### KEIHANNA Area and NTT Keihanna Building

**Address:** 2-4, Hikaidai, Sakaecho, Saiwakun, Kyoto, Japan 619-0237

![Map of KEIHANNA Area and NTT Keihanna Building](image)

**By Train and Bus:**
- "Keikyushu" station on Keisei-Kyoto Line. (30 minutes from Kyoto by express bus.)
- "Keikyushu" station on Keisei-Express Line. (1 hour from Keikyushu Station)

**By Car:**
- 15 minutes from "Keikyushu" station on Keisei-Kyoto Line. (By car to the Shinjuku Station)
- 20 minutes from "Keikyushu" station on Keisei-Kyoto Line. (By car to the Shinjuku Station)
- 20 minutes from "Keikyushu" station on Keisei-Kyoto Line. (By car to the Shinjuku Station)

### ATSUGI Area NTT Atsugi R&D Center

**Address:** 3-1, Minato-cho, Atsugi-shi, Kanagawa, Japan 243-0198

![Map of ATSUGI Area NTT Atsugi R&D Center](image)

**By Train and Bus:**
- "Keikyushu" station on Keisei Line. (5 minutes from Shinjuku Station.)

**By Car:**
- 15 minutes from "Keikyushu" station on Keisei Line. (5 minutes from Shinjuku Station.)

---

[URL: http://www.ntt.jp](http://www.ntt.jp)  Tel: 0774.93.5020  Email: cs liaison@lab.ntt.jp
Building a new technical infrastructure that can connect humans to information

Since the invention of the telephone, which ushered in the age of communication, our daily lives have been migrating towards a new era in communication that encompasses a wide diversity of electronic equipment. There have also been significant changes in the quantity and quality of information handled by people and electronic equipment. Under these circumstances, it is necessary to reconsider the quality of communication established between humans, between humans and computers, and between computers. New theories and processing techniques are also needed to work with this information.

At the Communication Science Laboratories, we are tackling the computer science and human science aspects of this issue with a view to building a new technical infrastructure that can connect “humans” to “information” in broad terms. We aim to make academic contributions through the creation of new concepts and the discovery of new principles, and social contributions through technological innovation leading to new services. As a global leader in communication science, we are engaged in a broad range of research collaborations with major universities and research organizations not only in Japan but also in other countries.

Media Information Laboratory

We aim to implement functions that can identify and find people and objects by picking out sounds and voices from the vast amount of audio and video information that is obtained via microphones and cameras and made available by ubiquitous networks.

- Robust media search
  For media information such as video and images, we are developing a technique for analyzing and identifying media content at high speed that is unaffected by signal distortion or noise. With this robust media search (RMS) technique, we can support the storage and distribution of information and, as well, handle the media information explosion.

- Audio/voice/processing
  With the world over advanced speech enhancement and speech recognition technology at its core, we are implementing technology that uses audio information to help us understand the surrounding environment and a communication zone. With this technology, we will support new services that help people to communicate.

- Dynamic information processing
  In making active use of dispersed phenomena such as fuzzy chaos, we are implementing a high-speed random number generator and an information-theoretic secure encryption system. With these technologies, we will contribute to the implementation of safe and secure communications.

Innovative Communication Laboratory

We aim to construct computational principles for the creation of knowledge by establishing links between real-world information and the vast tide of language information in the world, and to create core technologies for the transformation of the information infrastructure of the future.

- Using statistical learning to interpret the real world
  An electronic communication terminal, sensor devices, and storage equipment have become more widespread, various types of data (text, video, audio, sensor data, etc) related to real-world situations will be generated in increasing quantities. To interpret these huge quantities of data, we will develop learning machines for perceptual learning. In extreme cases, it aims to yield advanced machine learning techniques based on machine learning, where sensors are used to obtain the status of the real world.

- Quantum information science
  By applying the principles of quantum mechanics, it will become possible to perform various types of information processing that are currently regarded as impossible. Through our research into quantum information science related to quantum computing and quantum cryptography, we aim to implement quantum-tocommunication techniques in the near future.

Human Information Science Laboratory

We are working on a systematic clarification of the perceptual, motive and emotional mechanisms of humans with regard to communication, and we are proposing design principles for the information and with people at an emotional level.

- Clarification of sensory-motor interactions
  We are clarifying the information processing mechanism that the brain uses to achieve sensitivity and skillful body actions in response to sensory information. Based on these findings, we will propose design principles for an interactive interface that can be used naturally and without discomfort by anyone.

- Clarification of subpersonal human interaction
  In interaction communication between people, it is thought that the transmission of emotions is supported by subtle information that the people themselves are unaware of. By clarifying this technology, we will explore the possibilities of enhanced communication by conveying feelings and nuances that cannot be put into words.

Moriya Research Laboratory

Our mission is to achieve the ultimate high-quality acoustic environment by straddling related fields.

- Speech/audio signal processing and encoding
  We are engaged in basic research on speech/audio signal processing and encoding aimed at high quality and a high level of realism. In the short term, we aim to develop a high-quality compression coding technology that is effective for new communication applications in 21 environments, and to have this technology adopted all over the world by submitting proposals for international standardization. In the long term, we will utilize hardware and component technologies and the research fruits of related fields such as human science and neuroscience to work towards the realization of new high-quality and highly functional audio processing systems.
Building a new technical infrastructure that can connect humans to information

Since the invention of the telephone, which ushered in the age of communication, our daily lives have been migrating towards a new era in communication that encompasses a wide diversity of electronic equipment. There have been significant changes in the quantity and quality of information handled by people and electronic equipment. Under these circumstances, it is necessary to reconsider the quality of communication established between humans, between humans and computers, and between computers. New theories and processing techniques are also needed to work with this information.

At the Communication Sciences Laboratory, we are tackling the computer science and human science aspects of this issue from a view of building a new technical infrastructure that can connect "humans" to "information" in broad terms. We aim to make academic contributions through the creation of new concepts and the discovery of new principles, and social contributions through technological innovation leading to new services. As a global leader in communication science, we are engaged in a broad range of research collaborations with major universities and research organizations not only in Japan but also in other countries.

Media Information Laboratory
We aim to implement functions that can identify and find people and objects by picking out sounds and voices from the vast amount of audio and video information that is obtained through microphones and cameras and made available by ubiquitous networks.

- Robust media search
  For media information such as videos and images, we are developing techniques for searching and identifying media content at high speed that is unaffected by signal distortion or noise. With this robust media search (SMS) technology, we can support the storage and retrieval of information and also handle the media information explosion.

- Audio/visual processing
  With the world's most advanced speech enhancement and speech recognition technology as its core, we are developing technology that can use audio information to help in understanding the surrounding environment and making use of the information.

- Dynamic information processing
  By making active use of diversified phenomenon such as audio, we are implementing a high-speed, random number generator and an information-theoretic secure encryption system. With these technologies, we will contribute to the implementation of safe and secure communications.

Innovative Communication Laboratory
We aim to construct computational principles for the creation of knowledge by establishing links between real-world information and the vast tide of language information in the world, and to create new technologies for the information infrastructure of the future.

- Using statistical learning to interpret the real world
  As electronic communication terminals, sensor devices, and storage equipment become more widespread, various types of data (text, video, audio, sensor data, etc.) related to real-world situations will be generated in increasing quantities. To interpret these huge quantities of high-dimensional data, we are working on machine learning algorithms for natural language processing, image processing, and sensor information processing, focusing on probabilistic and statistical learning.

- Quantum information science
  By applying the principles of quantum mechanics, it will become possible to perform diverse types of information processing that are currently regarded as impossible. Through research into quantum information science combining quantum computing and quantum cryptography, we aim to implement quantum communication technologies in the near future.

Information Security Laboratory
We are working on a systematic clarification of the perceptual, motive, and emotional mechanisms of communication, and we are proposing design principles for the information and communication technologies that can engage people at an emotional level.

- Clarification of visual, auditory and tactile sensory functions
  We are clarifying the information processing mechanisms of the brain that produce sensory information from the outside world. Our goal is to build a foundation for new sensory presentation techniques that are more realistic and natural for humans, and for techniques that support sensory functions that have been impaired due to aging or disability.

- Clarification of sensory-emotional interactions
  We are clarifying the mechanisms whereby a person's state of mind and body is changed by sensory information. Our findings will lead to benefits such as technology that can be used to treat post-traumatic stress and other emotional disorders.

Moriya Research Laboratory
Our mission is to achieve the ultimate high-quality acoustic environment by straddling related research fields.

- Speech/audio signal processing and encoding
  We are engaged in basic research on speech/audio signal processing and encoding aimed at high quality and a high level of realism. In the short term, we aim to develop a high-quality compression coding technology that is effective for new communication applications in IT environments, and to have this technology adopted all over the world by submitting proposals for international standards.

- Media information extraction
  We are developing a technique for automatically extracting information related to objects and events included in media information such as video, audio and images. This technique connects media information with symbolic information such as text and attributes, thereby bringing new value to vast quantities of media information.

- Communication environment
  We are researching technologies including conversation scope analysis using non-verbal information such as expressions and actions, conversation control strategies using semantic information, and a communication system that supports collaborative work between multiple locations while giving users the same "environment" as sharing the same room. We aim to create an interactive communication environment that can support the communication behavior of the near future.