

## **Roles of singular value decomposition in interdisciplinary physics research**

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### **Abstract:**

Interdisciplinary physics researches based on information-theory-oriented concepts attract much attention for recent decades. These researches facilitate development of tensor network methods for strongly correlated systems, better understanding of the holography principle (quantum-classical correspondence) and deep learning, and so on. A core factor of this trend is due to singular value decomposition (SVD). This is quite natural, since SVD is a typical method for principle component analysis. The extraction algorithm of important data is essential for the abovementioned problems. However, full understanding of rich functionality of SVD is still far from an enough level in a viewpoint of theoretical physics.

In this seminar talk, I will present summary of our previous works [1-7] and recent results. We focus on the Monte Carlo snapshots of the classical 2D Ising model, and apply SVD to the snapshots. We discuss how we can pick up correlation length and critical exponents of the model. Furthermore, SVD creates a curved space in which a set of data with different length scales is encoded. This mechanism would be a key to understand the holography principle.

Open issues and future directions of information physics are presented.

### **References:**

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