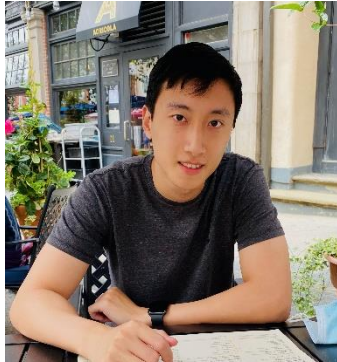# RICE QUANTUM GROUP MEETING SEMINAR SERIES

Presenter: **Daniel Liang**

Research Group: Prof. Nai-Hui Chia's group

Date: November 17, 2023, Friday

Time: 4PM – 5PM

Venue: SST 300

Learning Beyond Stabilizer States

*Abstract***:**

Clifford circuits are an extremely well studied class of quantum circuits with a wide set of applications, such as error correction, quantum key distribution, learning theory, classical simulation, and more. Some well-known facts about Clifford circuits are that they generate the set of stabilizer states and that Clifford circuits with T gates form a universal gate set. Since stabilizer states were shown to be efficiently learnable by Montanaro in 2017 (as well as Aaronson and Gottesman in 2008), a major question in quantum learning was whether or not the same is true of states produced by Clifford circuits with a small number of T gates. To that end, we answer that question in the affirmative by giving a learning algorithm that runs in time poly(n)*exp(t) where n is the number of qubits and t is the number of T gates used. Along the way, we also give an efficient property tester for a magic monotone known as stabilizer nullity/dimension that runs in linear time in the number of qubits with no dependence on t. Both algorithms use Bell difference sampling as the main algorithmic tool.

Joint work with Sabee Grewal, Vishnu Iyer, and William Kretschmer

*Bio***:**

Daniel is a Postdoctoral Researcher at Rice University. He received his PhD in Computer Science from UT-Austin in Spring 2023 where he focused on the intersection of the Clifford formalism and learning theory. His research interests broadly include quantum information, quantum complexity theory, and theoretical computer science. Specifically, the application of learning theory to quantum problems. That is, given some unknown quantum system, try and learn it, under varying definitions of the word "learn".

Snacks and Coffee will be served during the event Wine & cheese will be served after the talk. Everyone is welcome to stay around after the seminar for further informal discussions.