**THE CHINESE UNIVERSITY OF HONG KONG**
Department of Information Engineering
*Seminar*

# Information Theoretic Constraints Breed New Combinatorial Structures: Entropy Functions on Two-Dimensional Faces of Polymatroidal Region of Degree Four

**By**
**Prof. Qi Chen**
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Date    :  **2 September 2024 (Monday)**
Time   :  **2:00pm – 3:00pm**
Venue  :  **Rm 833, Ho Sin Hang Engineering Building, CUHK**

*Abstract*

Characterization of entropy functions is of fundamental importance in information theory. By imposing constraints on their Shannon outer bound, i.e., the polymatroidal region, one obtains the faces of the region and entropy functions on them with special structures. In this talk, we introduce a system of entropy function characterization from the perspective of faces of the polymatroidal region, which covers the traditional inequality characterization. We enumerated all 59 types of 2-dimensional faces of $\Gamma_4$ by an algorithm, fully characterize entropy functions on 57 types of them, and partially characterize the remaining 2 types. For some of the faces, we adopt the graph-coloring approach to characterize the entropy functions on them, and for the others, we introduce some new combinatorial design structures. These structures are generalizations of variable-strength orthogonal which are utilized to characterize matroidal entropy functions, and they are interesting themselves for combinatorial theorists. This work is collaborated with my master student Shaocheng Liu, and Prof. Minquan Cheng from Guangxi Normal University.

*Biography*

Qi Chen received his PhD degree at Information Engineering Department, The Chinese University of Hong Kong in 2014. From 2014 to 2017, He was a post-doctoral fellow at Institute of Network Coding and Information Engineering Department, The Chinese University of Hong Kong. From Sept. 2015 to Jan. 2016, he was also a postdoc at ECE department, Drexel University. In 2018, he joined State Key Laboratory of Integrated Services Networks and School of Telecommunication Engineering, Xidian University, Xi'an, China, where he is now an associate professor. His research interests include information theory and related areas, in particular, the characterization of the entropy region.

**\*\* ALL ARE WELCOME \*\***

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