NCTS
National Center for Theoretical Sciences

Interdisciplinary Distinguished Lectures

Date May 9 (Fri.) 2:00-4:30

Venue R515, Cosmology Bldg., NTU

Aim & Scope

The NCTS Interdisciplinary Distinguished Lecture series aims to introduce important research directions in sciences to the Taiwan mathematical community. And at the same time create a platform that people with different backgrounds can meet, discuss and develop interdisciplinary collaborations. Each Interdisciplinary Distinguished Lecture is designed to be a half day activity with lectures, discussions and a close up.

We are very happy to have Professor Bob Li give the NCTS Interdisciplinary Distinguished Lecture. Li started his career in Mathematics. He is an alumnus of NTU (1970) and Berkeley (1974), and taught at MIT and UI Chicago, all in mathematics. He gradually switched his directions after moving to Bell Lab. in 1979. His seminal work on linear network coding has changed the landscape of the information technology. He is an IEEE Fellow, a member of National Academy of Artificial Intelligence and a foreign member of Serbian National Academy of Sciences. Li considers his works as building connections between mathematics and technology.

Organizers

Yng-Ing Lee
National Taiwan University

Tai-Chia Lin
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Contact

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Invited Speaker

Prof. Bob Li

Distinguished University Professor,
University of Electronic S&T of China

Agenda

1:30-2:00	Registration
2:00-3:00	Lecture (1hr)
3:00-3:30	Q&A / Informal Discussion
3:30-4:00	Tea Break
4:00-4:30	Conclusion

Title

A Dialog Between Algebra and Engineering

Abstract

Once a mathematical subject is widely applied to engineering, it is often referred to as "engineering mathematics," that is, the intersection between the two disciplines. In algebra, such subjects are exemplified by linear algebra. Meanwhile, the classical coding theory is built upon Galois theory. Diverse engineering applications of Fermat's little theorem are in coding, encryption, network coding, etc.

This presentation is in the form of two contiguous series of algebraic concepts in engineering. The first series revolves around *network coding theory*. Explicit topics include "changing faces of *the Butterfly network*," network encryption/decryption, fast division routines, convolutional network coding, linear algebra over a PID, and local ring.

The second series consists of examples of hardware computation algorithms, multistage switching networks, sorting/routing/multicast networks, Boolean algebra, lattice, and cut-through coding. The examples together provide a taste of *algebraic switching theory*. Mathematics being the foundation of many engineering fields, occasionally engineering knowledge feedbacks to mathematics. For instance, *cut-through codability of lattice* is an algebraic concept derived from engineering practice.