Realization of Common Platform Technology, Facilities, and Equipment that creates Innovative Knowledge and Products

Four-Dimensional Topological Data Analysis for Future Medical Care

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Summary : We shall establish a new methodology of data analysis, called "Four-dimensional topological data analysis (4d-TDA)", tracking the time evolution of geometric structures in various data with mathematically rigorously. In particular, applying 4d-TDA to issues in the fields of medicine and drug development, we shall contribute to a realization of a future society providing high-quality medical care to everyone at a lower cost.

4d-TDA consists of topological flow data analysis (TFDA) and persistent homology (PH) combined with data-driven mathematical modeling.

Our research objectives are:

- Creating a new classification for cardiovascular diseases based on blood flow structures in the heart; developing a software applicable to clinical diagnosis with echocardiography and MRI.
- Designing conditions for effective clinical trials, which reduces the time and the number of participants, for antiviral drugs against infectious disease such as COVID-19 by predicting dynamics of biomarkers.
- Establishing a common platform that provides mathematical solutions to many problems in human society.