

# The 19th Takagi Lectures

July 8 (Sat)–9 (Sun), 2017

Lecture Hall (Room No. 420)

Research Institute for Mathematical Sciences  
Kyoto University, Kyoto, Japan

## ABSTRACT

### **Mark Braverman:**

#### *Information Complexity and Applications*

This paper is a lecture note accompanying the 19th Takagi Lectures in July 2017 at Kyoto University.

We give a high-level overview of the information complexity theory and its connections to communication complexity. We then discuss some fundamental properties of information complexity, and applications to direct sum theorems and to exact communication bounds. We conclude with some open questions and directions.

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### **Hugo Duminil-Copin:**

#### *Sharp Threshold Phenomena in Statistical Physics*

This text describes the content of the Takagi Lectures given by the author in Kyoto in 2017. The lectures present some aspects of the theory of sharp thresholds for boolean functions and its application to the study of phase transitions in statistical physics.

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### **Roger E. Howe:**

#### *Duality and Rank in Representation Theory*

The notion of rank of a representation, introduced in the 1980s for unitary representations of classical groups over local fields, can be adapted to apply to admissible, non-unitary representations, and also to finite fields. In this context, it yields new insights into representation theory for classical groups, including natural correspondences related to, but more regular than the much-studied local theta correspondence.