



December 25, 2017

NII launches new Research Center for Medical Big Data

Objectives include designing cloud platforms to collect medical imaging data
and developing AI techniques for image analysis

Japan's National Institute of Informatics (NII; Chiyoda-ku, Tokyo; Dr. Masaru KITSUREGAWA, Director General), one of four organizations that constitute the inter-university research institute corporation, the Research Organization of Information and Systems, held a press conference on December 25 to announce the creation of the Research Center for Medical Big Data. The new center, led by Professor Shinichi Satoh of NII's Digital Content and Media Sciences Research Division, will use cutting-edge tools of information technology, including networking, cloud computing, security infrastructure, and artificial intelligence (AI), to solve problems in various areas of medicine. NII has already begun R&D collaborations with three academic societies selected for research projects by the Japan Agency for Medical Research and Development (AMED), namely, the Japan Gastroenterological Endoscopy Society, the Japanese Society of Pathology, and the Japan Radiological Society, and the new center will serve as a platform for R&D initiatives such as AI technology for analyzing medical images and cloud-based platform design for medical imaging big data using the SINET5 academic information network, designed and operated by NII. Additional research collaborations with academic societies in medical fields are envisioned in the future.

The R&D projects tackled by the Research Center for Medical Big Data will be conducted atop a medical imaging big-data cloud platform specially designed to allow medical imaging data, anonymized by the various academic societies before transfer to NII, to be collected in a secure environment and subjected to data analysis by researchers in the cloud. Secure transfers of medical imaging data, first from universities and hospitals to servers operated by academic societies and then from those servers to the medical imaging big-data cloud platform, will exploit the features of SINET5^(*), an ultra-high-speed network connecting all regions of Japan at data rates of 100 Gbps, and the strengthened virtual private network (VPN) provided by SINET5 (Figure 1). For the medical imaging big data that it collects, the Center will develop AI analysis technology based on machine learning and image recognition, two central areas of modern AI practice.

Using medical imaging data collected and anonymized by the Japan Gastroenterological Endoscopy Society, the Japanese Society of Pathology, and the Japan Radiological Society, NII's new Center expects to begin data entry later this fiscal year (Table 1). In future years, the Center plans to expand the scale of its data-collection efforts by enlisting the cooperation of a greater number of hospitals and other institutions.

Japan’s Ministry of Health, Labour and Welfare is promoting the spread of evidence-based medicine, a challenge that, in practice, will require sophisticated utilization of big data and AI techniques. NII is Japan’s only comprehensive academic research institution in the field of information science, and its commitment to the dual goals of research and service, including the design and operation of SINET and other initiatives, makes it one of a few research institutions of its kind in the world. The new Center hopes to contribute to improving the quality of medical care in Japan through R&D efforts that exploit insights derived from both academic research and service.

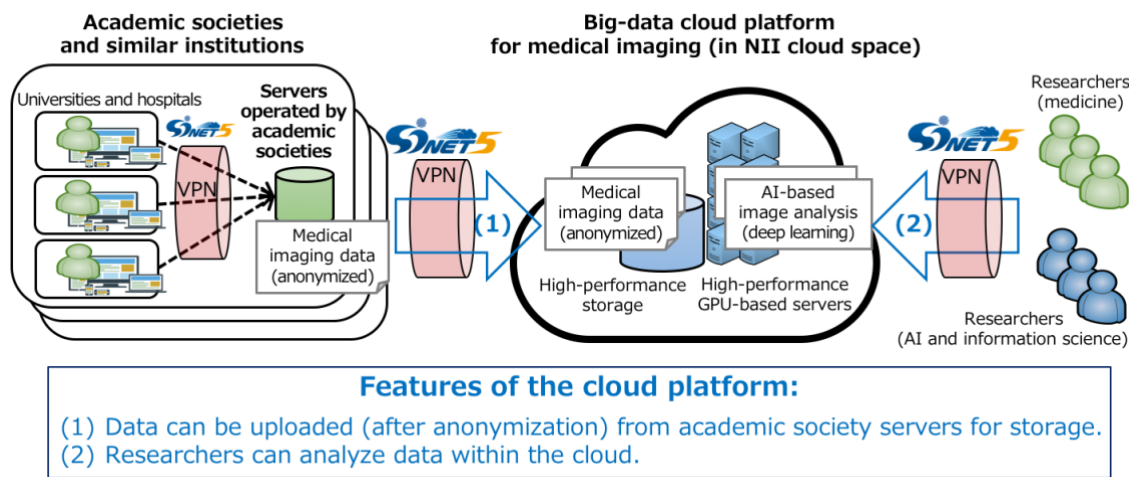


Figure 1: Schematic depiction of the cloud platform for medical imaging big data

	Target number of cases to enter	Number of hospitals cooperating with research project
Japan Gastroenterological Endoscopy Society	10,000	62
Japanese Society of Pathology	110,000	23
Japan Radiological Society	20,000	6

Table 1: FY2017 data-entry goals for statistics on disease cases

The Research Center for Medical Big Data was established as an NII research facility^(*)2) on November 1, 2017. The Assistant Director of the Center is Tatsuya Harada, Professor in the Department of Mechano-Informatics at the Graduate School of Information Science and Technology, The University of Tokyo (also Visiting Professor at NII and Team Leader of the Machine Intelligence for Medical Engineering Team of the RIKEN Center for Advanced Intelligence Project). NII’s new Global Research Center for Systems Design and Mathematics was also established on November 1, extending the number of NII research facilities to 15:

1. Research and Development Center for Academic Networks (established April 2006)
2. Center for Global Research in Advanced Software Science and Engineering (established January 2008)
3. Research Center for Community Knowledge (established January 2008)
4. Global Research Center for Quantum Information Science (established November 2010)
5. Research Center for Knowledge Media and Content Science (established April 2012)
6. Global Research Center for Cyber-Physical Systems (established October 2012)
7. Global Research Center for Big Data Mathematics (established October 2012)
8. Center for Cloud Research and Development (established April 2015)

9. Center for Dataset Sharing and Collaborative Research (established April 2015)
10. Research Center for Financial Smart Data (established February 2016)
11. Cognitive Innovation Center (established February 2016)
12. Center for Cybersecurity Research and Development (established April 2016)
13. Research Center for Open Science and Data Platform (established April 2017)
14. Global Research Center for Systems Design and Mathematics (established November 2017)
15. Research Center for Medical Big Data (established November 2017)

Collaborations with three academic societies in medical fields

In January 2017, three academic societies, the Japan Gastroenterological Endoscopy Society, the Japanese Society of Pathology, and the Japan Radiological Society, were selected for R&D projects within AMED's "Program on ICT Infrastructure Development for Clinical Research" (known as of FY 2017 as the "ICT infrastructure establishment and implementation of artificial intelligence for clinical and medical research" project) under the theme "Research on the design of database platforms for diagnostic images and other data to facilitate the use of information and communication technologies and methods of artificial intelligence (AI)". NII has been reconsigned the contracts of each society.

The enterprise unit is affiliated with AMED's "Realizing the digital revolution in medical care" project. In addition to improving the quality of medical care in Japan and uniformization efforts to ensure that standard care is available everywhere throughout the country, this project aspires to generate the evidence needed for clinical development of diagnostic support and therapeutic technologies originating from Japan by promoting research on ICT platform design for clinical studies, focusing primarily on institutions boasting cutting-edge information and communication technologies for clinical research.

In what follows, we describe the R&D efforts ongoing within each society and discuss the content and goals of the research challenges shouldered by NII.

Japan Gastroenterological Endoscopy Society

Research on the design of a new comprehensive database combining a nationwide database of gastroenterological endoscopy diagnoses with endoscopic images.

The NII's research contribution is to "design a big-data cloud platform for medical images." Exploiting AI-based image-analysis techniques, NII will design and implement a high-performance cloud platform for analyzing medical imaging big data and demonstrate the possibility of implementing big-data analytical methods for medical images.

Japanese Society of Pathology

Development of pathology support systems and implementation of a platform for collecting digital images of pathological tissue (whole-slide images: WSIs) to facilitate effective use of AI and related techniques.

The NII's research contribution is to "demonstrate AI techniques to assist in automated diagnosis of pathologies." NII will develop an AI system to assist pathologists in making diagnoses from P-WSI (Pathology-whole-slide images) big data.

Japan Radiological Society (selected with Kyushu University as home institution)

R&D projects to create a national database for image diagnosis.

The NII's research contribution is to "develop artificial-intelligence (AI)-based systems to assist in image diagnosis." NII will develop a platform capable of making effective use of big datasets,

implement a data-analysis platform to exploit AI techniques, and demonstrate the possibility of using automated diagnostic technologies.

In addition to the three academic societies mentioned above, in September FY2017, NII completed an agreement that paves the way toward a collaboration with the Japanese Ophthalmological Society, which was selected (with home institution the Department of Ophthalmology at Faculty of Medicine, University of Tsukuba) for an R&D project on the topic of “platform design for databases of images and other content to enable next-generation ophthalmological therapies based on ICT and AI”, part of AMED’s “ICT infrastructure establishment and implementation of artificial intelligence for clinical and medical research” program. NII’s research contribution to this project is expected to be in the area of “design of cloud platforms for medical imaging big data”; NII will design a big-data cloud platform to collect ophthalmological image data and historical data, and enable AI-based methods of data analysis.

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Footnotes:

(*1)SINET5: The Science Information NETwork, an academic information network designed and operated by NII. Since its official launch in April 2016, SINET5 has connected all regions of Japan via an ultra-high-speed network offering data rates of 100 Gbps, as well as faster Japan–U.S. channels also offering 100 Gbps and new channels connecting Japan and Europe. As of late FY2016, a total of 857 universities and research institutions across Japan, including all 86 of Japan’s national universities, were members of the network.

(*2)Research facility: research unit that carries out planned initiatives targeting specific research problems with clearly defined objectives. Units are divided into three categories: services and business enterprises, large-scale research projects, and industry/government/academic partnerships. This Center falls in the category of large-scale research projects.

Comments from NII Director General Masaru Kitsuregawa

“Within the field of research on IT-driven analysis of medical imaging data, the theme chosen by the Japan Agency for Medical Research and Development for its ‘ICT platform design research for clinical studies’ enterprise project, the National Institute for Informatics (NII) plays the role of enabling IT platforms. In particular, for the data itself, the most crucial aspect of the entire endeavor, the use of the SINET5 academic information network designed and operated by NII will allow the collection of enormous quantities of imaging data. At the same time, the ability to manipulate incoming data within the cloud is also essential, and above all, the entire system must operate within a fully secure environment. NII already operates research centers devoted to networking, cloud computing, and security, and by partnering with image-analysis teams, we can help to establish a robust grounding for this research enterprise. Indeed, I believe that NII, with its comprehensive research portfolio spanning all corners of information science, is uniquely capable of playing this role—on top of which, by exploiting our position as an inter-university research institute and our ability to aggregate the strengths of many universities, we will ensure that the composition of our research center amounts to an ‘all-Japan all-star’ team of crack researchers.”



Photograph: NII Director General Masaru Kitsuregawa (center-left) and AMED President Makoto Suematsu (center-right) attend a press conference with Center Director Satoh(far-left) and Special Assistant to the President Tanaka of the Japan Gastroenterological Endoscopy Society(far-right).