December 6, 2023

所属機関

# 目次

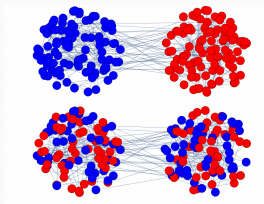# セクション１

# Introduction: The community detection from the perspective of physics

Approach to the community detection problem

- Min Bisection
  - Optimizing the objective function (e.g. modularity) for a given network
  - Maximizing is NP-hard but it performs well in real-world networks
  - However, model sometimes overfits to the data



**Figure 1:** Partition of a random graph

- The top partition has 38 edges crossing while the bottom one has 39.
- For optimzer, the top one is "optimal" but actually there is no community.

## Introduction: The community detection from the perspective of physics

- In computer science, we think worst-case instances for evaluating algorithms.
- However, the real world networks are not worst-case instances.
- In physics, we think typical instances for evaluating models. (e.g. thermodynamics)
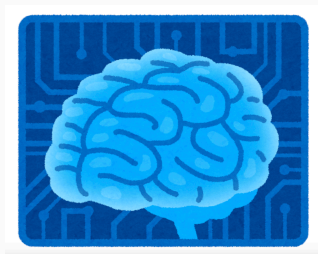  $\Rightarrow$ It is natural to use physical perspective to evaluate the community detection models.

**Figure 2:** 図

- 文字
- 表