

## COMPUTER SCIENCE COLLOQUIUM

Department of Computer Science  
City University of Hong Kong

### Refinement of Two Fundamental Tools in Information Theory

**Dr HO Siu Wai**  
**Research Fellow**  
**Institute for Telecommunications Research**  
**University of South Australia, Adelaide**  
**Australia**

**Date :**

28 October 2009 (Wednesday)

**Time :**

3:00pm - 4:00pm (Refreshment will be served at 2:45pm)

**Venue :**

CS Seminar Room, Room Y6405, 6th Floor, Yellow Zone, Academic Building, City University of Hong Kong, Tat Chee Avenue, Kowloon Tong

#### Abstract

In Shannon's original paper and textbooks in information theory, the entropy of a discrete random variable is assumed or shown to be a continuous function. However, we found that all Shannon's information measures including entropy and mutual information are discontinuous in the general case that random variables are taking values in possibly countable infinite alphabets. This fundamental property explains why strong typicality and Fano's inequality can only be applied on finite alphabets. Note that strong typicality and Fano's inequality have wide applications in information theory so it is very important to generalize them.

In this talk, details about the discontinuity of all Shannon's information measures will be given. We will show how these results lead to a new definition of typicality and an inequality tighter than Fano's inequality. The applications in network coding and information theoretic security will be discussed.

#### Biography

Dr. Siu-Wai Ho is a research fellow in the Institute for Telecommunications Research, University of South Australia, Adelaide SA 5095, Australia. He received the B.Eng., M.Phil, and Ph.D. degrees in Information Engineering from The Chinese University of Hong Kong, Hong Kong, in 2000, 2003, and 2006, respectively. During 2006-2008, he was a Postdoctoral Research Fellow in the Department of Electrical Engineering, Princeton University, Princeton, NJ. His research interests are in Shannon theory, data communications and recording systems, and information theoretic security. Dr. Ho was a recipient of the Croucher Foundation Fellowship for 2006/2008 and the 2008 Young Scientist Award from the Hong Kong Institution of Science.

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All are welcome!

*In case of questions, please contact Dr TAN Chee Wei at Tel: 3442 2051, E-mail: [cheewtan@cityu.edu.hk](mailto:cheewtan@cityu.edu.hk),  
or visit the CS Departmental Seminar Web at <http://www.cs.cityu.edu.hk/>.*