Overview

Basic Approach
Sony conducts research and development as a creative entertainment company with a solid technological foundation with the aim of “filling the world with emotion through the power of creativity and technology.” Sony believes it is essential to understand the motivations of creators and users in order to fulfill its management objective of creating technology that gets closer to people. To help solve the problems faced by humanity, society, and our planet, we will contribute through Sony Group’s diverse products, content and services, which people and technology are constantly improving.

Structure
R&D
Based on Sony Group’s R&D mission to “Push our civilization forward and make this planet sustainable” and the direction of our technology—“We are here for creators”, we consider all people who pioneer the future as creators, including researchers and entrepreneurs, and we are engaged in research and development activities to expand their creativity. Sony is prioritizing R&D that enables creators to fully apply their creativity and convey their ideas to diverse range of people, we also emphasize diversity within our organization. In addition to conducting R&D activities at multiple sites across Japan, China, India, Europe, and the United States, each taking advantage of regional characteristics and strengths, we will continue to recruit talented researchers from around the world. These diverse organizations constitute the Sony R&D ecosystem which aims to contribute towards creating value for the Sony Group, and we will further strengthen our collaborations with creators as well as academia to pioneer a better future together.

Technology That Inspires Emotion
Sony Computer Science Laboratories
Sony Computer Science Laboratories, Inc. (Sony CSL) was established in 1988 to pioneer new research fields and paradigms, as well as new technologies and businesses, for the good of humanity, society and our planet. Sony CSL gives free rein to its researchers and is committed to creating a better future via creative and imaginative research. As of 2023, Sony CSL is researching a diversity of themes at its laboratories in Tokyo, Paris, Kyoto and Rome, ranging from social issues in areas such as ecosystems, urban planning, and energy to augmentation of human capabilities and creativity. It strives to channel the fruits of its research back into society.
Sony Research

Sony Research was founded in April 2023 with the mission to "pioneer the future of creation." It undertakes the research and development of disruptive technologies that aims to empower creators around the world to maximize their creativity, IP value, and fan engagement. Sony Research defines creators in the largest possible sense and aims to develop technology that can also make fundamental societal contributions. The company includes Sony AI, which was founded in 2020 and will initially focus on projects in the realm of sensing, AI, and digital virtual spaces. Going forward, the scope of research will be expanded to include new fields and challenges. Recognizing the power and influence that AI can have on society, Sony Research aims to contribute by developing AI that is responsible, fair, and transparent.

Sony Innovation Fund

Sony has participated for many years in the global ecosystem for creating new businesses and supporting the business growth of venture companies. It established the Sony Innovation Fund in 2016, the Innovation Growth Fund in 2019, the Sony Innovation Fund: Environment in 2020 to support companies tackling global environmental issues, and in 2021 launched an innovative program to support ESG initiatives by companies that it invests in. Sony Ventures Corporation, established in July 2021, launched Sony Innovation Fund 3 L.P. in February 2022. This new investment fund, which completed a final closing with a total of 26.5 billion yen, invests in venture companies in industries that are expected to show strong growth. The new fund brings the total Assets Under Management (AUM) to over 60 billion yen. Sony Innovation Fund 3 L.P. is intended to contribute to social progress and the creation of sustainable societies via ESG-focused investment and support for venture companies.

Sony Research Award Program

Sony Research Award Program is an open innovation program for research and development. The program is open to universities and research institutions in North America, Europe, and India, and calls for research proposals, sponsoring grant awards recipients with research funding and opportunities to collaborate with Sony’s diverse R&D organizations. Launched in 2016 for North American universities, the program has expanded to cover more regions and research institutions and granted awards to a total of 134 research projects by FY2022. It contributes to making Sony’s R&D advanced and promoting R&D on innovative technologies and their implementation in society on a global scale.

Sensing Solution University Collaboration Program (SSUP)

Sensing Solution University Collaboration Program (SSUP) is a program that, with the keywords of "Sensing" and "Collaboration," offers joint research and research support through the free lending of research equipment for research themes that use Sony Semiconductor Solutions Corporation's sensing solutions, as well as related activities to encourage co-creation and to support education. It aims to create a better future and bring surprise and excitement to people, sensing the world with Sony’s devices such as low-power consumption microcontroller computers and cameras, to create solutions for real-world problems as well as in the entertainment world. Beginning in 2019, SSUP has globally conducted joint research with 45 university laboratories (32 in Japan and 13 overseas) by FY2022.

Sony Startup Acceleration Program (SSAP)

SSAP engages in companies across 22 industries, creating 25 new businesses from scratch, business acceleration services in more than 300 cases to hundreds of (NPOs), and educational institutions. Thus far, SSAP has provided new commercialization for Sony group companies, external organizations as a program to support the creation and operations of new companies from FY2018. With Sony’s employees serving as experienced creators around the world to maximize their creativity, IP value, and fan engagement. Sony Research defines creators in the largest possible sense and aims to develop technology that can also make fundamental societal contributions. The company includes Sony AI, which was founded in 2020 and will initially focus on projects in the realm of sensing, AI, and digital virtual spaces. Going forward, the scope of research will be expanded to include new fields and challenges. Recognizing the power and influence that AI can have on society, Sony Research aims to contribute by developing AI that is responsible, fair, and transparent.

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Technology for Sustainability

Sony regards working to realize a sustainable society as a key theme and is conducting technological development to solve both environmental and social issues.

Projects

IoT for a Sustainable Society: Sony’s Earth MIMAMORI platform

In order to realize a sustainable society, it is necessary to constantly protect various regions such as mountain forests, satoyama (woodlands surrounding rural settlements), rivers, and coasts. Furthermore, it requires the detection of anomalies to prevent problems from arising, instead of addressing environmental issues after they have already arisen. Such systems can only be realized through the ability to acquire and transmit data in a global sensor network extending to mountainous and coastal areas not serviced by conventional mobile networks. They also require devices and networks that can function in areas where electricity service is difficult. Sony has a range of technologies to realize these systems:

- IMX500, an intelligent vision sensor equipped with AI processing functionality
- Low-power edge AI devices such as SPRESENSE™ that offer advanced sensing in a battery-powered device
- ELTRES™-compatible radio signal processing technology that enables low power and low bit rate data transmission with a range of over 1,000 km
- Prediction One, an analysis tool that makes useful predictions from the data collected
- A wafer-level diode-pumped solid-state surface-emitting laser, which can be used in atmospheric monitoring to sense particles invisible to the eye and more besides.

Combining these technologies enables sensing all around the world, even in locations where humankind is not active. The data from such sensing can be collected by low earth orbit satellites and the necessary information relayed to human society via AI processing. Sony calls this concept “MIMAMORI” and is engaged in research and development to make this mechanism to change human behavior patterns a reality. Within frameworks such as a comprehensive alliance with the Japan International Cooperation Agency (JICA), and the Social Innovation Division for Planetary Boundary jointly established with Hokkaido University, Sony is collaborating with external partners in joint research and trials at various locations around the globe. In March 2023, Sony signed a letter of intent with Thailand’s Geo-Informatics and Space Technology Development Agency (GISTDA) to work towards building a system to alleviate damage caused by natural disasters. These projects will help to prevent environmental destruction and predict emergencies such as river flooding and wildfires, as well as increase agricultural and livestock productivity.

STAR SPHERE, a New Look at Earth

In August 2020, Sony announced that it would begin developing a nanosatellite that could be operated from the ground to capture the earth and stars. Development has been completed under a joint demonstration agreement with the Japan Aerospace Exploration Agency (JAXA) and the University of Tokyo. Until now, space missions have been used mainly for industrial purposes such as planetary exploration or space communication and surveys, and only a few people, such as astronauts, have experienced manned space flights. Believing that it is important for ordinary people to experience the universe for themselves and see Earth in a new light, as a planet in space, to help humanity create sustainable societies and find solutions to environmental issues, Sony, the University of Tokyo, and JAXA founded the STAR SPHERE project. In January 2023, STAR SPHERE’s nano satellite “EYE” was launched from Florida, USA. “EYE” uses water as an environmentally conscious propellant, and it can maneuver to a certain extent. The satellite is currently in orbit around the Earth, and assessments are being conducted in preparation for deploying the service. By allowing the general public to discover unfamiliar aspects of the Earth and stars, such as the expressive colors of the aurora, STAR SPHERE will give people more opportunities to learn about our planet and environment.
Synecoculture™ and Augmented Ecosystems

Conventional agriculture largely focuses on increasing productivity from a single crop by plowing topsoil, spreading fertilizer, and applying agrochemicals. These practices damage ecosystems and cause environmental problems. Sony CSL successfully conducted demonstration tests for Synecoculture, a new agricultural practice that balances productivity and biodiversity, moving closer toward sustainability. Synecoculture is already being used in the Sahel region in Africa and has the potential to have a major global impact by contributing to desert greening and helping local economies around the world.

Synecoculture eliminates the need for the plowing, fertilizing, and agrochemical use that impact the environment, by taking maximum advantage of the material cycling that occurs naturally in ecosystems, aiming to create rich ecosystems with a diverse mix of plants that coexist together and grow lushly. The importance of building ecosystems with a high degree of biological diversity and functionality is increasing in response to climate change, food crises, and pandemics. Synecoculture provides a fundamental solution to such global agenda. Sony CSL is also working to supply new value through augmented ecosystems, which expand the applications for Synecoculture beyond food production to the creation of ecosystems with diverse objectives and functions. The project supports education to enhance the understanding of natural environments and adds new value to the basic infrastructure of urban and living spaces. Building on this project, Sony founded SynecO, Inc. to create sustainable environments and industries based on the renewable natural capital in which society should be rooted.

* Synecoculture is a trademark of Sony Group Corporation.

NOS-DX1000 Next-gen Olfactometry System
Contributing to Longevity with Proprietary Odorant Control Technology

According to a report by Japan’s Ministry of Health, Labour and Welfare, one in five elderly people in Japan will have dementia in 2025, making it critical to detect the disease early and control its progression. Several studies report that a drop in olfactory ability is one of the symptoms that heralds the onset of Alzheimer’s disease or Lewy body dementia. This indicates that olfactometry could play a role in the early detection of the disease.

In March 2023, Sony Corporation released the NOS-DX1000 Next-gen Olfactometry System. Previous methods of measuring the sense of smell had drawbacks such as requiring 30 or more minutes for measurement, contaminating rooms with odors, or only being usable in certain facilities. Sony’s product uses the proprietary Tensor Valve™ technology, which prevents odor leakage to digitally transform processes of smell testing and measurement in an easy-to-use manner. The device contains deodorizing mechanism that suppresses odor contamination, enabling olfactometry to be carried out anywhere. Sony plans to contribute to extending longevity in a super-aged society by introducing the Next-gen Olfactometry System for diagnosis in hospitals and clinics in the near future, and will continue to contribute to ototorhinology and neurology going forward by providing simpler and more accurate olfactometry.
**Products**

**Edge AI Solutions to Help Solve Social Issues**

In May 2020, Sony Semiconductor Solutions Corporation (SSS) announced the commercial release of its IMX500 intelligent vision sensors, the first image sensors in the world to be equipped with AI processing functionality. They feature a stacked configuration consisting of a pixel chip and logic chip, which are key technologies of SSS image sensors. The logic chip is equipped with SSS’s proprietary DSP (Digital Signal Processor) dedicated to AI signal processing, and embedded memory for the AI model.

The spread of the IoT has made cloud AI processing systems commonplace. However there is concern that this will lead to increased CO2 emissions as IP traffic and data center electricity consumption rise due to higher data volumes from the growing number of IoT devices. Edge AI processing addresses these problems by processing and analyzing data on the devices themselves. SSS developed the IMX500 to be capable of outputting the desired and analyzing data on the devices themselves. SSS developed the IMX500 to be capable of outputting the desired information that can identify an individual.

In an effort to solve this, edge devices (AI cameras) with IMX500 sensors are being used in a demonstration test in collaboration with a local application development partner. Another test is being conducted in the field of logistics. SSS and NEC Corporation have been collaborating since December 2022 to demonstrate an edge AI sensing solution using edge devices (AI cameras). Unused shelf space is rendered visible with edge AI and combined with inbound and outbound logistics data in a system that can reduce work by advising warehouse workers how to use shelf space optimally. The trend in commerce toward online platforms is leading to increasingly significant shortages of personnel and processing capacity in the logistics industry. Sony will use the knowledge gained from demonstration tests to work toward implementing the technology in the logistics industry and alleviate worker shortages by facilitating digital transformation.

**OTC (Over the Counter) Hearing Aids**

Sony Corporation’s self-fitting OTC hearing aids were launched in the U.S. in October 2022, in partnership with WS Audiology. OTC hearing aids are newly approved hearing aids in the U.S. that can be purchased without professional prescription or intervention for people with perceived mild to moderate hearing loss over the age of 18. In the U.S., the low prevalence of hearing aid use is an issue. Less than 20% of people aged 20-69 who need hearing aids actually wear them. Some studies show that hearing loss may increase the risk of developing dementia, which means hearing care is an important issue to address to extend people’s healthy life expectancy. The advantages of OTC hearing aids are price affordability, ease of purchase at mass retailers or online stores, and easy self-fitting. During the initial stage of product development, we considered we could apply Sony’s headphone designs to hearing aids, but we found that people with hearing loss have unique needs and challenges through a series of in-depth interviews. Based on these findings, we created discreet, sleek and ergonomic designs to encourage people to want to wear the hearing aids, and developed a user-friendly smartphone app for improved usability.

We will continue to combine Sony’s technologies and expertise in the development of OTC hearing aids with the aim of providing hearing experiences that deliver “Anshin” and “Kando” to enrich human life.


Sony and WS Audiology Have Entered into a Partnership Agreement in the Over-the-Counter Self-Fitting Hearing Aid Business

Aiming for Over the Counter (“OTC”) hearing aids where everyone can share the moment, for richer conversations and experiences

Sony Electronics Launches its First Over-the-Counter Hearing Aids in the US and Makes Hearing and Improved Accessibility Options for Consumers a Reality
Material

**Licensing of Triporous™**

Triporous is a plant-based porous carbon material with excellent adsorption qualities. Sony obtained end-to-end patents on this material and began licensing Triporous in 2019. Triporous is made from rice husks, of which Japan alone generates around two million metric tons per year, and this excess biomass is part of approximately 100 million metric tons generated annually worldwide. Manufacturing Triporous can reduce air pollutants and greenhouse gases more than using incinerator disposal. Thanks to its microstructure derived from rice husks, Triporous has unique adsorption properties different from those of conventional activated carbon. Using filters containing Triporous instead of activated carbon to recycle water takes advantage of Triporous’s superior adsorption properties, reducing system costs and waste by allowing filters to be changed less frequently. This has been demonstrated in cooperation with a water treatment equipment manufacturer. Triporous is also being put to use in deodorizing, and waste by allowing filters to be changed less frequently. This has been demonstrated in cooperation with a water treatment equipment manufacturer. Triporous is also being put to use in deodorizing, antimicrobial fibers for apparel and in cleansers for healthcare.

Clothes containing Triporous were even selected for use on the International Space Station. Sony will work with partners to apply Triporous to solve a variety of social issues and help to bring about a more environmentally conscious, recycling-oriented society.

**Outside Sales of SORPLAS™ Recycled Plastic**

Sony commenced outside sales of its proprietary Sustainable Oriented Recycled Plastic (SORPLAS™) in 2014. SORPLAS is a flame-retardant recycled plastic that offers excellent heat resistance, durability, and recyclability. It contains up to 99% recycled materials. SORPLAS was first used in Sony products in 2011 and has since been incorporated into a wide variety of Sony products. Sony aims to promote the recycling of resources and help reduce the environmental impact of society as a whole by offering SORPLAS to other companies. Many companies are interested in using SORPLAS. So far, it has been adopted for a wide variety of products, including televisions, cameras, smartphones, computers, lighting fixtures, and daily necessities such as travel goods and stationery.

Services and Systems

**Implementing Open Xchange Systems in Society**

Sony Computer Science Laboratories, Inc. (Sony CSL) is conducting research, development, and demonstrations with its Open Xchange Systems (OXS) to promote decarbonization and biodiversity conservation through climate change mitigation. OXS combine Sony CSL’s decentralized Open Energy Systems™ (OES) and educational programs including tools that visualize carbon dioxide emitting behaviors in daily activities. With these technological and design approaches, OXS aims to accelerate the use of renewable energy and trigger behavior changes that would lead to decarbonization. One of the main actions taken with OXS was to publish the source code for the Autonomous Power Interchange System (APIS), the core module of the OES, as open-source software in 2020. In July 2021, the UMABA Project was commenced. This new power-sharing demonstration, which linked storage batteries and EVs over an AC network, was conducted by an industry-academia-government consortium investigating environmentally conscious working vacations. The project is based in Umaba School Cottage, a working vacation facility in Miyoshi, Tokushima Prefecture, and is working to facilitate decarbonization in the area. Going forward, the research team at Sony CSL will continue to research and implement OXS to realize a society that can achieve decarbonization and improve people’s quality of life anywhere in the world, regardless of the absence of energy infrastructure.
Digital Cinema Systems

Previous film development required a massive amount of positive film, water and chemicals. To rectify this issue, Sony introduced the HDW-F900, the world’s first 24P digital video camera for cinema production, back in the year 2000, and began offering 4K digital cinema projection systems consisting of projectors and other devices in 2007. Since then, we have continued to provide digital cameras to movie production sites and theaters worldwide. These cameras save both resources and power and improve operation efficiency.

In 2018, Sony released the VENICE digital cinema camera. This camera was both smaller and lighter than conventional models, yet capable of 6K recording. In 2022, Sony released VENICE 2, which supports internal recording in an even smaller, lighter body.

Virtual Production Technology

Sony provides virtual production technology to creators that has the potential to reduce environmental impact of content production. The technology enables in-studio filming that mimics the look of being on-location. The combination of large LED displays, cameras, camera tracking, and a real-time 3DCG rendering engine allows creators to shoot in front of a virtual 3DCG background image on the display, mixing CG and live action without post processing. According to Sony Pictures Entertainment, this technology could reduce greenhouse gas emissions approximately 75% compared to on-location productions. In addition, 3DCG virtual backgrounds can be reused repeatedly to minimize waste.

Supporting Disaster Prevention and Environmental Projects with Drones

The Sony Group’s Aerosense Inc. combines automated flight drones with cloud services to build and provide various industrial solutions. They enable high-precision drone surveying that helps save labor at civil engineering sites nationwide. This technology is also used for confirmation work in natural disaster response and prevention, bolstering national resilience by allowing damage to be quickly investigated during such events. In recent years, climate anomalies have driven an increase in natural disaster damage. Authorities need ways to safely and efficiently make assessments of broad areas at long distance. One of the many current applications of Aerosense’s vertical take-off and landing (VTOL) drones is inspecting roads and power lines damaged by mountain landslides.

In 2022, Aerosense and the IT company funlead corp. began an international research collaboration with Malaysia’s Sunway University. Drones and AI were used to generate maps of mangrove distribution in Malaysia, demonstrating the technology and contributing to environmental conservation abroad. The project illustrates how Aerosense drones are trusted even outside Japan for their high reliability and technical capabilities.

FeliCa™ IC Card Ticket System

Sony’s smart card ticket system, based on FeliCa contactless IC card technology, is helping to alleviate air pollution in Bangladesh. The city is facing serious air pollution issues due to increasing traffic congestion. Transport operators in Bangladesh have introduced FeliCa’s IC card ticket system to encourage citizens to use the metro and buses. The number of passengers has increased due to the improved convenience of public transportation, such as smooth boarding and alighting, and traffic congestion has been reduced.

Aerosense drone

Virtual Production Technology That Can Reduce Environmental Impact
Responsible AI

Framework for AI Ethics Initiatives

Through the utilization of artificial intelligence (AI), Sony aims to contribute to the development of a peaceful and sustainable society while delivering kando—a sense of excitement, wonder and emotion—to the world. At the same time, Sony understands that the influence of AI on society is multi-faceted and can have unintended consequences. Sony established the Sony Group AI Ethics Guidelines in September 2018 to guide all Sony officers and employees in utilizing AI and conducting AI-related R&D in a manner that conforms with our values and emerging social norms. The guidelines were subsequently revised to align with Sony’s Purpose established in January 2019 to “fill the world with emotion, through the power of creativity and technology.” In December 2019, Sony established the Sony Group AI Ethics Committee and since that time has been strengthening its initiatives and framework for AI ethics. In 2021, the AI Ethics Office was established to provide subject matter expertise on AI ethics to all Sony business units. In addition, Sony has established a notification system for AI utilization in products, services, and internal operations in Sony Group’s business units, to share information on AI ethics risks. In March 2021, in accordance with the Sony Group AI Ethics Guidelines, Sony established an internal document stipulating requirements to be complied with in the commercialization process of electronic products and services. In July 2021, Sony started conducting AI ethics assessments in the product development life cycle, and has since assessed over 100 instances. Sony uses e-learning tools to promote an understanding of AI ethics among its employees and invites speakers from outside the company to discuss this issue at lectures and symposia.

Stakeholder Dialogue and External Collaboration

Sony actively pursues dialogue with relevant companies, organizations, and the academic community on ethical issues surrounding AI utilization, while considering the interests of diverse stakeholders, including customers and creators. In May 2017, Sony became the first Japanese company to join the Partnership on AI to Benefit People and Society (PAI), a non-profit organization created to contribute to solutions for some of humanity’s challenging problems, including advancing the understanding of AI and addressing ethics surrounding AI technology. One of the most common issues in AI ethics is that of fairness, transparency, and accountability, abbreviated as “FTA.” Sony utilizes knowledge it has gained from its AI and robotics related research, development, and business ventures and contributes to a number of working groups addressing this issue. Sony currently serves as an expert advisor for PAI’s strategic planning. Sony also serves on the steering committee for ABOUT ML*, an initiative to improve the transparency of machine learning. Sony also serves as an expert advisor to the Explainability Research Project and the Diversity and Inclusion Research Project. Since August 2021, Sony’s Global Head of AI Ethics has been a General Chair of the ACM Conference on Fairness, Accountability, and Transparency (FAccT), the premier conference on sociotechnical algorithmic systems. Sony is also involved with Japanese initiatives to establish principles and guidelines that promote the utilization of AI for social good. These initiatives include the AI Utilization Strategy published by Keidanren (Japan Business Federation) in February 2019 and the Social Principles of Human-Centric AI published by Japan’s Cabinet Office in March 2019. Sony is currently a member of the Conference toward AI Network Society, a group within the Ministry of Internal Affairs and Communications whose goal is the comprehensive study of the social, economic, ethical, and legal factors involved in the promotion of AI networks throughout society as a whole. Additionally, Sony provided its Prediction One predictive analysis tool with the ability to visualize the predictive reasoning. In 2021, Sony also launched its AI Ethics Research Flagship within Sony AI with projects to conduct cutting-edge research into the challenges faced in the development of AI products and services, including ethical data collection and algorithmic fairness. Taking advantage of its position as a company that extends across a wide range of industries, Sony will put fair and transparent AI into practice, leveraging its global and diverse perspective.

AI and Pandemic Response Subgroup, a working group that aids the development of responsible AI solutions for epidemics of infectious disease such as COVID-19. At the request of the AI Council of the Center for Strategic and International Studies (CSIS), a U.S. think tank, Sony is participating as a council member to set the AI ethics agenda for the G7 Hiroshima Summit 2023 and reach a common global consensus on responsible AI use.

* ABOUT ML stands for “Annotation and Benchmarking on Understanding and Transparency of Machine Learning Lifecycles.”

Trusted R&D for AI

Sony pursues R&D for AI that is trusted and backed by solid technologies, and is engaged in technical initiatives related to AI ethics. As a solution for securing FTA, Sony implements its AI development tool, Neural Network Console, with explainable AI (XAI) and fairness plugins to make it easy to use. XAI is a technology that enables people to understand the logic behind AI decision-making, an area often called a “black box” since it is not always immediately apparent how it works. Sony has also released its machine learning fairness library and Responsible AI XAI source code as open source software. Additionally, Sony provided its Prediction One predictive analysis tool with the ability to visualize the predictive reasoning. In 2021, Sony also launched its AI Ethics Research Flagship within Sony AI with projects to conduct cutting-edge research into the challenges faced in the development of AI products and services, including ethical data collection and algorithmic fairness. Taking advantage of its position as a company that extends across a wide range of industries, Sony will put fair and transparent AI into practice, leveraging its global and diverse perspective.

Sony’s Purpose & Values

The Sony Group Code of Conduct

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