ASHBi SEMINAR

Deciphering Biological Principles by Machine Learning and Mathematical Modeling

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Date: Wednesday, 10th February 2021
Time: 3:00PM–4:00PM
Venue: Zoom Online Meeting

Understanding biological principles is the ultimate goal of life science.Recent technological advancements in quantitative and comprehensive measurements primarily bioimaging and sequencing provide dynamic and detailed information on complex biological phenomena more than ever. To decipher such intricate data, informatics and mathematics are now indispensable. In this talk, I would like to show two examples how we can use machine learning and mathematics for this purpose.

In the first part, after touching on a general overview how machine learning has been and should be used in life science, I will show an application of deep neural network to unveil the regulatory laws in size regulation of microbes. This example demonstrates how machine learning can assist us in searching for rules and relations among multiple observables and their combinations.

In the second part, by using bacterial chemotaxis as an example, I want to share the idea that finding rules to reproduce observed phenomena is not the goal for understanding biological principles. A set of biological molecules, reactions and their dynamical rules implements a certain biological functions, and mathematics is necessary to grasp the functional aspects of dynamical rules. I will show how we can use information theory to clarify the functional optimality of the biochemical network for chemotaxis.

Finally, I may introduce our new attempts if time remains.

Organizer: Prof Yasuaki Hiraoka

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