

Quantum Chemistry on Quantum Computers lecture series at CQuERE, TCG CREST



By Dr. Kenji Sugisaki,
Special Appointment Lecturer, Osaka City University, Japan
JST PRESTO, Japan (Concurrent)
Visiting Associate Professor, CQuERE, TCG CREST, India

Dates:
28th Oct-23rd Dec
Live streaming:
<https://www.youtube.com/channel/UCISrgcVpVYMiJ6PSeNyHXaA>
(TCG CREST's YouTube channel)

#	Date and Time in IST	Theme
1	10/28 (Thu) 10:00	General introduction of quantum computers History of quantum computing, qubits, quantum gates, quantum circuits, universal quantum gates, NISQ devices, quantum error correction, etc.
2	11/11 (Thu) 10:00	Quantum algorithms Quantum teleportation, Deutsch–Jozsa algorithm, quantum fingerprinting (SWAP test), quantum Fourier transformation, etc.
3	11/17 (Wed) 10:00	Quantum phase estimation algorithm Hadamard test (1-qubit QPE), iterative QPE, Bayesian QPE, relationship between evolution time length and phase precisions, resource estimations, etc.
4	11/25 (Thu) 10:00	Fermion–qubit transformation and quantum circuit constructions Jordan–Wigner transformation, parity basis, Bravyi–Kitaev transformation, Trotter decomposition, etc.
5	12/2 (Thu) 10:00	Variational quantum algorithms Chemistry-inspired ansatzes, hardware-efficient ansatzes, error mitigations, excited states calculations, resource estimations, etc.
6	12/9 (Thu) 10:00	Adiabatic quantum algorithms Adiabatic theorem, quantum annealing, adiabatic state preparation, etc.
7	12/16 (Thu) 10:00	Computational complexities Computational complexity classes (in classical computing; P, NP, etc., and on quantum computing; BPP, BQP, QMA, etc)
8	12/23 (Thu) 10:00	Techniques for resource (qubits/quantum gates) and error reductions Symmetry adaptations, quantum circuit optimizations, Trotter decomposition error reductions, etc.

All are welcome!

* Some lectures will include hands-on tutorials using python/openfermion and IBM-Q. Please install python (I recommend [Anaconda](#)) and [openfermion](#) on your laptop, and please sign up to [IBM quantum](#).