Joint CQSE & NCTS Seminar

2024
May 03, Friday

TIME   May 03, 2024, 14:30~15:30 pm
TITLE   Benchmarking Quantum, Digital, and GPU Annealers
SPEAKER Prof. Jehn-Ruey Jiang(Department of Computer Science and Information Engineering, National Central University)
PLACE   NCTS Physics Lecture Hall, 4F, Chee-Chun Leung Cosmology Hall, NTU
ONLINE   https://nationaltaiwanuniversity-zbn.my.webex.com/

Abstract:

Annealers leverage quadratic unconstrained binary optimization (QUBO) formulas to address combinatorial optimization problems (COPs) and have shown potential to outperform classical computers. This talk demonstrates benchmarking of three prominent types of annealers, namely quantum, digital, and GPU annealers. The quantum annealer (QA) is exemplified by the D-Wave Advantage, which relies on the quantum tunneling mechanism to rapidly locate the minimum-energy system state corresponding to the optimal solution to a COP. The digital annealer (DA) is typified by the Fujitsu Digital Annealing Unit (DAU), which is based on a quantum-inspired digital technology architecture to perform parallel and real-time optimization calculations to solve a COP. The GPU annealer (GPUA) is exemplified by the Compal Quantix solver, which harnesses graphics processing units (GPUs) to conduct adaptive bulk searches for the optimal COP solution. This talk first provides introductory overviews of QA, DA, and GPUA and then proceeds to benchmark their performance on various well-known COPs such as the subset sum, maximum cut, vertex cover, 0/1 knapsack, graph coloring, Hamiltonian cycle, traveling salesperson, and job shop scheduling problems. Their performance is also compared with that of state-of-the-art algorithms running on classical computers. This talk is concluded with an overall qualitative comparison of QA, DA, and GPUA.

Biography:

Prof. Jehn-Ruey Jiang received his Ph.D. degree in computer science in 1995 from National Tsing Hua University, Hsinchu, Taiwan. He is currently with the department of computer science and information engineering, National Central University, Taoyuan, Taiwan. He is also leading the Advanced Computing And Networking (ACAN) Laboratory, which focuses on investigating advanced technologies about computing and networking. His research interests include quantum annealing algorithms, universal quantum algorithms, quantum computing, quantum Internet, as well as machine learning/deep learning and quantum machine learning/deep learning.