

## Day 1 (Poster B)

Shuta Kikuchi, Keio University

Title: Dynamical process on the bit-width-reduced Ising model and tuned method in simulated annealing

Abstract:

The bit-width of the interaction and external magnetic field coefficients in actual Ising machines is limited. Oku et al. proposed a new bit-width reduction method that can theoretically obtain the ground state of the original Ising model by adding auxiliary spins. However, the dynamical process to the ground state in the bit-width-reduced Ising model is unknown. Thus, we performed simulated annealing (SA) with the same temperature schedule and parameters to compare the dynamical process on the original Ising model and the bit-width-reduced Ising model. As a result, the solution accuracy of bit-width-reduced Ising model decreased. Here, we study the dynamical process of the bit-width-reduced Ising model and found two reasons for the decrease of solution accuracy: 1) the change in the effective temperature, and 2) the slow relaxation caused by the entropy effect of the auxiliary spins. Then, from the above discussion, we performed SA with tuned temperature schedule and inherent parameters, and the results showed that the solution accuracy was improved. In this presentation, we will show the detailed mechanism and propose a method to adjust conditions in simulated-annealing based Ising machines.

The work was done in collaboration with Nozomu Togawa (Waseda University) and Shu Tanaka (Keio University).