

03 Education

Omics Analysis: A unique program

Utilizing Big Data in Medicine

With the advent of next-generation sequencers and mass spectrometers, technological advances in life medical sciences are progressing at an amazing rate. In addition to conventional data on medical history, drug administration, and biopsy tests, a broad range of big data can now be accumulated. This includes omics information such as individual genome information on diverse molecular levels, CT and MRI imaging data, and records of daily patient activities from wearable devices. By utilizing this data, we may now discover cellular and molecular mechanisms of disease processes, realize tailor-made medicine for individual patients, and optimize drug development research.

However, to derive new value from the data, or to integrate the various forms of medical data for use in determining an appropriate treatment plan, data uncertainty must be taken into account, and the information must be summarized, analyzed, and interpreted appropriately. Unfortunately, data science education in Japan's medical fields had been limited to basic statistical literacy clinical statistics and biological statistics, and there were no ways for students to learn data analysis. Our division was created to resolve this issue. We have a "unique program" where in an "Omics Analysis Program" we teach the ability to take a multifaceted approach to data analysis.

Becoming Research Physicians with Data Science Literacy

Lectures focus on life medical sciences and data science, with crossovers between these two very different areas, offering leading-edge content rare among Japan's medical educational institutions. In collaboration with the Graduate School of Information Science, students are provided with an opportunity to

learn programming, now an essential skill, starting from the basics. They are also given concrete examples and opportunities to hear of actual cases and acquire cutting-edge knowledge from front-line researchers who are invited from

outside universities and research institutions. In third-year basic medicine seminars, students are able to learn a program on using imaging data to diagnose cancer, providing a multitude of opportunities to learn about data science in various ways.

Of course, traditional approaches to research whereby a hypothesis is proposed and verified by repeating experiments many times to gain both knowledge and experience are important. In the future, however, we hope students also acquire omics analysis approaches, a style of thinking known as data-driven science where hypotheses are structured based on available data. This is because in Japan, few have expertise in both life medical sciences and data analysis, and so acquiring data science literacy will prove to be a strength in their futures. Even better, collaborative research requiring an integration of diverse fields will provide opportunities for communication among researchers and having a common ground will facilitate such endeavors. In the US and Europe, many researchers have multiple specialties in vastly different fields such as physics and medicine. For our graduates to become truly effective as international researchers, it is undoubtedly essential that they possess knowledge in a broad range of fields. Many of the students in this graduate program are already mathematically adept. By continuing to hone those talents, our goal is to contribute to the education of research physicians and clinicians who are also data science literate.



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Nurturing data analysis abilities

Opening paths to a new era

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