

# Statistical Physics of Information and Its Applications



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Job Title	Professor	Degree	Ph. D.
Academic Society and Association	Physical Society of Japan		
Research Keywords	Statistical Physics, Information Science, Big Data Analysis		
Technical Fields and Topics possible for collaboration	<ul style="list-style-type: none"> <li>Environmental Technology</li> <li>Image Processing</li> <li>Statistical Mechanics of Spin Systems</li> </ul>		

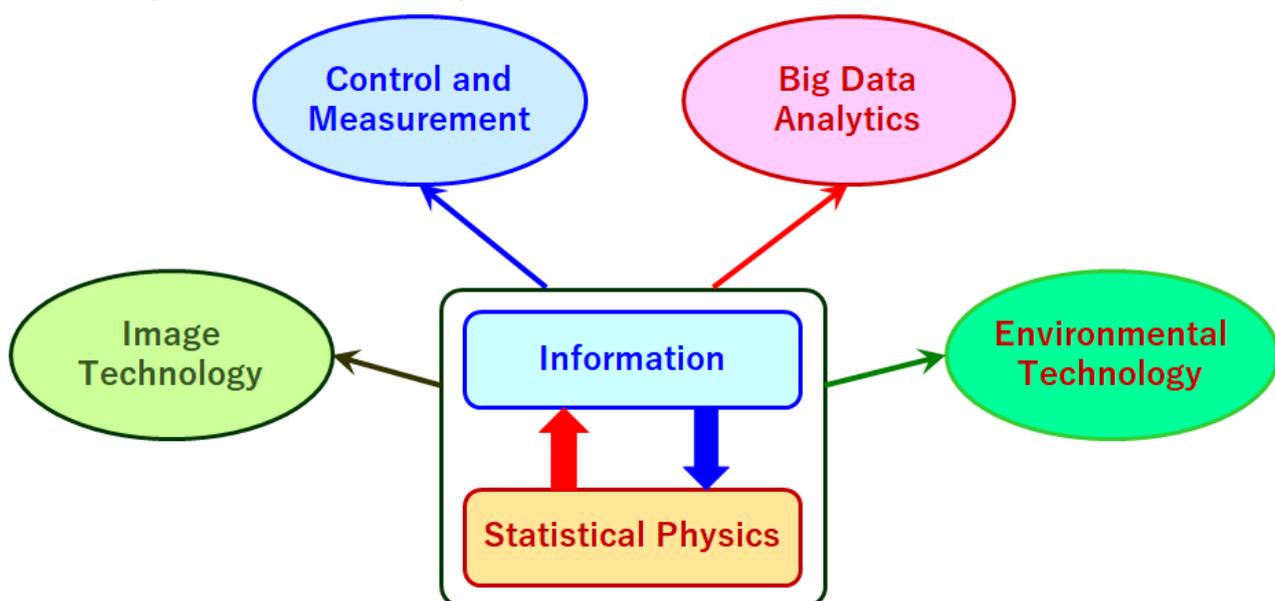
## Details of the Research Theme

Application of information science and technology using large-scale data to various fields.  
 Application of statistical mechanics to science, engineering and technology.

Since the development of computer technology, researchers have utilized large-scale data in various fields, such as machine learning, decision making, data extraction from large-scale data and so on. Especially, in this field, we have investigated time-series analysis using the principal component analysis for large-scale data, such as the meteorological data, power consumption of the air conditioner and so on.

Also, statistical physics has developed for clarifying macroscopic properties of many-body systems by making use of information on microscopic elements, such as magnetic spin systems. In last three and four decades, based on the analogy between Bayesian inference and statistical physics, researchers have applied statistical mechanics to information science and technology in various areas. In this field, we have first studied image restoration and error-correcting codes based on statistical mechanics of the Ising model.

In recent years, as shown in Fig. 1, we have investigated various problems using large-scale data due to the Big Data analysis and application of statistical mechanics to information science and technology in various areas, such as image processing, control and measurement, environmental technology. For instance we have investigated inverse halftoning in print technology, image reconstruction from JPEG compressed image, phase unwrapping in the SAR interferometry, environmental prediction in small-scale systems and so on.



**Fig. 1 Statistical mechanics of information and its applications**