

Toward a new method for constructing expander graphs and their applications 2

ABSTRACTS

September 4th (Mon.)

- Speaker : Takashi Satomi (The University of Tokyo)

Title : Expansion of Cayley graphs and Young's convolution inequality

Since the adjoint operator of a Cayley graph is a convolution operator, it is known that the (spectral) expansion of the graph is related to the evaluation of the L^p norm of a convolution from above. In this talk, we see the optimal constant (the optimal ratio of both sides) of Young's convolution inequality, which is a basic tool for evaluating the L^p norm.

- Speaker : Jun Muramatsu (NTT Corporation.)

Title : Error Correcting Codes with Sparse Graph Structure

This presentation explains an error correcting code with sparse graph structure called Low Density Parity Check (LDPC) codes. First, it will be explained what kind of principle the error correcting code (linear code) is realized, and what properties should be satisfied for the error correcting code that achieves the theoretical limit. Finally, a random construction method for sparse graph structures (LDPC matrices) with such properties is introduced.

September 5th (Tue.)

- Speaker : Cid Reyes Bustos (NTT Corporation.)

Title : Expansion for certain families of non-regular graphs

For practical and theoretical applications, many times it is necessary to go beyond regular graphs. However, in the fully general case the lack of symmetries and structure makes the development of the theory difficult. In this talk we introduce certain multi-regular generalizations of Cayley graphs and give some of their properties. In particular, the spectral properties, with partial analogs to Cayley graphs, allow us to consider the expansion for these families of graphs.

- Speaker : Jun Tarui (The University of Electro-Communications)

Title : Expanders and Computational Complexity Theory

I will talk about diverse applications of expanders in computational complexity theory by touching upon (hopefully most of) the following topics: saving the number of random bits in randomized algorithms expander mixing lemma as a toy example of fooling certain computations randomness extractor gap amplification using expanders in Dinur's alternative proof of PCP theorem high-dimensional expanders (HDX) and locally testable codes resolution of rapidly mixing conjecture of matroid basis exchange by HDX.

- Speaker : Yuji Suga (Internet Initiative Japan Inc.)

Title : Association Schemes Found in Card-Based Cryptography

Card-based cryptography is a technique for implementing cryptographic protocols such as secret computation using physical cards. In this presentation, we will deal with non-commitment schemes that use mainly bundles of cards called up-and-down cards, instead of the two-color cards used in the standard model. We introduce card-based protocols in which association schemes of ranks 4, 6, 8, and 12 appear, and show several open problems.

- Speaker : Semin Oh (Pusan National University)

Title : Finding Graphs with Neural Networks

The interest of our research is to find graphs with specific properties. In this presentation, the method will be introduced using the graph spectrum to find certain integral graphs, and methods will be introduced, which are reinforcement learning and Graph Neural Networks. These use Neural Networks in general and consider more general graph structure.