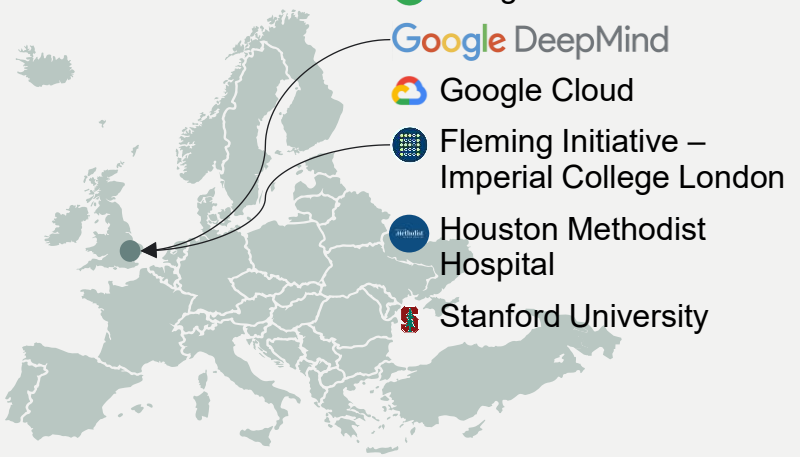
Source: Implement Economics based on Google, European Molecular Biology Laboratory

Accelerating scientific breakthroughs with an AI co-scientist

2 days

Time spent recreating years worth of research

Overview of collaborators



- Google Research
- Google DeepMind
- Google Cloud
- Fleming Initiative – Imperial College London
- Houston Methodist Hospital
- Stanford University

Google has introduced an AI co-scientist to help accelerate scientists with novel hypotheses and research proposals

The challenge

- Modern science produces millions of new papers each year, making it difficult for researchers to keep up and find the most impactful ideas
- Scientific work across fields is also important - for example, the Nobel Prize-winning discovery of CRISPR combined genetics, micro- and molecular biology
- This “breadth and depth” challenge means researchers spend an increasing amount of time navigating complexity, slowing down scientific discovery

The solution

- Google developed an AI co-scientist to support scientists with scientific discovery. The AI system mirrors the scientific method: it reviews literature, proposes novel hypotheses, and outlines experiments to test and expand knowledge
- Rather than just summarising information, it generates new scientific ideas — giving researchers a starting point with greater speed, scope and focus
- We have worked together with researchers from institutes including Imperial College London, Stanford and others to test its capabilities.

The impact

- AI co-scientist has already helped researchers identify new uses for existing cancer drugs, potentially speeding up discovery of new treatments
- In one example, AI co-scientist replicated decades of research in just two days, helping scientists at Imperial College London validate a breakthrough on antibiotic research
- It has further pointed to promising new drug targets for liver disease, which could save years of trial-and-error in the lab

Source: Implement Economics based on Google

05

AI x New Frontier

AI has even more in store for Europe — if the right policies are in place to unlock its full potential

The three cases of AI at the new frontier of science show how AI is being used to unlock the scientific breakthroughs of the future

The promises of AI to unlock new frontiers…[1]	… are already materialising today…	…contributing to Europe's future goals
Enable advanced experimental control of large-scale complex experiments	**Swiss Plasma Center:** Advancing nuclear fusion research by using AI to autonomously control plasma in collaboration with Google DeepMind	**EU fusion pathway:** Incorporate fusion electricity into the grid by 2050[2]
Better control and manipulate quantum systems; Calibrate scaled-up experiments in quantum computers	**Google Quantum AI:** Developing a quantum computer capable of super-charging AI innovation	**Quantum Flagship Initiative:** Consolidate and expand European scientific leadership and excellence in quantum research[3]
Enable scientific research particularly in the natural and mathematical sciences	**Google DeepMind:** Achieved gold-medal at the International Mathematical Olympiad with AI model	**Future European Strategy for AI in Science:** Make science in the EU more impactful and productive by fostering responsible adoption of AI[4]

Source: Implement Economics based on the European Commission, Quantum Flagship Initiative

Accelerating fusion science through AI-powered plasma control

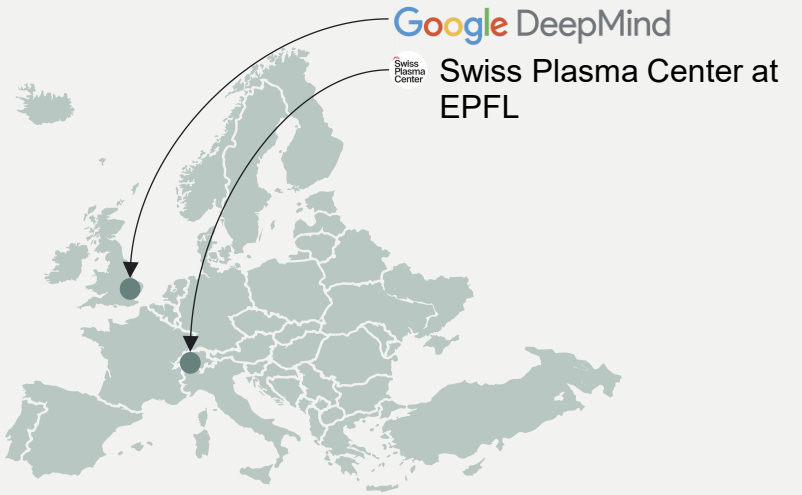
First ever

Magnetic confinement control with AI

Open access

Fusion plasma simulator made available for all scientists

Overview of collaborators



Google DeepMind and the Swiss Plasma Center demonstrate how AI can autonomously control plasma, advancing nuclear fusion research

The challenge

- To solve the global energy crisis, researchers have long sought fusion energy – a potential source of limitless, and clean, energy
- Nuclear fusion, the reaction that powers the stars, is one contender - by smashing and fusing hydrogen, huge amounts of energy are released
- Recreating these conditions on earth is difficult, and controlling them is a major challenge

The solution

- Google DeepMind and the Swiss Plasma Center at EPFL developed the first AI system able to learn how to magnetically stabilise superheated plasma inside a real fusion reactor
- Trained in simulation, the AI learned to adjust magnetic fields thousands of times per second to keep the plasma stable — even controlling new configurations that scientists had never tested before

The impact

- The AI solution was able to autonomously control plasma in a nuclear fusion reactor – a breakthrough published in Nature
- The AI allows scientists to test new plasma shapes quickly, accelerating progress toward making fusion a reliable, clean energy source
- This collaboration is one example of Google DeepMind's broader collaborative work on Fusion, further exemplified by the 2024 release of TORAX, a free plasma simulator to help fusion researchers worldwide design next-generation reactors

Source: Implement Economics based on Google, MIT, Nature

Building a future quantum computer to open new AI frontiers

< 5 minutes

Time to solve a task beyond reach of existing computers

Physics World Breakthrough of the Year

Overview of collaborators

Google Quantum AI

Willow, Google's new quantum chip, demonstrates performance far beyond classical supercomputers

The challenge

- Quantum computers use the physics of atoms to process information in entirely new ways, promising huge advances in medicine, clean energy, and materials science
- For decades, building these machines proved nearly impossible: as quantum systems scale and grow, they become unstable and prone to errors, limiting their usefulness for real-world science

The solution

- Google launched Willow, a new quantum chip that, for the first time, became more stable as it scaled — a challenge that the field has pursued for almost 30 years
- This breakthrough shows that large, useful quantum computers are achievable sooner than expected — and when they arrive, we expect them to accelerate AI innovation

The impact

- In benchmarking, Willow solved a problem in under five minutes that would take today's fastest supercomputers 10^{25} years, longer than the age of the universe
- Willow marks a step toward practical quantum applications, in AI and also in areas like drug discovery and clean energy, and was given the 2024 Physics Breakthrough of the Year award

Source: Implement Economics based on Google, Physics World

AI achieves gold-medal at the International Mathematical Olympiad

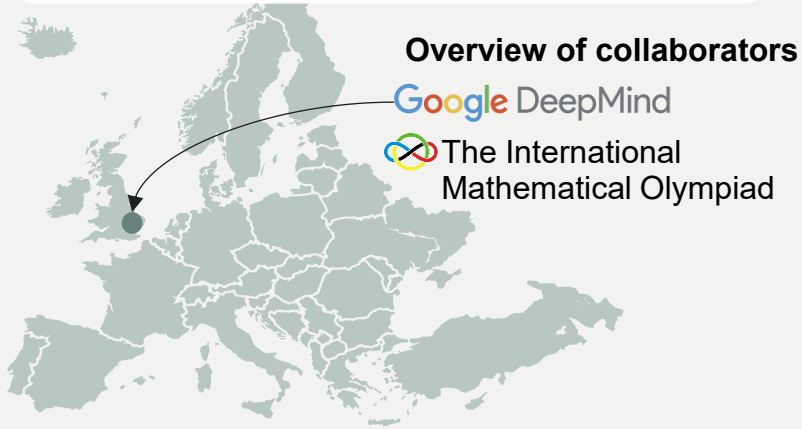
Top 8%

AI performance relative to the global elite mathematicians[1]

35 / 42 points

Gold-medal-level performance at IMO 2025

> "*Their (Google DeepMind's) solutions were astonishing in many respects. IMO graders found them to be clear, precise and most of them easy to follow*"
> **Dr. Gregor Dolinar, IMO President Prof.**



AI achieves gold-medal at the International Mathematical Olympiad (IMO), showing AI's growing ability to do complex reasoning

The challenge

- The International Mathematical Olympiad (IMO) is the world's most prestigious competition for mathematicians, designed to test creativity and deep reasoning
- AI systems have long struggled with such open-ended problems that require multi-step reasoning, abstract thinking, and precise proofs rather than pattern recognition

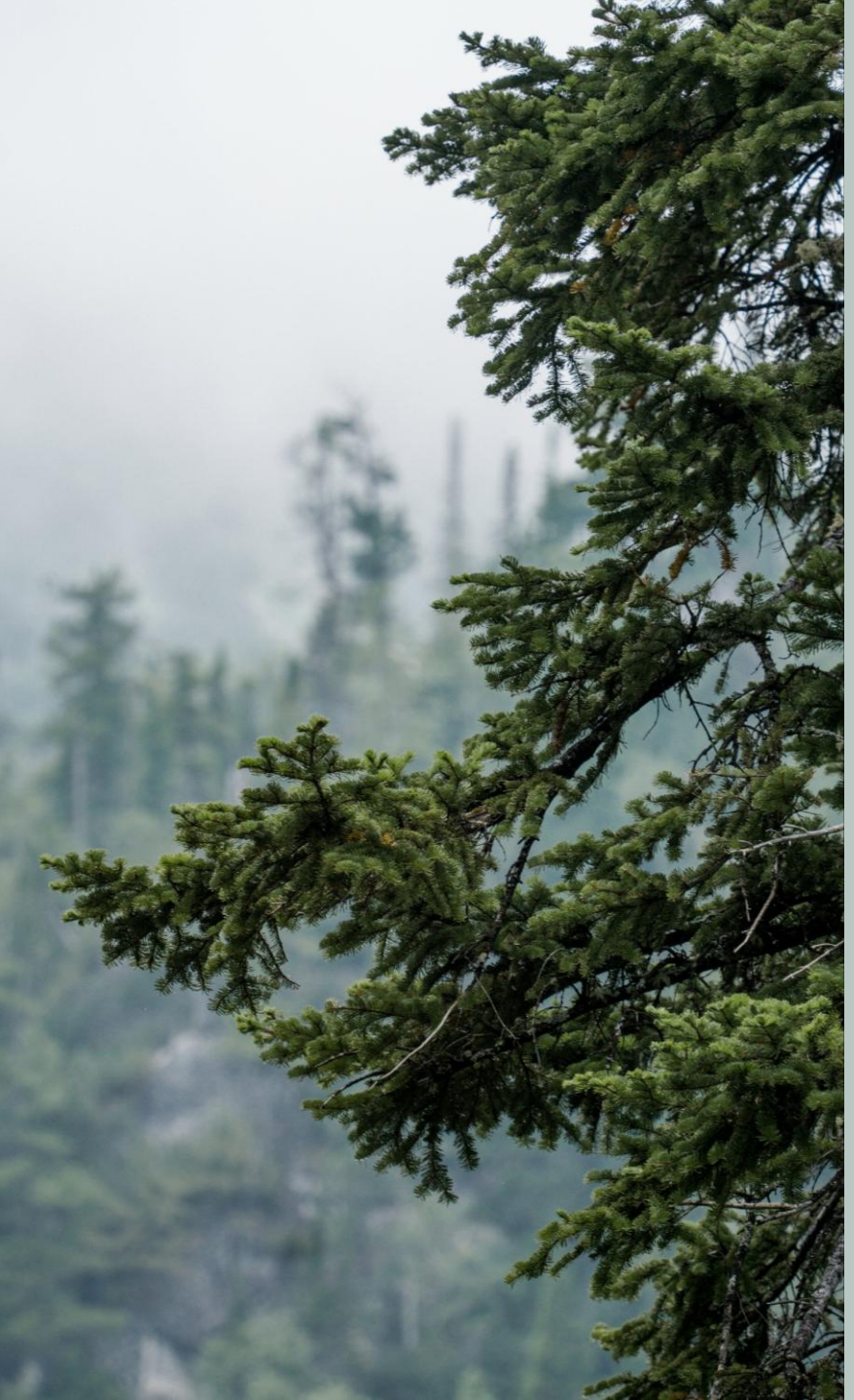
The solution

- Google DeepMind developed an advanced version of Google's AI model Gemini Deep Think, an enhanced reasoning AI for solving complex problems
- The system was trained with new reinforcement-learning and parallel-thinking techniques, allowing it to explore multiple solution paths simultaneously and produce rigorous proofs — all within the four-and-a-half-hour IMO limit

The impact

- Google's AI model Gemini Deep Think achieved a gold-medal score of 35 points, solving five of six IMO problems — the best AI performance ever officially certified by IMO graders
- This marks a major step forward in AI-assisted reasoning, showing how systems that combine natural-language fluency with complex reasoning skills can support scientists, engineers, and mathematicians across disciplines

1. The International Mathematical Olympiad ("IMO") is the world's most prestigious competition for young mathematicians and has been held annually since 1959. Each country taking part is represented by six elite, pre-university mathematicians who compete to solve six exceptionally difficult problems in algebra, combinatorics, geometry, and number theory. Medals are awarded to the top half of contestants, with approximately 8% receiving a prestigious gold medal.
Source: Implement Economics based on Google



06

Policy's Role

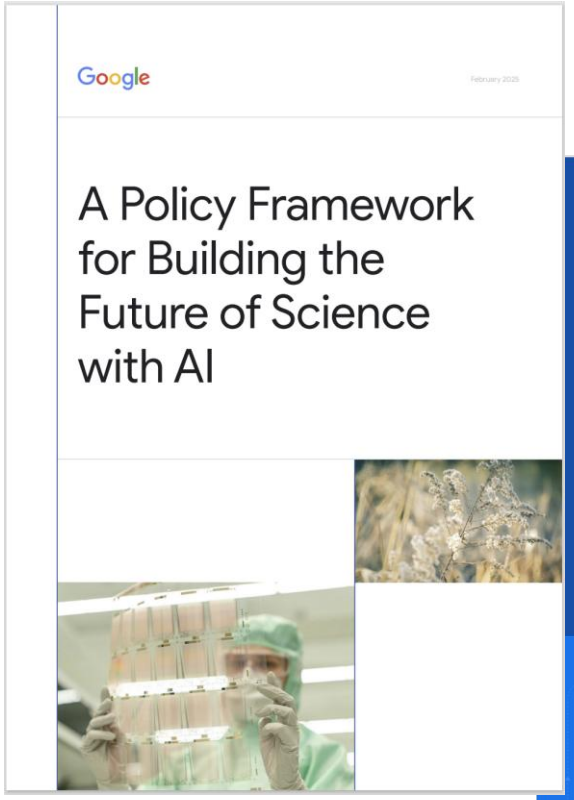
Unlocking AI for Scientific Advancement

Accelerating scientific discovery through policy

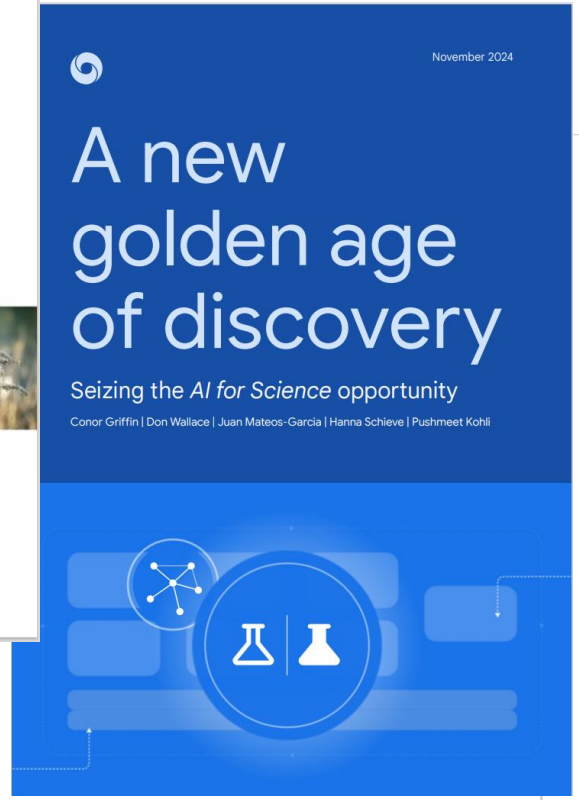
Artificial intelligence is already accelerating science across Europe. To secure our scientific future and fully realise this potential, policymakers must adopt a cohesive strategy.

The following section presents our recommendations on policy.

These recommendations draw from a range of Google and Google DeepMind policy papers, and they lay out a comprehensive agenda for empowering Europe's scientists and ensuring AI is deployed responsibly and impactfully.



Access the full report here



Access the full report here

Access the full report here

Enabling the AI-Driven Ecosystem: Building the Foundations (1/2)

The foundation for AI-driven scientific discovery rests on three pillars: high-quality data and powerful computing infrastructure, a skilled workforce, and an enabling policy environment. Policymakers must focus on laying these essential groundwork elements.

The following policy recommendations are critical for equipping researchers across all scientific domains with the tools necessary for future breakthroughs.

Key policy pillars to enable the AI-Driven ecosystem

Data
Making the World Readable to Scientists

The power of AI in science hinges on access to large, high-quality scientific datasets. However, much valuable scientific data remains uncollected, uncurated, or inaccessible. A coordinated effort is needed to make the scientific world more "machine-readable" through digitisation, standardisation, and improved data sharing practices.

Policymakers should run AI for Science Data Stocktakes to identify opportunities to build new, AI-ready datasets and upgrade existing data assets for the AI era, co-funding the most ambitious initiatives with industry and philanthropy. High-quality, well-maintained data will enable AI to accelerate discovery across domains.

This effort should be coupled with open data policies, making publicly funded research data and government datasets available and accessible to researchers, and targeted investments to unlock untapped or underutilised scientific data sources. Further, national institutions, with their capacity for data stewardship, should create and disseminate anonymized, diverse datasets, particularly in sensitive areas like health and medicine, while upholding strict privacy standards.

Enabling the AI-Driven Ecosystem: Building the Foundations (2/2)

Key policy pillars to enable the AI-Driven ecosystem

Infrastructure

Increase Access to AI Infrastructure

Countries must build the infrastructure necessary to empower their scientists with the tools they need to be dramatically more effective in solving pressing challenges like disease eradication, sufficient supplies of energy, and food security. Accomplishing this will require making AI-enabled research tools and resources more accessible to more scientists in more places. Public-private partnerships to build infrastructure for science is an enabler for AI-powered scientific progress by reducing unnecessary obstacles to innovation and fostering broader collaborations.

Policymakers should create national AI for science resource centers to make data, AI models, compute capacity, software and tools accessible for scientific research. These national resource centers could also coordinate with an international center designed to facilitate the use of AI for global scientific collaboration and progress.

Talent

Teach AI as the next Scientific Instrument

Cutting edge data and models are not enough on their own to unlock the potential of AI. Scientists must learn how to use AI as a scientific instrument to make it part of their everyday toolkit.

Governments and universities can expand access to AI training—from short practical courses for existing researchers to new interdisciplinary degree programmes and fellowships. Postgraduate science students should have access to AI fundamentals, building capacity for AI-driven innovation in areas like medicine and biology.

This should be complemented by more advanced training opportunities for established researchers and efforts to integrate AI and data science skills more deeply into scientific education at all levels, and a commitment to training educators through updated professional development programmes.

Directing Strategic Investment: Setting Goals & Experimenting

Strategic investment is crucial for ambitious, long-term research. By defining clear goals and embracing new organisational models, Europe can maximise the returns on its scientific commitment.

Two key pathways to directing strategic investments

Identify
Priority Areas for Leveraging AI in Science

Launch an EU effort to identify and prioritize the most important unsolved problems in science that are well-suited to AI approaches. This could take the form of a public call for submissions from the scientific community, followed by expert evaluation and selection of a set of "grand challenges" to focus EU efforts. These problems could then form the basis of new scientific competitions, supported by high-quality datasets, rigorous evaluation methods, and competitive benchmarks. It could also help direct greater public, private and philanthropic funding and attention to these priority areas.

Build Evidence
and Experiment with New Ways of Organising Science

As AI transforms research, policymakers need better evidence on what works. Governments can invest in metascience to study how AI is used across disciplines, and experiment with new ways of organising science—such as Focused Research Organisations or dedicated AI for Science institutes—to test faster, more collaborative approaches to discovery. In addition, regulatory sandboxes may encourage experimentation and innovation in AI technologies, allowing companies to test and refine solutions.

Guiding Deployment and Collaboration: Realising Impact

To ensure that AI's foundational capabilities translate into measurable progress across Europe's scientific and societal priorities, policymakers should focus on deploying AI responsibly and effectively across scientific domains such as health, climate, and the natural sciences.

Three key routes to realising the impact

Enable
Global Legal and Institutional Collaboration

Science thrives on collaboration and the open exchange of information. Governments should work together to create harmonised, interoperable regulations to encourage continued scientific progress, especially in areas like copyright, privacy, and cross-border data flows. Global legal frameworks can protect the marketplace of scientific ideas and enable responsible AI progress.

Deploy
Scaling AI Solutions through Partnerships and Targeted Action

Successful implementation of AI solutions relies on partnership. AI should be used for cross-sector collaborations to measure progress towards shared goals. Within the environmental domain, examples include managing natural disaster preparedness and response or creating roadmaps for countries across the EU to adopt AI solutions in energy, industry, transport, and agriculture.

Guide
Transparency and Responsible AI Progress

Policymakers can play a key role in guiding and enabling both AI and the infrastructure behind it to realise the technology's benefits while also mitigating potential risks. For example, leaders can set policies that help ensure AI transparency and governance mechanisms to strengthen public trust.