Report 2017

Toward Promotion of International Discussions on AI Networking

- Overview -

July 28, 2017

The Conference toward AI Network Society

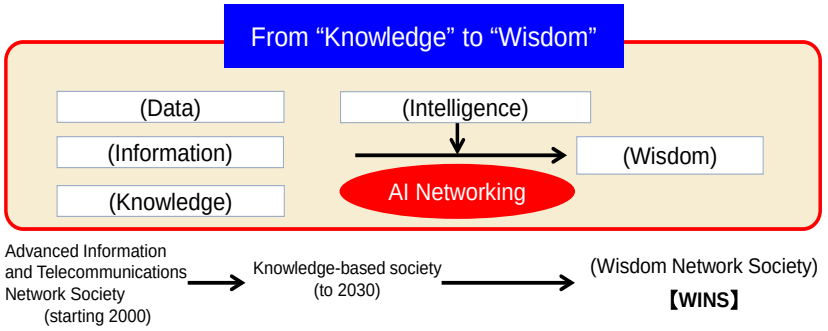
Introductory Chapter: AI Networking and Wisdom Network Society

AI networking

"AI networking" means that **AI systems' connection with the Internet** or other information and communications networks, thereby **forming collaboration with other AI systems or other kinds of systems**.

(Note) AI networks (Networked AI Systems) are systems that include AI systems as components connected to information and communications network, such as the Internet.

(Remarks) Conventionally called "AI Network Systems."



Relationship of "Data", "Information", "Knowledge", "Intelligence" and "Wisdom"	
Data	Fragmented facts/numerics/texts
Information	Combination of Data with meaning
Knowledge	Systematic accumulation of Data/Information
Intelligence	Function to learn and analyze Data/Information/Knowledges so as to create brand-new Data/Information/Knowledges
Wisdom	Human's ability to use Intelligences based on Data/Information/Knowledges so as to design the appropriate status of humans or societies and resolve relevant issues

"Wisdom Network Society" (WINS)

Wisdom Network Society (WINS) is a concept of a human-centered society in which humans live with Networked AI Systems symbiotically, and create, distribute and link data/information/knowledges freely as well as safely to formulate Wisdom Networks, and thereby progress mutual cooperation among persons/things/events in various fields beyond the boundaries of respective spaces, and consequently creative and dynamic developments are expected to be brought about.

- Symbiosis of Humans with Networked AI Systems
- Free and safe creation, distribution and linkage of data/information/knowledges to formulate Wisdom Networks
- Progress of mutual cooperation among persons/things/events in various fields beyond the boundaries of spaces

Symbiosis → Networking → Cooperation

Creative and dynamic developments are expected to be brought about.

<Basic philosophies of Wisdom Network Society>

- All people's enjoyment of benefits
- Human dignity and individual autonomy
- Innovative R & D and fair competition
- Controllability and transparency
- Participation of stakeholders
- Harmonization between physical space and cyberspace
- Realization of vibrant communities by cooperation beyond the boundaries of spaces
- Solving global problems by distributed cooperation

[Japan]

■ **International Forum toward AI Network Society** (March 13-14, 2017)

Stakeholders from Industry, academia, the civil society and the governments (Japan, the United States and European countries) exchanged ideas with the aim of promoting international discussions.

< Main Consensus through Discussions >

- **Consensus building through global discussions**: Consensus building is important through open and global discussions to be held continuously by various stakeholders.
- **Establishment of a human-centered society**: A human-centered society should be established, in which people would widely enjoy the benefits of AI networking. Education and human resource development are important.
- **Governance of AI networking**: A non-regulatory and non-binding approach (so-called soft law) would be appropriate. It is important for developers to fulfill their accountability.

■ **Declaration to be the World's Most Advanced IT Nation—Basic Plan for the Advancement of Utilizing Public and Private Sector Data** (the Cabinet Decision on May 30, 2017)

- Promotion of the international sharing of the assessment of the socioeconomic impact and risks of AI networking and study on the ideal state of governance contributing to the solution of related social, economic, ethical, and legal issues through international discussions at G7, OECD, and other international organizations.

[Overseas]

■ **The U.S Government (the Executive Office of the President)** [From May 2016]

The White House co-hosted four workshops with universities and nonprofit organizations, and discussed AI benefits and risks brought to the society. After a Request for Information process, a report entitled “Preparing for the Future of Artificial Intelligence” was released in October 2016 to recommend AI-related policies, as well as “The National Artificial Intelligence Research and Development Strategic Plan” was formulated. Another report on economic and employment impact was released in December 2016.

■ **Partnership on AI** [From September 2016]

Partnership on AI was established by Amazon, DeepMind/Google, Facebook, IBM and Microsoft to serve as an open platform to research and form best practices of AI technology, improve the public’s understanding of AI, and discuss and involve in AI and its social impact. After Apple’s participation in January 2017, other several corporations, including Sony, joined the Partnership in May 2017.

■ **The Institute of Electrical and Electronics Engineers (IEEE)**

The IEEE’s “Ethically Aligned Design” (December 2016) presented issues to encourage engineers’ discussion on how to design AI that harmonizes with humans according to moral values and ethical principles.

■ **Future of Life Institute (FLI)** [From March 2014]

FLI is an nonprofit organization of researchers, entrepreneurs, etc., conducting research to realize robust and beneficial AI. It unveiled the “Asilomar AI Principles” in February 2017, which set out guiding principles on the safety and ethics of AI.

Purpose

- In the process of the evolution of AI networking (that is a formation of networks in which AI systems are connected, over the Internet or other information-and-communication networks, to each other or to other types of systems), while enormous benefits are expected for humans as well as the society and the economy, concerns about risks such as lack of transparency will exist.

- It is essential to share guidelines, which serve as non-regulatory and non-binding soft law, and their best practices among stakeholders through open discussions to foster an international consensus.

- Protecting the interests of users and deterring the spread of risks, thus achieving a human-centered society by way of increasing the benefits and mitigating the risks of AI systems through the sound progress of AI networks.

Basic Philosophies

- To achieve a human-centered society where all human beings across the board enjoy the benefits from their life in harmony with AI networks, while human dignity and individual autonomy are respected

- To share the Guidelines, as non-binding soft law, and their best practices internationally among stakeholders

- To ensure an appropriate balance between the benefits and risks of AI networks, so as to: (a) promote the benefits from AI networks through innovative and open R&D activities and fair competition; and (b) mitigate the risk that AI systems might infringe rights or interests, while fully respecting the value of the democratic society such as academic freedom and freedom of expression.

- To ensure technological neutrality and to be mindful that developers are not imposed of excessive burden

- To constantly review the Guidelines and flexibly revise them as necessary, and to strive for broad and flexible discussions

Definition of Terms and Scope

"AI" refers to a concept that collectively refers to AI software and AI systems.

- **"AI software"** refers to software that has functions to change its own outputs or programs in the process of the utilization, by learning data, information, or knowledge or by other methods. (For example, machine learning software is classified into this category.)
- **"AI systems"** refers to systems that incorporate AI software as a component. (For instance, robots and cloud systems that implement AI software are classified into this category.)

"Developers" and "users" of AI systems are defined as follows, although it should be noted that they are relative concepts in that who are developers or users depends on the situation:

- **"Developers"** refers to those who conduct the R&D of AI systems (which includes R&D using AI systems), including those providing to others AI-network services using AI systems that they have developed on their own.
- **“Users"** refers to those who use AI systems, including end users as well as providers who provide third parties with AI-network services developed by others.

The Guidelines cover AI systems that can be networked (i.e. connected to networks)

The Guidelines cover broadly all developers as defined above.

The Guidelines cover development at a stage of connection to networks, but not include one within closed spaces (such as laboratories or sandboxes in which security is sufficiently ensured)

Chapter 2: Draft AI R & D Guidelines for International Discussions (4)

AI R&D Principles	Comments
(1) Principle of collaboration *Developers should pay attention to the interconnectivity and interoperability of AI systems.*	•In order to ensure the interconnectivity and interoperability of AI systems, developers should pay attention to the following matters: (i) cooperation to share relevant information. (ii) compliance with international standards. (iii) data format standardization and support to the opening of interfaces and protocols. (iv) the open and fair treatment of license agreements, including those on standard essential patents, and conditions.
(2) Principles of transparency *Developers should pay attention to the verifiability of inputs/outputs of AI systems and the explainability of their judgments.*	•It is desirable that developers pay attention to the verifiability of the inputs and outputs of AI systems as well as the explainability of the judgment of AI systems within a reasonable scope in light of the characteristics of the technologies to be adopted. (*The disclosure of algorithm, source code, or learning data is not intended. In interpreting this principle, consideration for privacy and trade secrets is also required.)
(3) Principle of controllability *Developers should pay attention to the controllability of AI systems.*	•In order to assess the risks related to the controllability of AI systems, it is encouraged that developers make efforts to conduct verification and validation. In addition, in order to ensure the controllability of AI systems, it is encouraged that developers pay attention to whether the supervision and countermeasures by humans or other trustworthy AI systems are effective, to the extent possible in light of the characteristics of the technologies to be adopted.

Chapter 2: Draft AI R & D Guidelines for International Discussions (5)

AI R&D Principles	Comments
(4) Principle of safety *Developers should take it into consideration that AI systems will not harm the life, body, or property of users or third parties through actuators or other devices.*	• It is encouraged that developers make efforts to conduct verification and validation in advance in order to assess and mitigate the risks related to the safety of the AI systems and implement measures, throughout the development stage of AI systems to the extent possible in light of the characteristics of the technologies to be adopted, to contribute to the intrinsic safety and the functional safety. • Developers should make efforts to explain the designers' intent of AI systems and the reasons for it to stakeholders such as users, when developing AI systems to be used for making judgments regarding the safety of life, body, or property of users and third parties.
(5) Principle of security *Developers should pay attention to the security of AI systems.*	• Developers should make effort to conduct verification and validation in advance in order to assess and control the risks related to the security of AI systems and take measures to maintain the security to the extent possible in light of the characteristics of the technologies to be adopted throughout the process of the development of AI systems ("security by design").
(6) Principle of privacy *Developers should take it into consideration that AI systems will not infringe the privacy of users or third parties.*	• Developers should make efforts to evaluate the risks of privacy infringement and conduct privacy impact assessment in advance as well as taking necessary measures, to the extent possible in light of the characteristics of the technologies to be adopted throughout the process of development of the AI systems ("privacy by design").

Chapter 2: Draft AI R & D Guidelines for International Discussions (6)

AI R&D Principles	Comments
(7) Principle of ethics *Developers should respect human dignity and individual autonomy in R&D of AI systems.*	• It is encouraged that, to the extent possible in light of the characteristics of the technologies to be adopted, developers make efforts to take necessary measures so as not to cause unfair discrimination resulting from prejudice included in the learning data of the AI systems. • It is advisable that developers take precautions to ensure that AI systems do not unduly infringe the value of humanity, based on the International Human Rights Law and the International Humanitarian Law.
(8) Principle of user assistance *Developers should take it into consideration that AI systems will support users and make it possible to give them opportunities for choice in appropriate manners.*	• In order to support users of AI systems, it is recommended that developers pay attention to the following matters: (a) providing in a timely and appropriate manner the information that can help users' decisions and are easy-to-use for them. (b) making available functions that provide users with opportunities for choice in a timely and appropriate manner. (c) making AI systems easier to use for socially-vulnerable people such as universal design.
(9) Principle of accountability *Developers should make efforts to fulfill their accountability to stakeholders including AI systems' users.*	• It is encouraged that, taking into account the R&D principles (1) to (8) set forth in the Guidelines, developers make efforts: (a) to provide users et al. with both information and explanations about the technical characteristics of the AI systems they have developed; and (b) to gain active involvement of stakeholders (such as their feedback) in such manners as to hear various views through dialogues with diverse stakeholders. • it is advisable that developers make efforts to share the information and cooperate with providers et al. who offer services with the AI systems they have developed on their own.

Roles Expected to Be Taken by Related Stakeholders

- Environmental improvements for promoting dialogue among various stakeholders by governments and international organizations

- Dialogues of stakeholders, including the developers and the users of AI systems, their sharing of best practices and common perceptions about the benefits and the risks of AI

- Preparation and release of recommended models by standardization bodies

- Government's assistance to AI-developer communities and active promotion of policies that support the R & D of AI

Preliminary Assessment and Assessment by Usage Field

A scenario-based analysis of the impacts (mainly positive impacts or benefits) and risks of AI networking was made on the basis of a scenario assuming specific use scenes (i.e., use cases).

Preliminary Assessment

(1) Disaster response, (2) Transportation (vehicles), (3) Health, (4) Education and human resource development, (5) Retail and logistics, (6) Manufacturing and maintenance, (7) Agriculture, (8) Finance (loan), (9) Public works and infrastructure, (10) Living

Assessment by Use Field (from the viewpoint of AI system users)

[Public]	Town development, Public governance, Crisis management
[Individuals]	Health, Transportation, Living, Education/learning, Work, Property, Hobbies/entertainments
[Industry]	Products, Money

*In this report, assessments are conducted on three areas underlined so far.

■ **Typical suggestions obtained from scenario analysis**

- Collaborations among various AI systems will become possible. As a result, significant impacts, such as the real-time optimization of the entire operations using AI systems in collaboration, will be brought in addition to the conventional impacts from the AI systems.
- Employment opportunities in some business fields are expected to decrease. However, the transfer of employees to higher value-added positions or the creation of new employment opportunities is expected.
- There are common risks assumed in each use case. It is important to deal with these risks.

Impact on Employment and Working Style

■ It is pointed out that the service industry and transportation industry, which have functioned as absorbers for the influence to employment due to the development of the information and communications field, will be affected by the spread of AI systems and serious unemployment may occur.
* It should be kept in mind that this has been based on subjective forecasting, the reliability of which is not ensured, and that the possibility of new job creation has not been considered.

■ The degree of aggregation of routine tasks is high in the Japanese labor market, and there is a view that non-regular workers, who are susceptible to the spread of AI systems, may be greatly affected.

■ Prompt response to employment opportunities to be newly created will be important, along with education for the smooth transition of job seekers to the new opportunities and human resource development.

Points to be Kept in Mind (1/3)

■ **Problems caused by mixing various AI systems**

➢ e.g. The competition or conflict among networked AI systems differing in property, performance or purpose may force them to negotiate with or adjust to each other.

■ **Problems associated with the coexistence of those who use AI systems and those who do not or cannot.**

➢ e.g. There may be a difference in services for those who use AI systems and those who do not or cannot.

■ **The allocation of responsibility in the case of the manifestation of AI system risks, such as the occurrence of an accident.**

➢ e.g. Problems will arise in the allocation of responsibility in the case of the occurrence of an accident caused by an autonomous vehicle or the infringement of privacy as a result of the leakage of personal data.

■ **The balance between the flow of data/information and the protection of personal data and privacy**

➢ e.g. In the acquisition of images captured by cameras, problems may arise as to how to get approval for their use from those who are the data sources.

Points to be Kept in Mind (2/3)

■ **The nature of data/information handled by AI systems**

- ➢ e.g. Careful handling is required for highly private or confidential data/information.
- ➢ e.g. From a viewpoint of intellectual property protection, problems may arise from the handling of AI products or learning data.

■ **Securement of fair competition in the ecosystem formed with the progress of AI networking**

- ➢ e.g. Business activities may be affected by whether their AI systems are allowed to be connected to influential AI networks or by conditions if allowed.
- ➢ e.g. Competing AI system operators can reduce or restrict the competition by cooperative pricing for their services.

■ **Role sharing between humans and AI (robots)**

- ➢ e.g. Problems will arise in the role sharing between humans and AI (robots), such as whether humans are satisfied with services provided by interactive robots or nursing robots, and whether they may reject the services.
- ➢ e.g. Problems will arise in the range of matters that can be entrusted to the functions of AI systems at the time of making important decisions (e.g. diagnosis, recruitment and personnel evaluation).

Points to be Kept in Mind (3/3)

■ **Improvement in literacy on AI systems**

➢ e.g. Improvements in elderly people's literacy concerning AI systems will be particularly important for them to enjoy the benefits of AI systems.

■ **Gaps among regions and uneven distribution**

➢ e.g. Regional differences may occur in the spread of AI systems depending on the financial situation of users (e.g. municipalities) or the attitude of each user to the use of AI systems.

➢ It is pointed out that attention will need to be paid to the income disparity and the redistribution of income with the progress of AI networking

■ **Costs of Introduction and use of AI systems**

➢ e.g. Problems will arise in costs of the introduction and use of AI systems for small and medium-sized businesses.

■ **Problems with the black-boxed judgment of AI systems**

➢ e.g. For the black-boxed judgment of AI systems, users (such as governments and businesses) may not be able to respond appropriately to requests for information disclosure, explanation to customers, and inspections and audits of supervisory authorities.

Chapter 4: Future Challenges (1)

Matters concerning the sound progress of AI networking

- **Toward the formulation of the AI R&D Guidelines**: A follow-up to international discussions towards the formulation of the AI R&D Guidelines as international guidelines.
- **Toward the formulation of the AI Utilization Guidelines**: Study on the formulation of the AI Utilization Guidelines as international guidelines.
- **Smooth collaboration of AI systems**: e.g. A study on the range of related information expected to be shared among stakeholders and the ways to share it.
- **Competitive ecosystem**: Keeping watch on the trends of related markets.
- **Protection of the interests of users**: e.g. Study on how developers or AI network service providers voluntarily provide necessary information to users and how to protect users (with insurance or other means).
- **Challenges related to technology development**: e.g. Promotion of R&D technologies that can supervise (with monitoring and warning, etc.) and control other AI (by stopping, disconnecting the AI from the networks, repairing the AI, etc.).

Matters concerning the information and data circulating on AI networks

- **Security measures**: e.g. Study on how to implement the security into AI systems
- **Protection of privacy and personal data**: e.g. Study on how to obtain individuals' consent and on data processing (e.g. anonymization and encryption)
- **Institutional issues relating to contents**: e.g. Improvement of environment for the promotion of creating learning data, appropriate protection and promotion of use of learned models.

Matters concerning the evaluation of the socioeconomic impact of AI networking

- **Scenario analysis on the socioeconomic impact of AI networking**: Continuation and international sharing of scenario analysis
- **Establishment of evaluation indicators for the impact of the progress of AI networking and evaluation indicators on richness and happiness**: Study on setting indicators
- **Fostering social acceptability on the use of AI systems**: Keeping watch on society's acceptance of the use of AI systems.

Matters concerning human-related issues in society where AI networking will progress

- **Study on the relationship between humans and AI systems**: e.g. Study on the role sharing of professionals (doctors, lawyers, accountants, etc.) and AI systems
- **Study on the relationship between stakeholders**: e.g. Study on the responsibility allocation corresponding to the manifestation of AI system risks
- **Education, human resource development, and work environmental improvements compatible with AI networking**: e.g. Education and human resource development according to the change of employment and work with the progress of AI networking
- **Literacy cultivation on AI systems and prevention of the AI network divide**: e.g. Study on measures to improve the literacy of information-weak people such as elderly people
- **Safety net development**: e.g. Keeping watch on labor market trends and study on measures to prevent the unfair disparity, such as the redistribution of income with the progress of AI networking

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