



National Institute of Information and Communications Technology

Universal Communication Research Institute

Realizing universal communication
for mutual understanding

<https://ucri.nict.go.jp/en/>



National Institute of Information and Communications Technology



Greetings

Means of communication have diversified in recent years as our society has become global and multicultural. Communication technologies—the infrastructure of communications—continue to evolve and with IoT (Internet of Things) allowing all ‘things’ to be connected, the boundary between cyberspace and physical space is becoming less noticeable. New values can be created by analyzing massive and diverse information (big data) from both spaces using artificial intelligence (AI). However, while this has demonstrated possibilities in resolving some of the social issues such as language barriers and shortage of labor due to the declining birthrate and the aging society, we still face many challenges in finding truly valuable information from big data, establishing mutual understanding by taking advantage of such information, and taking the right actions in a society where different cultures coexist.

The Universal Communication Research Institute (UCRI) of National Institute of Information and Communications Technology (NICT), a National Research and Development Agency, has been promoting research and development (R&D) and social implementation of technologies that can uplift the quality of communication by creating an AI research platform using high-quality, large-scale database mainly in Japanese and specialized for specific fields, with the aim to achieve universal communication and to establish mutual understanding among the people. The technologies include: multilingual communication technology which enables low-latency AI simultaneous interpretation that can be used in business scenes; data-driven intelligent communication technology which enables users to interact with virtual personalities based on their interests and backgrounds; and smart data analytics technology which enables real-world analysis and predictions by connecting public and private data. Some of the results of these R&D have been implemented into practical systems or made into databases and released to the public as open source or via industry-academia-government collaboration projects such as "Advanced LAnGuage INformation Forum (ALAGIN)." We also conduct licensing and joint field experiments with private companies to further promote social implementation of our R&D outcomes. We hope these activities would help remove the barriers of language, knowledge, and data utilization in global businesses, elderly care, environmental risk reduction, etc. and contribute to solving social issues and creating new values.

UCRI resides in the heart of Kyoto, Osaka, and Nara, known as "Keihanna Science City" and along with other research institutes in the area, we seek to create new industries through industry-academia-government collaboration activities such as Research Promotion Council of Keihanna Info-Communication Open Laboratory , in scope of the Expo 2025, Osaka, Kansai.



Dr. UCHIMOTO Kiyotaka,
Director General

External view of UCRI



Computer facilities

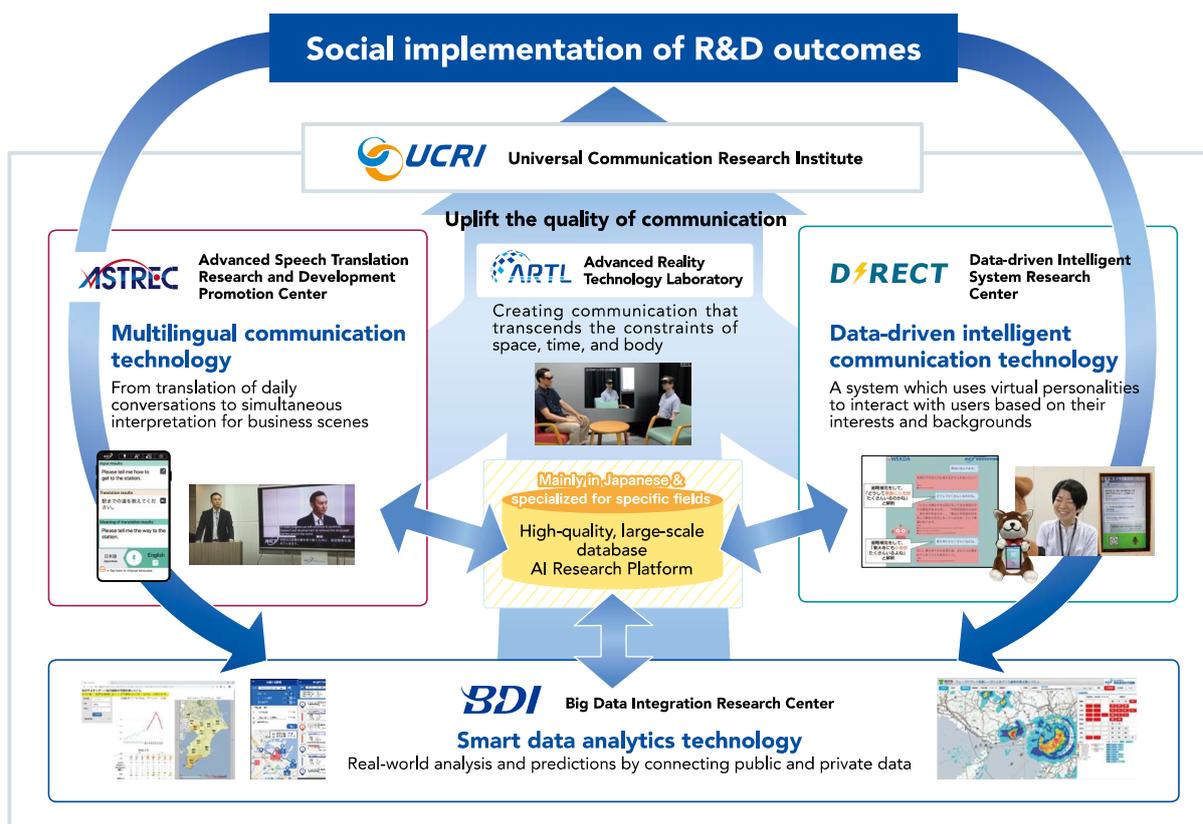


Organizational Structure



Outline of UCRI and its Mission

Mission: To promote R&D and social implementation of the technologies shown below-to remove the barriers of language, knowledge, and data utilization in global businesses, elderly care, environmental risk reduction, etc. and contribute to solving social issues and creating new values with the aim to achieve universal communication and establish mutual understanding among the people.



Advanced Speech Translation Research and Development Promotion Center

<https://astrec.nict.go.jp/en/>

A society without language barriers in which the people of the world can communicate with one another without worrying about the differences in language or ability, has long been a great dream of the human race. Japan has been pursuing the national project, Global Communication Plan, since 2014, with the aim of realizing a society without language barriers. The Advanced Speech Translation Research and Development Promotion Center was established as a research hub that would play a central role in research and development under this Plan. Furthermore, the Ministry of Internal Affairs and Communications announced the "Global Communication Plan 2025*" which initiated a new industry-academia-government research and development with ASTREC and companies who provide speech translation services leading the way. ASTREC aims to realize a low-latency AI simultaneous interpretation that is capable of supporting business scenes by the year 2025 when the Expo 2025 Osaka, Kansai will be held.

*https://www.soumu.go.jp/main_content/000678485.pdf

Multilingual speech translation app "VoiceTra"

<https://voicetra.nict.go.jp/en/>

The free app utilizes NICT's latest speech recognition, translation, and text-to-speech technologies.

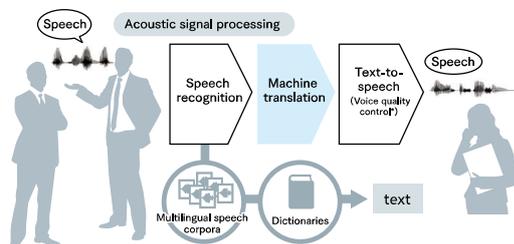


Prototype simultaneous interpretation system



Advanced Speech Technology Laboratory

In order to develop high-precision speech recognition technologies which automatically convert speech to text with practical accuracy e.g., speeches and discussions at business meetings or international conferences and other similar events, we aim to a) create speech corpora for speech recognition, b) decrease the latency and increase the accuracy of speech recognition engines, and c) develop technologies which automatically convert speech to text from audio streams that include phonetic/non-phonetic speech of multiple speakers and languages. In addition, in order to achieve text-to-speech technologies that effectively convey the speakers' intentions, we aim to d) develop text-to-speech technologies which produce human-level voices and e) develop voice quality control technologies which are tolerant to degradation by natural causes.



*A technology which allows you to change the speaker and control the speed when using text-to-speech.

Advanced Translation Technology Laboratory

In order to develop practical AI simultaneous interpreting technologies which can be used for speeches and discussions at business meetings, international conferences, and other similar events, not only do we aim to create large-scale bilingual corpora, but we also aim to develop a) phrase detection for input speech and other technologies that can be integrated with summarization technologies; b) translation technologies which allow transmission of information of multiple fields and languages using Japanese only; c) technologies that can minimize the dependency on bilingual data; d) technologies which increase the translation accuracy by taking into account the context, speakers' intentions, the surrounding environment, and etc.; and e) evaluation technologies of simultaneous interpretation.



Min'na no Jidou Hon'yaku @TexTra

<https://mt-auto-minhon-mlt.ucri.jgn-x.jp/>

A machine translation website developed by NICT. The "high-accuracy machine translation engine" based on our latest research on automatic translation can be used for free.

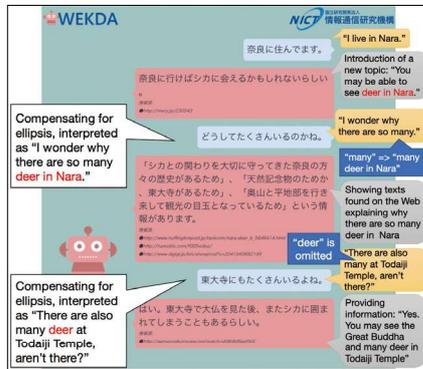
Data-driven Intelligent System Research Center

<https://direct.nict.go.jp/en/>

The Data-driven Intelligent System Research Center develops natural language processing technologies which enable for instance, to automatically discover valuable combinations of information scattered in many places, and to automatically generate important hypothetical knowledge through deep semantic analysis of large volumes of data like Web data. Recent events like Japan's tsunami and the ensuing nuclear incident have demonstrated the potentials of disruptive effects of big crisis events across geographically, socially, and semantically distinct spheres of society. In such social crisis scenarios it is crucial to be able to analyze gigantic data streams on a semantic level, allowing people to efficiently explore unexpected but possible implications of given events or information and formulate relevant hypotheses or likely future scenarios. Our goal is to realize these objectives using information technology. To accomplish this goal, we conduct research on natural language processing, text mining, various types of inference mechanisms and multimedia information processing. We particularly focus on deep semantics, on a level that past technologies could not handle.

WEB-based Knowledge Disseminating dialog Agent WEKDA

This speech dialogue system can chat without using built-in rules, making the fullest use of WISDOM X and deep learning.



WEKDA NICT 情報通信研究機構

奈良に住んでいます。 "I live in Nara."
Introduction of a new topic: "You may be able to see deer in Nara."
奈良に行けばシカに会えるかもしれないらしい
"I wonder why there are so many."
どうしてたくさんいるのかわ。 "many" => "many deer in Nara"
"deer" is omitted
Compensating for ellipsis, interpreted as "I wonder why there are so many deer in Nara."
Compensating for ellipsis, interpreted as "There are also many deer at Todaiji Temple, aren't there?"
Providing information: "Yes. You may see the Great Buddha and many deer in Todaiji Temple"

Deep-learning version of WISDOM X

<https://www.wisdom-nict.jp/>

This large-scale Web information analysis system can give replies to all sorts of questions based on the analysis of information contained in six billion web pages.



WISDOM X あなたの疑問へ 何が解決できるような高齢化の問題は何かあるか?

128 answers
Question: "What problems concerning aging could AI solve?"

care problem, locomotive syndrome, disadvantaged shoppers, lonely society, nursing care leave, unoccupied house problem, lack of skilled workers, old people providing care for old people, 2040 problem, insufficient successor, lonely death, traffic accident and medical bills, shortage of doctors

MICSUS: Multimodal spoken dialog system for elderly care

Introductory video <https://www.youtube.com/watch?v=gCurC3f9-Go>

By exploiting WEKDA conversational response technologies, this multi-modal spoken dialogue system for elderly care also helps to avoid social isolation.

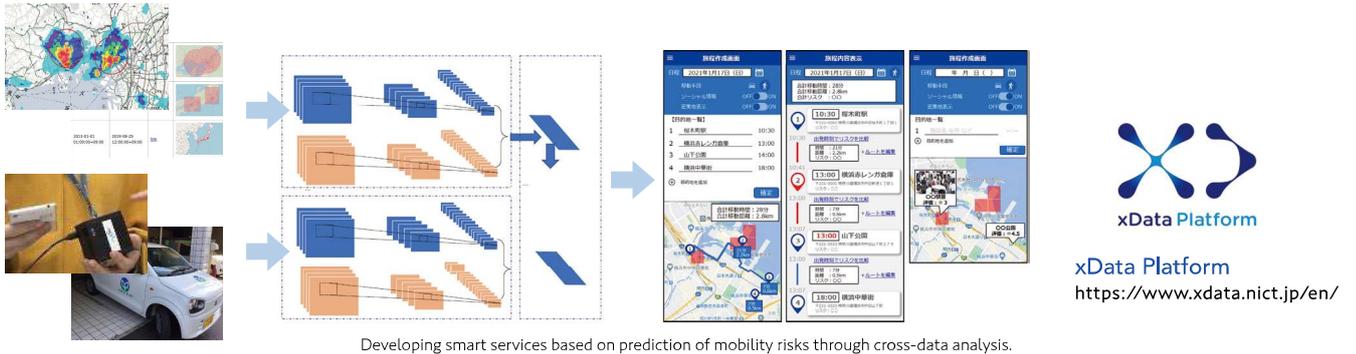


Jointly developed with KDDI, NEC Solution Innovator, and Japan Research Institute under the second term of Cross-ministerial Strategic Innovation Promotion Program (SIP)

Big Data Integration Research Center

<https://bdirc.nict.go.jp/en/>

With the widespread use of the IoT, it is expected that advanced services for a smart and sustainable society will be created by interconnecting a wide variety of sensing data to generate and utilize actionable data that is useful for understanding complex situations in the real world and supporting actions appropriate to the situation. At the Big Data Integration Research Center, we are conducting the research and development of machine learning and data mining technologies for cross-data analysis that appropriately collects sensing data of various types and fields, and discovers, learns, and predicts their cross-sectional associations. We are also working on the research and development of federated AI technology that enables the cross-data analysis model to be adapted to the individually collected data, while at the same time allowing them to be interconnected for overall optimization. The federated AI technology will enable us to perform cross-data analysis using private data in addition to conventional public data so that we can effectively deploy the analysis model to solve various issues. Based on these technologies, we are building a platform necessary for the development of smart services that support safe and comfortable transportation and healthy lifestyles taking into account local environmental issues. We provide APIs for data collaboration and analysis and a user development environment and promote co-creation-based problem solving using users' data and know-how.



Examples of R&D outcomes released to the public

 **VoiceTra**
<https://voicetra.nict.go.jp/en/>

VoiceTra translates your spoken words into 31 different languages.



Min'na no Jidou Hon'yaku @TexTra

<https://mt-auto-minhon-mlt.ucri.jgn-x.jp/>

A machine translation website developed by NICT. The "high-accuracy machine translation engine" based on our latest research on automatic translation can be used for free.

 **KoeTra**
<https://www.koetra.jp/en/>

An app that facilitates communication between hearing-impaired people and people with normal hearing.
*Technology transferred to FEAT Ltd.

 **SpeechCanvas**
<https://www.speechcanvas.jp/>

Convenient app to assist with communication with hearing-impaired people at counters, etc.
*Technology transferred to FEAT Ltd.

 **WISDOMX**
<https://www.wisdom-nict.jp/>

This large-scale Web information analysis system can give replies to all sorts of questions based on the analysis of information contained in six billion web pages.

 **RaNNC**
<https://github.com/nict-wisdom/rannc>

Software for facilitating parallel learning over multiple GPUs by automatically segmenting large scale neural networks.

 **RaSC**
<https://alaginrc.nict.go.jp/rasc/en/>

A free middleware that can concurrently execute a large number of programs with high speed.

 **DISAANA**
<https://disaana.jp/>
An emergency response SNS information analysis system that answers disaster-related questions by extracting information from Twitter.

 **D-SUMM**
<https://disaana.jp/d-summ/>
A system that organizes and summarizes disaster-related information extracted from Twitter to provide assistance during emergencies and support evacuations.

 **SOCDA**
LINE ID: @socda
A disaster countermeasure chatbot that collects and sends disaster information via the Social Network LINE in cooperation with local authorities and other related organizations.

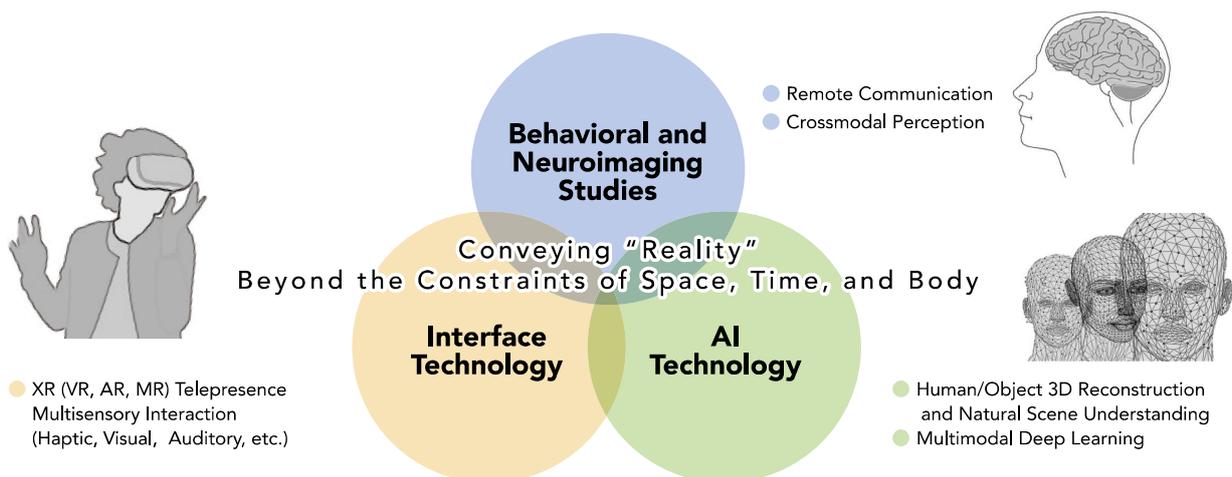
*The following are registered trademarks of National Institute of Information and Communications Technology. TexTra (No.5398294), VoiceTra (No.5398295), SpeechCanvas (No.5737506), ASTREC (No.5800265), DISAANA (No.5943933), D-SUMM (No.5943934), WISDOM (No.5949442), WEKDA (No.6067599), 翻訳バンク (No.6085106), Regarding KoeTra,

Advanced Reality Technology Laboratory

<https://ucri.nict.go.jp/artl/en/>

In the future society shaped by the next generation information and communication technology "Beyond 5G," we expect to remotely carry out activities equivalent to those in real space beyond the constraints of space, time, and body, or even experience cyber reality that exceeds our daily life. If the capability and diversity of remote activity increase dramatically, we may build a society resilient against infectious diseases and natural disasters, as well as improve workforce productivity and enhance people's life-work balance.

Aiming at such a future society, Advanced Reality Technology Laboratory is developing technologies that remotely convey the sense of reality and promote mutual understanding among people. In particular, we are exploring the nature of reality that humans perceive from multisensory information by human behavior analysis and functional brain imaging. We are also developing AI technologies for digitalizing and understanding people, objects, and environments in the real world, and designing XR (VR/AR/MR) interfaces that naturally convey reality to remote people via image, sound, touch etc. Furthermore, we endeavor to deploy our research results in society through collaboration with industry, academia, and government.



Industry-academia-government collaboration

Global Communication Development Promotion Council

<https://gcp.nict.go.jp/>

A council established to further advance multilingual speech translation technology and promote its social implementation in anticipation of the Expo 2025, Osaka, Kansai.



Ultra-Realistic Communications Forum (URCF)

<https://www.urcf.jp/>

The purpose of this forum is to bring together a wide range of universities, research institutes, and industries involved in the research, development, and commercialization of ultra-realistic communications, to facilitate the exchange of information on trends in cutting-edge technologies of different fields, and to efficiently promote vision creation, research and development, demonstration experiments, and standardization through industry-academia-government collaboration.



Registered trademark No.6366079 No.6366080

Hon'yaku (Translation) Bank

<https://h-bank.nict.go.jp/>

"Hon'yaku (Translation) Bank" is a nationwide project launched to develop high precision automatic translation.



Advanced Language Information Forum (ALAGIN)

<https://www.alagin.jp/index-e.html>

A forum aiming to contribute to the development of universal communication by means including the progressive development and promotion of technologies which will deliver information processing and communication above and beyond language barriers.

Research Promotion Council of Keihanna Info-Communication Open Laboratory

<https://www.khn-openlab.jp/en/>

Aiming for the development of new technologies, developing human resources and creating new industries by promoting collaborative research and development between industry-academia-government, as well as utilizing the NICT Research Promotion of the Council Keihanna Info-Communication Open Laboratory, with the Kansai being instrumental in helping establish the country as a world leader in the field of ICT, and in turn aiming to contribute to the revitalization of the Kansai economy.

Universal Communication Research Institute

3-5 Hikaridai, Seika-cho, Soraku-gun, Kyoto 619-0289, Japan TEL : 0774-98-6300 FAX : 0774-98-6955

▶ Access by Train

From Hosono Stn. JR-H20 on the JR Gakken-Toshi Line, or Shin-Hosono Stn. B-21 on the Kintetsu Kyoto Line

■ Nara-Kotsu Bus

#36 for "Hikaridai Loop Line", #46 for "Hikaridai Sanchohome", or #56 bound for "Gakken Nara Tomigaoka Stn." and get off at "Hikaridai Sanchohome" stop. The bus ride will take about 15 minutes, and the building is across the road from the bus stop. Alternatively, get off the #58 or #59 bus at "Keihanna Plaza" and walk for six minutes.

From Gakken Nara Tomigaoka Stn. C-30 on the Kintetsu Keihanna Line

■ Nara-Kotsu Bus

#56 bound for "Hosono Stn." and get off at "Hikaridai Yonchohome" (bus stops in front of the building), or take #59 bound for "Hosono Stn." and get off at "Keihanna Plaza" and walk for six minutes. Either bus ride will take about 15 minutes.

▶ Access by Car

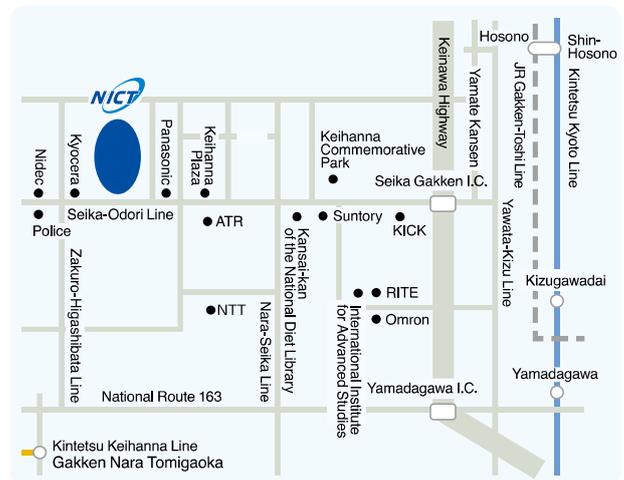
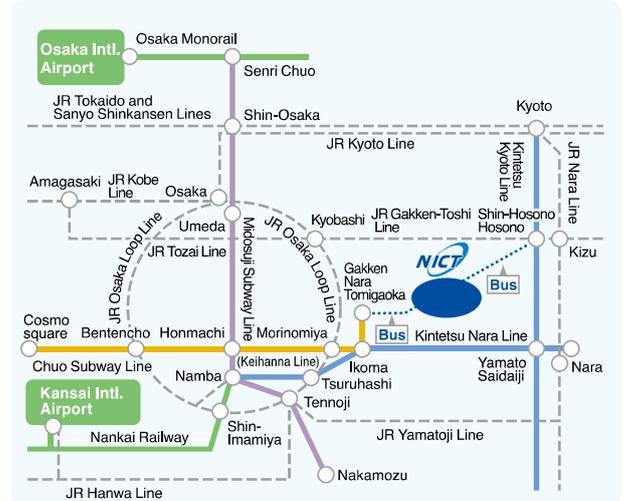
From Osaka Hanshin Expressway #13, Higashi-Osaka Route → Daini Hanna Road(E92) → Nakamachi Ramp → via Gakuenmae → via Tomigaoka

From Kyoto Hanshin Expressway #8, Kyoto Route → Daini Keihan Road(E89) → Shin-Meishin Expressway(E1A) → Keinawa Highway(E24) → Seika-Gakken I.C. → Seika-Odori Line

From Nara Narayama-Odori Road → Nara-Seika Line

▶ Access by Highway Bus

There are buses traveling directly to Keihanna Plaza from Kansai International Airport and Kyoto Station Hachijo Exit.



National Institute of Information and Communications Technology (NICT) Headquarters

4-2-1 Nukui-Kitamachi, Koganei, Tokyo 184-8795, Japan URL : <https://www.nict.go.jp/en/>

▶ Access by Train

From JR Kokubunji Stn. JC-16 *All buses take about 10 minutes.

■ Tachikawa Bus (North Exit)

Get off at "Jouhou-Tsuushin-Kenkyuu-Kikou-Mae." 2-minute walk from bus stop.

■ Ginga Tetsudo Bus (North Exit)

Bound for Kodaira Stn. South Exit. Get off at "Sarejio-dori." Bus stops in front of NICT.

■ Keio Bus (North Exit) Bay 1

Bound for Kodaira Danchi. Get off at "Jouhou-Tsuushin-Kenkyuu-Kikou-Mae." 2-minute walk from bus stop.

From JR Musashi-Koganei Stn. JC-15

■ Keio Bus (North Exit) Bay 5

Bound for Kodaira Danchi. Get off at "Jouhou-Tsuushin-Kenkyuu-Kikou-Mae" (approx. 15 minutes). 2-minute walk from bus stop.

From Kodaira Stn. SS-19 On Seibu Shinjuku Line

■ Ginga Tetsudo Bus (South Exit)

Bound for Kokubunji Station Entrance. Get off at "Sarejio-dori" (approx. 15 minutes). Bus stops in front of NICT.

