

This white paper is an annual report on the measures implemented by the Government of Japan to promote science, technology, and innovation in accordance with the Basic Act on Science, Technology and Innovation.

It consists of two parts: **Part 1, which highlights topics from the fiscal year, and Part 2, which is the annual report** (as per previous years).

The Part 1, titled the “**How AI will transform Science, Technology and Innovation**”, outlines the background of the recent rapid advancement of Generative AI, domestic and global trends in AI R&D, the use of advanced AI technology in across many scientific fields (**AI for Science**), and the impact of advanced AI on society.

Part 1 How AI will transform Science, Technology and Innovation

Chapter 1 A New Era of AI

After a review of the development of artificial intelligence (AI) up to now, describes the background of, and factors causing, the recent rapid development of generative AI technology, and introduces future directions in next-generation AI technology.

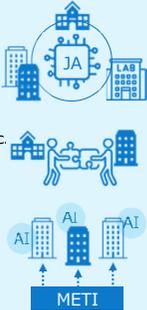


Chapter 2 AI R&D in Japan

Introduces examples of initiatives related to the development of generative AI, the provision and use of computing resources and data resources, research on AI safety, and the development of AI human resources.

R&D on Generative AI in Japan

- The accelerated development of models with high Japanese language performance and light version models, which are intended for use in daily life and industrial settings where advanced Japanese language processing is required, is being carried out at universities, research institutions, start-ups, private companies, etc.
- The NII is hosting an **LLM Study Group** (LLM-jp) together with private companies, universities, etc.
- In order to strengthen domestic generative AI development capability, the Ministry of Economy, Trade and Industry has launched its **GENIAC (Generative AI Accelerator Challenge)** program, which supports the provision of computing resources to institutions developing foundation models.



Computing resources and Data resources for the development of Foundation models

- National Institute of Advanced Industrial Science and Technology's AI Bridging Cloud Infrastructure (ABCI)**
AIST has launched its Large-Scale Language Model Building Support Program, which enables user to reserve 40-80 computational nodes for a maximum of 60 days.
- Utilization of the supercomputer Fugaku**
Development of technology to efficiently execute large-scale language model training in an ultra-large parallel computing environment.



AI Safety

- AI Safety Institute (AISI)**
AISI was launched in February 2024 to establish assessment methods and standards regarding AI safety.
- Center for Large Language Models (LLMC)**
The NII has established a new center for R&D on ensuring the transparency and reliability of generative AI.

Development of AI human resources

- Approved Program for Mathematics, Data Science and AI Smart Higher Education
- Next-Generation AI Human Resource Development Project (support program for doctoral course students)



Chapter 3 Global Trends in AI R&D

Describes global trends of AI R&D, as well as examples of multinational collaboration.

USA

The US Government has secured voluntary commitments from companies to ensure the safety of AI. A Presidential Executive Order issued in October 2023 calls for the promotion of active AI R&D by private companies and universities while setting regulations regarding foundation models that pose a serious risks to national security risks. In addition, the government established the US Artificial Intelligence Safety Institute (USAISI).

EU

In March 2024, the European Parliament passed the AI Act. The Act classifies risk levels of AI systems and sets regulations in accordance with the risk level. The EU also supports AI R&D, including the utilization of AI in other fields.

UK

The UK Government promotes AI R&D at universities, startups, etc., and has laid out a pro-innovation regulatory framework. In November 2023, the UK held the AI Safety Summit and established the UK Artificial Intelligence Safety Institute (UKAISII).

*Chapter 3 also introduces initiatives in Germany, France, Italy, Canada, China, and Singapore.

Hiroshima AI Process

Based on the outcome of the G7 Hiroshima Summit in May 2023, Japan, in its Presidency of G7, led discussions on AI governance, in cooperation with the OECD and GPAI.

In December, the Hiroshima AI Process Comprehensive Policy Framework, which includes International Guiding Principles and International Codes of Conduct, was agreed upon at the Digital and Tech Ministers' Meeting, and was then endorsed by the G7 leaders.

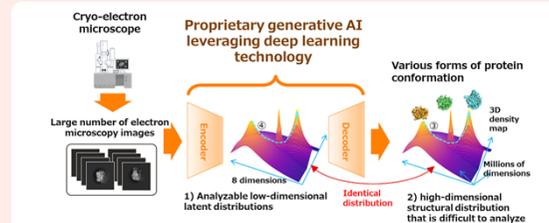


Chapter 4 Transformation of Science by the Use of AI

Highlights some cases of the use of advanced AI in multiple scientific fields, which can lead to acceleration of scientific discoveries and improvement of R&D productivity, alongside indicating new challenges posted by AI.

Utilization of advanced AI in diverse scientific fields (AI for Science)

- Sophistication and acceleration of simulations**
Creating predictive models of structure and function based on huge amounts of data is enhancing efficiency and speed of prediction of protein 3D structures and their changes, search for new materials, etc.



- Generation of new scientific hypotheses and inferences**

Utilization of AI can lead to exploration and generation of hypotheses based on vast amounts of data and to new scientific discoveries, by going beyond human cognitive limitations and biases.

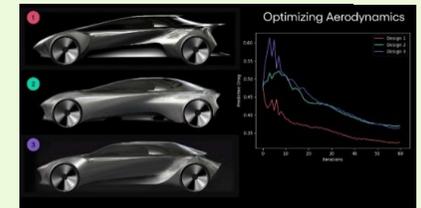
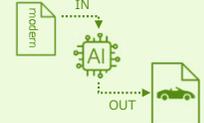
- AI-driven Robotics and Autonomous laboratory work**
Development of general-purpose AI robots that can do multiple tasks such as housework like a human, as well as automated and autonomous technologies to perform part or all of research experiments.



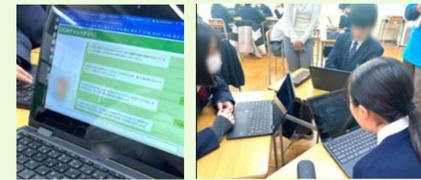
Chapter 5 Impact of Advanced AI on Society

Introduces examples of empirical research on the utilization of advanced AI in administrative affairs, public services and knowledge-intensive fields, as well as demonstration projects aiming at increasing the social benefits of AI and ensuring that many more people benefit from them.

- Toyota Research Institute in the United States has demonstrated new generative AI technique to amplify vehicle designers.



- MEXT has announced tentative guidelines on the use of generative AI in schools, and has designated 52 schools as pilot schools for using generative AI in educational activities and school duty; results and knowledge are now being accumulated.



Development of AI foundation model for scientific research

Centering on RIKEN, development of AI foundation models for science oriented specified scientific fields, by learning scientific research data to an AI foundation model. Firstly, focused on life/medical science, material science.

Innovation on scientific research by "AI Foundation Model for Science"

