Quantum Computing Final Project Task 2
Written by Erik Davtyan
Proofread by Varazdat Stepanyan

Question 1. These are three experimental demonstrations of quantum simulations. Noting its relative date of publication, describe your chosen paper's impact in the business trade press. Do you feel it had the largest influence of the three? Why or why not?

To rate the articles firstly we check the impact factors of the journals and the amount of times they've been cited. One of the articles has a notably higher number of citations. According to scholar.google.com by 15/5/2020 the "Scalable Quantum Simulation of Molecular Engines" article by Google has been cited 410 times and the impact factor back then was approximately 13. According to the same source "Observation of a many-body dynamical phase transition with a 53-qubit quantum simulator" by University of Maryland has been cited 430 times and IBM's "Hardware-efficient variational quantum eigensolver for small molecules and quantum magnets" article has been cited 601 times. These two had impact factors equal to 45.8.

By more citations, the impact factor of the journal in which it was published, and the superior media coverage, the paper written by IBM had the largest influence out of the 3. The reasons for the superior media coverage of the papers by IBM and Google are further discussed in question 2.

Question 2. Two of the papers employ superconducting qubits, and were from research at large corporations, while one paper describes research using atomic qubits, performed at a research university. Based on how these results were received in the news press, can you see how the technology, and the research institution, made a difference in expectations for future developments?

The researches which were done at Google and IBM, unsurprisingly, had a far greater media coverage. Reading a news article about a published paper in a science journal by some university is far less exciting than one published by Google. Also, Google and IBM spend resources on advertising themselves to grab the attention of more scientists who are interested in those problems and more businessmen to invest in their research.

Moreover, the researches which were done at Google and IBM use superconducting qubits. Superconducting qubits, due to use by those tech giants, are known to be the superior kind of qubits. These papers yet again "proved" the superiority of superconducting qubits, continuing the self-fueling feedback cycle. On the contrary - the paper published by the research university used atomic qubits, which also resulted in less hype in the news.

Question 3. Imagine that you are responsible for investing the money of a company or a funding agency interested in the further development of quantum computation. Would you invest your money in your chosen paper's project? Why or why not?

If I had enough money (I wish), I would invest it in the university research. There are 4 main reasons for this.

1. From a business perspective, I would have a larger ROI (Return on Investment) if their technology succeeded and made money. This is due to the fact that Google and IBM already have a lot of money and investors, so my share in the final product would be significantly smaller.
2. Superconducting qubits have been researched quite extensively by these tech giants. On the contrary - atomic qubits are still relatively new, so the efficiency of the investment would also be higher. The less the total investment, the more every dollar makes a difference in the actual product itself. Efficiency of tech developments drops as the investment in them increases.
3. From a scientific perspective - the superconducting qubits will continue rapid development regardless if I invest or not. So to help the development of quantum computing further - it would be a better idea to invest in the less funded areas.
4. Even though the research is published by a university and has less media coverage, the Impact Factor of the journal it is published in is higher than Google's article's journal. This further gives confidence in the research done.

References:

Hardware-efficient variational quantum eigensolver for small molecules and quantum magnets

https://www.ibm.com/blogs/research/2017/09/quantum-molecule/
https://www.sciencemag.org/news/2017/09/quantum-computer-simulates-largest-molecule-yet-sparking-hope-future-drug-discoveries
https://www.technologyreview.com/2017/09/13/149180/ibm-has-used-its-quantum-computer-to-simulate-a-molecule-heres-why-thats-big-news/
https://www.sciencealert.com/ibm-has-simulated-the-most-complex-molecule-yet-with-a-quantum-computer
https://venturebeat.com/2017/09/13/ibm-simulates-chemical-reactions-on-a-quantum-computer/
https://www.engadget.com/2017-09-14-ibms-simulated-molecule-could-lead-to-drug-and-energy-advances.html
https://spectrum.ieee.org/tech-talk/computing/hardware/tiny-quantum-computer-simulates-big-molecules

https://thenextweb.com/insider/2017/09/14/1076900/

Observation of a many-body dynamical phase transition with a 53-qubit quantum simulator

https://www.sciencedaily.com/releases/2017/11/171129131434.htm
https://www.nextbigfuture.com/2017/11/largest-quantum-simulations-using-53-qubit-trapped-ions-and-another-with-51-ryberg-atoms.html
https://www.vice.com/en_us/article/7xwz7b/53-qubit-quantum-simulator-computer

Scalable Quantum Simulation of Molecular Energies

https://www.sciencealert.com/google-s-quantum-computer-is-helping-us-understand-quantum-physics
https://ai.googleblog.com/2016/07/towards-exact-quantum-description-of.html
https://www.chemistryworld.com/news/quantum-computer-simulates-hydrogen-molecule-/1010041.article
https://www.ibtimes.co.uk/google-boasts-quantum-computing-breakthrough-first-display-real-world-use-1571823