

8th Singapore Mathematics Symposium

Date: 29 September, 2017 (Friday)

Venue: Nanyang Technological University, School of Physical and Mathematical Sciences LT4 ([Map](#))

Time: 1pm – 5:30pm

Schedule:

1:00 – 1:10: Welcome by Victor Tan, SMS president

1:10 – 2:00: Prof Van Vu (NUS Math): Random matrices: recent results and new questions

2:05 – 2:55: Prof Dong Fengming (NTU NIE): Research triggered by 4CC

2:55 – 3:25: Tea break

3:25 – 4:15: Prof Yap Von Bing (NUS DSAP): Some Musings on Probability

4:20 – 5:10: Prof Thomas Peyrin (NTU SPMS): Lightweight Cryptography

5:15 – 5:30: Poster Prize Presentation and Closing Remarks

Organizing Committee: Chan Song Heng (NTU SPMS) (Chair), Chan Hock Peng (NUS DSAP), and Gan Wee Teck (NUS Math).

Title and Abstract:

(1) Speaker: Prof. Van Vu (NUS Department of Mathematics)

Title: Random matrices: recent results and new questions

Abstract: Random matrix theory has witnessed significant progresses in the last 15 years. We are going to survey several important results and discuss open questions, which, only 10 years ago, seem to be totally out of reached.

(2) Speaker: Prof. Dong Fengming (NTU NIE Mathematics and Mathematics Education)

Title: Research triggered by 4CC

Abstract: The four-color conjecture (i.e., every map can be colored by at most four colors such that adjacent counties receive different colors) was proposed by Francis Guthrie from England in 1852. This conjecture was first proved by Kenneth Appel and Wolfgang Haken at the University of Illinois in 1976. They constructed a computer-assisted proof for this conjecture. However, because part of the proof consisted of an exhaustive analysis of many discrete cases by a computer, some mathematicians do not accept it. In 1997, Neil Robertson, Daniel P. Sanders, Paul Seymour and Robin Thomas found a similar but more efficient proof because it reduced the complexity of the problem and required checking only 633 reducible configurations when compared to the 1476 reducible configurations in Appel and Haken's proof. Although the conjecture is considered proven, more than a century of investigation of the four-color conjecture (by several famous mathematicians, using various methods and approaches) has resulted in many fruitful studies of new problems. In this talk I will introduce some lines of research which were triggered by the study of the four-color conjecture.

(3) Speaker: Prof. Yap Von Bing (NUS Department of Statistic and Applied Probability)

Title: Some Musings on Probability

Abstract: The application of probability theory to empirical problems is peculiar, mathematically speaking. It seems related to a definition of randomness which stipulates infinitely many observations. These ideas will be illustrated with examples from measurement theory, hypothesis test and epidemiology. If time permits, the extent to which mathematics is empirical will be discussed.

(4) Speaker: Prof. Thomas Peyrin (NTU, School of Physical and Mathematical Sciences)

Title: Lightweight Cryptography

Abstract: In this talk, we will review the current state of the art of lightweight cryptography, a recent trend in symmetric-key cryptography design that aims at providing secure algorithms on very constrained devices such as RFID tags. After a short introduction to cryptographic primitives design, we will first discuss the problems faced by the research community to come up with such specific lightweight algorithms and why previous solutions are not working. Then, we will explain the current solutions that have emerged and identify the questions that remained open.