

# Joint CQSE & CASTS Seminar

「Dec. 18, 2020 (Friday)」

- Time : 14:30~15:30
- Place : Rm104, New Physics Building
- Speaker: **Prof. Jie-Hong (Roland) Jiang**  
Dept. of Electrical Engineering, NTU  
國立臺灣大學電機工程學系
- Title : **Bit-Slicing the Hilbert Space:  
Scaling Up Accurate Quantum  
Circuit Simulation to a New Level**

▲ The seminar is also open to non-NTU members; hence all participants must wear a mask. (Following Fall and Winter Precautionary Measures)

\*\*Sponsored by Center for Quantum Science and Engineering (CQSE) 量子科學與工程研究中心  
and Center for Advanced Study in Theoretical Sciences (CASTS) 理論科學高等研究中心, NTU  
\*\*Course: 109-1 (Phys8146) Applications of Quantum Computation

# Joint CQSE and CASTS Seminar

2020

December 18, Friday

TIME Dec. 18, 2020, 2:30~3:30pm  
TITLE Bit-Slicing the Hilbert Space: Scaling Up Accurate Quantum Circuit Simulation to a New Level  
SPEAKER Prof. Jie-Hong Roland Jiang  
Department of Electrical Engineering, NTU  
PLACE Rm104, Chin-Pao Yang Lecture Hall,  
CCMS & New Physics Building, NTU

## Abstract:

Quantum computing is greatly advanced in recent years and is expected to transform the computation paradigm in the near future. Quantum circuit simulation plays a key role in the toolchain for the development of quantum hardware and software systems. However, due to the enormous Hilbert space of quantum states, simulating quantum circuits with classical computers is extremely challenging despite notable efforts have been made. In this work, we enhance quantum circuit simulation in two dimensions: accuracy and scalability. The former is achieved by using an algebraic representation of complex numbers; the latter is achieved by bit-slicing the number representation and replacing matrix-vector multiplication with symbolic Boolean function manipulation. Experimental results demonstrate that our method can be superior to the state-of-the-art for various quantum circuits and can simulate certain benchmark families with up to ten thousands of qubits.

(Joint work with Yuan-Hung Tsai and Chiao-Shan Jhang; Reference <https://arxiv.org/abs/2007.09304> )

## Biography Brief:

Professor Jie-Hong R. Jiang received the B.S. and M.S. degrees in Electronics Engineering from National Chiao Tung University, Hsinchu, Taiwan, in 1996 and 1998, respectively. In 2004, he received the Ph.D. degree in Electrical Engineering and Computer Sciences from the University of California, Berkeley. He is a Professor in the Department of Electrical Engineering and the Graduate Institute of Electronics Engineering at National Taiwan University (NTU). His research interests include logic synthesis, formal verification, electronic design automation, and computation models of biological and physical systems.



## - N O T I C E -

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