

Performance Report

Muroran Institute of Technology



Muroran City in 2060
2019. 6
T. Hayashi

Muroran Institute of Technology

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国立大学法人

室蘭工業大学

MURORAN INSTITUTE OF TECHNOLOGY

Change the world The research and educational capacities of Muroran Institute of Technology.

Educational reform based on solid research capacities, from the Faculty of Engineering to the Faculty of Science and Technology

The institute, under the motto, "contributing to the community," is reforming its education and university keeping in mind how the solutions to issues in Hokkaido can lead to solutions to issues in Japan and the world. Starting from the 2019 academic year which marked the dawn of the new, Reiwa era, the institute is reforming its education to also nurture a wide range of science and engineering professionals who will continue to play an active role in their industries, taking advantage of the environment of Muroran, a manufacturing town rich in nature. In addition to an institute-wide enhancement of education in natural science and science and engineering that gets to the heart of matters and cultivates an inquisitive mind, the institute will promote information education unique to an institute of technology to nurture students who can understand and utilize the nature of ICT and AI and contribute to the creation of things and the creation of value.

The strength of this institute lies in its solid research capacities that underpin its educational capacities. As indicated by various rankings, the educational capacities of the institution is based on the solid, evidence-based research capacities of its professors and the activities of its more than 30,000 alumni in society which are the university's achievements and strengths.

Our passionate faculty members are experts in conveying to students the excitement of science and engineering that lurks between the lines of textbooks. The faculty and staff will work together with determination to develop human resources in science and engineering, conduct research that will lead to the creation of innovations, and help us to fulfill our role as a center for regional revitalization.

We would like to ask for the support and cooperation of all sectors.



President,
Muroran Institute of Technology
Yoshikazu Kuga

Muroran Tech's research and educational capacities are recognized worldwide

RESEARCH Ranked in THE World University Rankings for three consecutive years

The Times Higher Education World University Rankings 2021 ranked the institute at 1001+. Of the approximately 23,000 institutions of higher education in the world, our institute ranked in the top 6% and tied for 34th in Japan. This is the third consecutive year that the institute has been included in the rankings.



RESEARCH 1st & 2nd place in the research paper citation index ranking for field-specific rankings

In the Asahi Shimbun's "University Rankings," the institute was ranked first in the citation index for papers in the field of computer science for three consecutive years, 2019, 2020, and 2021.

It ranked second in the field of engineering. The institute is recognized for the high degree of papers that have a significant impact on research in the fields of computer science and engineering.

Citation Index by Field Computer Science (Asahi Shimbun "University Rankings 2021")

Rank	Name of university	Citation index
1	Muroran Institute of Technology	224.0
2	The University of Aizu	153.2
	Omitted	
8	Tokyo University of Agriculture and Technology	122.2
9	Tohoku University	121.1
10	University of Tsukuba	120.7

Citation index by field Engineering (Asahi Shimbun "University Rankings 2021")

Rank	Name of university	Citation index
1	The University of Aizu	130.4
2	Muroran Institute of Technology	127.3
	Omitted	
8	Tohoku University	113.4
9	Hokkaido University	112.2
10	Kyoto University	112.0

EDUCATION Ranked 3rd among universities in Hokkaido for "Educational Achievement" in THE World University Rankings Japan 2020

The "World University Rankings Japan 2020" comprehensively shows the "educational capacity" of universities based on internal and external data and academic reputation surveys. This institute ranked third among universities in Hokkaido for "educational achievement," which indicates whether graduates are active.



Muroran Tech Faculty Members Recognized at Home and Abroad

First Japanese woman to be selected as one of the world's 10 most outstanding young female researchers

Associate Professor Kaoru Ohta (MEXT Excellent Young Researcher) is the first Japanese woman to be selected as one of the N²Women: Rising Stars in Computer Networking and Communications 2020, which selects 10 outstanding young female researchers in recognition of their outstanding achievements to date. N²Women is an organization of researchers in the field of information networking and communications and is sponsored by the IEEE, ACM, and other societies.



Selected by the Institute of Physics Publishing

Assistant Professor Shintetsu Kanazawa was selected as an Outstanding Reviewer for Superconductor Science and Technology for 2019 by the Institute of Physics Publishing (IOP). The IOP publishes a number of highly influential scholarly journals. The award is given in recognition of the contribution a recipient makes to maintaining the high quality of its scientific journals due to their high level of expertise in the field of superconductivity applications.



Awarded the Hokkaido Science and Technology Incentive Award

Professor Mianxiong Dong was awarded the Hokkaido Science and Technology Incentive Award in 2019. The Hokkaido Science and Technology Incentive Award is awarded to young researchers who have made outstanding inventions and research in science and technology that are expected to contribute to the development of Hokkaido, and who are expected to play an active role in their field in the future. This is the fourth consecutive year that someone at our institution has won this award.

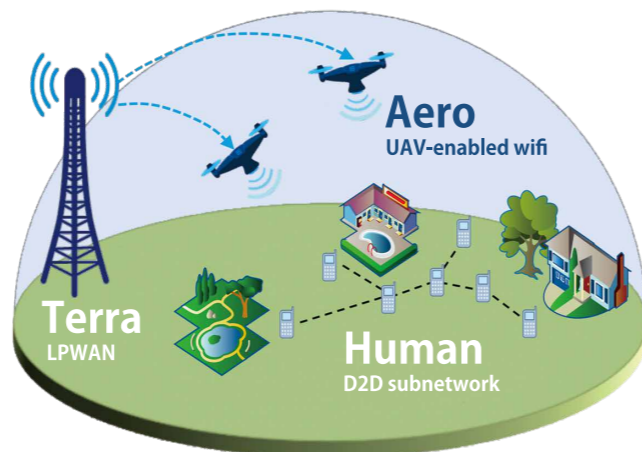


Aero, Terra, Human:

A Trinitarian Information Service System for Disaster Response

Our laboratory incorporates drones, which are widely used for a wide range of purposes, such as aerial photography and surveying, into disaster-resistant networks. The aim is to build a system that ensures communication both inside and outside the affected area even if mobile-phone base stations are damaged by an earthquake or other natural disasters. Even in a situation where it is difficult to confirm the safety of the victims, 1) mobile terminals used by people inside the affected area are networked with D2D* and connected to 2) drones flying inside the area, allowing people to communicate with external base stations via drones. We named the project the “heaven, earth, and people network” with “1)” representing people, “2)” heaven, and “3)” earth.

Currently, the focus is on 2), automated drone flights using AI*. We are developing an algorithm that can autonomously perform a series of actions to search victims while identifying the surrounding environment during flight by analyzing the footage of the on-board camera in real time. It is extremely difficult to achieve advanced processing in an environment that demands lighter drones, but it is also where researchers can demonstrate their skills. We plan to spend several years developing the system so that it can be put to practical use.



Aero, Terra, Human : Next Generation Disaster Response Platform



When a drone automatically recognizes people on the fly, it approaches to the people so that they can send SOS messages via the drone to the outside of a disaster area



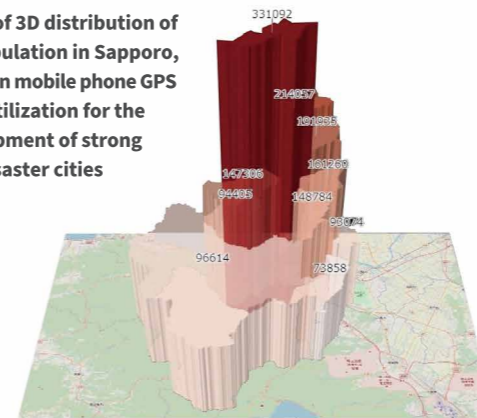
Professor
DONG Mianxiong



Associate Professor
OTA Kaoru

Visualizing current states of cities and traffic via big data and pursuing a richer and happier future for the City

Image of 3D distribution of the population in Sapporo, based on mobile phone GPS data. Utilization for the development of strong anti-disaster cities

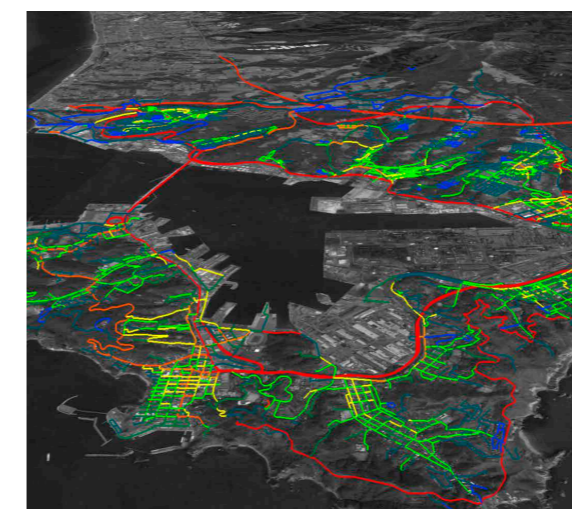


Our researchers are attempting to create sustainable cities and transportation systems by using a variety of statistical data. Conventionally, only analog methods such as a person trip survey have been used to understand the pattern of daily behavior pattern, using questionnaires. However, aside from this method, big data collected from devices such as smartphones, GPS, and ETC 2.0 have currently enabled us to analyze the movements of people and cars, with a high level of accuracy.

We seek optimization after scanning a city and understanding its current situation. Specifically, we address issues through various ideas such as the introduction of new transportation modes, including automated driving buses and the relocation of public facilities.

Currently, there is decline in the population of Hokkaido, which is 10 years ahead of the national average in Japan. This marks a great significance to propose new methods of urban development in this area. Shall we create a richer and happier city together?

Problem solving through a combination of various ideas such as introduction of new transportation system and relocation of public facilities



MAP:Google Earth



Associate Professor
ARIMURA Mikiharu

Elucidating the relationship between diet and dementia for dementia prevention

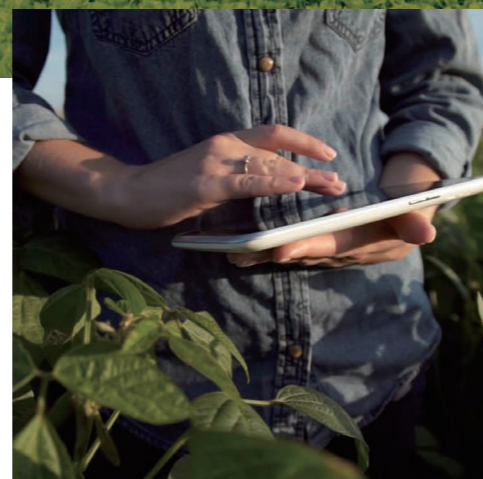
-Big data acquisition and analysis is expected to reveal the relationship between diet and dementia-

Protein aggregation is involved in the pathogenesis of neurodegenerative disorders such as Alzheimer's disease. Approximately ten years ago, we reported real-time imaging of the protein aggregation using quantum dots. Thereafter, we developed a novel high-throughput screening system for aggregation inhibitors using this imaging method. Subsequently, we succeeded in automating the screening system by using robots and image analysis tools, and 128 heterogeneous samples could simultaneously be evaluated more rapidly and accurately. Thus far, we have evaluated more than 1000 types of natural products containing foodstuffs by using this system. We have found that many foodstuffs exhibit protein aggregation inhibitory activity, although their activities are widely distributed. In the future, we would like to evaluate almost all of the foodstuffs eaten by human beings and create a database of the activities in these foodstuffs. We believe that we can reveal the relationship between diet and dementia by analyzing the big data integrated with our data, nutritional data, cohort data on diet and dementia risk, etc. If the relationship between diet and dementia is clarified, each and every person will be able to prevent dementia while enjoying their favorite meals.



Visualization and quantification of the ability of foodstuffs to prevent dementia.

Development of cultivation systems to increase this ability of foodstuffs.



Construction and utilization of a food database.

Associate Professor
TOKURAKU Kiyotaka

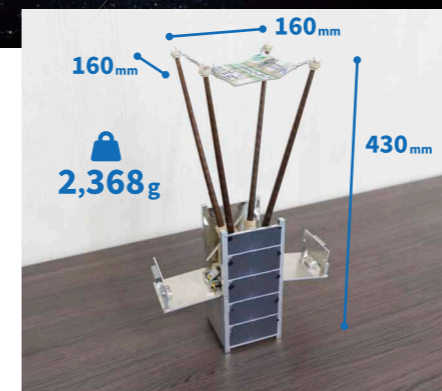
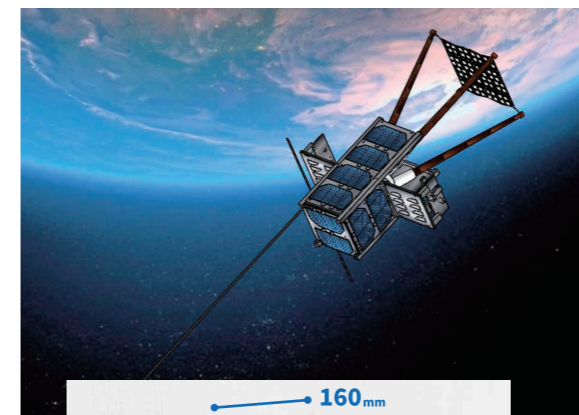
Muroran Tech's Research Capacity Reaches into Space!

From Hokkaido to the realization of a world first



Rocket to be equipped with a turbopump under joint development with Interstellar Technologies Inc.

Nano-satellite called "HIROGARI" jointly developed with Osaka Prefecture University



Full-scale "HIROGARI" model

We are conducting joint research with Interstellar Technologies Inc., headquartered in Taiki-cho, Japan, who has successfully launched the sounding rocket "MOMO" in May 2019.

Development on a rocket that can inject satellites into orbit, which is the next goal, has been greatly supported by the research at Muroran Tech.

The systematic study on turbopumps for rockets, a type of high-speed turbomachinery, is being conducted only at the Muroran Institute of Technology in Japan.

We have also jointly developed a nano-satellite called "HIROGARI" with Osaka Prefecture University and are working on a space demonstration of technology that will fold Miura fold panels into a small size in a satellite, launch it, and then expand it in space.

Beyond the achievement of this nano-satellite experiment is the realization of space solar power systems, a clean and inexhaustible energy resource.

We will explore new possibilities for utilizing space, and our research will overwhelmingly accelerate various developments and realize businesses that can compete internationally. This is the kind of dream-inspiring research that will bring space closer to us.

Professor
UCHIUMI Masaharu
Director, Aerospace Plane Research Center