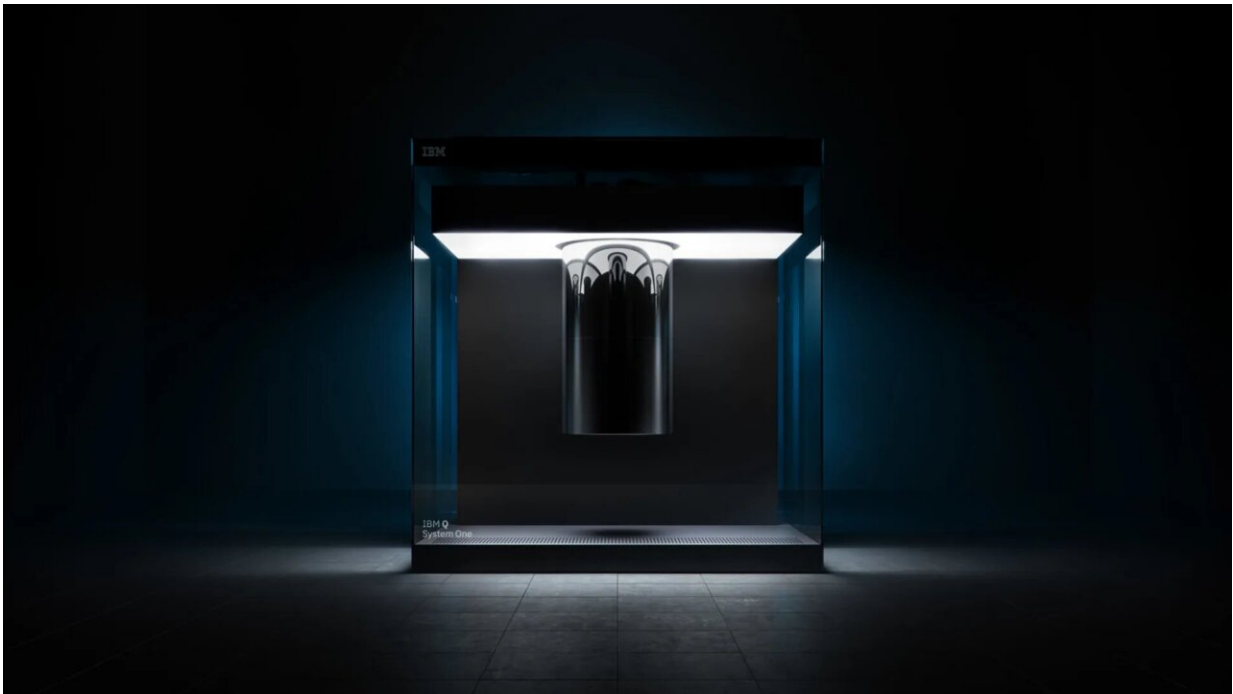


# Team scripts breakthrough quantum algorithm

July 27 2022

---



IBM's Q System One. Credit: IBM Research

City College of New York physicist Pouyan Ghaemi and his research team are claiming significant progress in using quantum computers to study and predict how the state of a large number of interacting quantum particles evolves over time. This was done by developing a quantum algorithm that they run on an IBM quantum computer. "To the best of our knowledge, such particular quantum algorithm which can simulate

how interacting quantum particles evolve over time has not been implemented before," said Ghaemi, associate professor in CCNY's Division of Science.

Entitled "Probing geometric excitations of fractional quantum Hall states on quantum computers," the study appears in the journal of *Physical Review Letters*.

"Quantum mechanics is known to be the underlying mechanism governing the properties of elementary particles such as electrons," said Ghaemi. "But unfortunately there is no easy way to use equations of quantum mechanics when we want to study the properties of large number of electrons that are also exerting force on each other due to their [electric charge](#)."

His team's discovery, however, changes this and raises other exciting possibilities.

"On the other front, recently, there has been extensive technological developments in building the so-called quantum computers. These new class of computers utilize the law of [quantum mechanics](#) to preform calculations which are not possible with classical computers."

"We know that when electrons in material interact with each other strongly, interesting properties such as [high-temperature superconductivity](#) could emerge," Ghaemi noted. "Our quantum computing algorithm opens a new avenue to study the properties of materials resulting from strong electron-electron interactions. As a result it can potentially guide the search for useful materials such as high temperature superconductors."

He added that based on their results, they can now potentially look at using quantum computers to study many other phenomena that result

from strong interaction between electrons in solids. "There are many experimentally observed phenomena that could be potentially understood using the development of quantum algorithms similar to the one we developed."

**More information:** Ammar Kirmani et al, Probing Geometric Excitations of Fractional Quantum Hall States on Quantum Computers, *Physical Review Letters* (2022). [DOI: 10.1103/PhysRevLett.129.056801](https://doi.org/10.1103/PhysRevLett.129.056801)

Provided by City College of New York

Citation: Team scripts breakthrough quantum algorithm (2022, July 27) retrieved 24 April 2024 from <https://phys.org/news/2022-07-team-scripts-breakthrough-quantum-algorithm.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.