CNOT-ing Optimized Circuit

Fractional Scaling Factors (1)

Meeting with Professor Schnetzer and Rikab

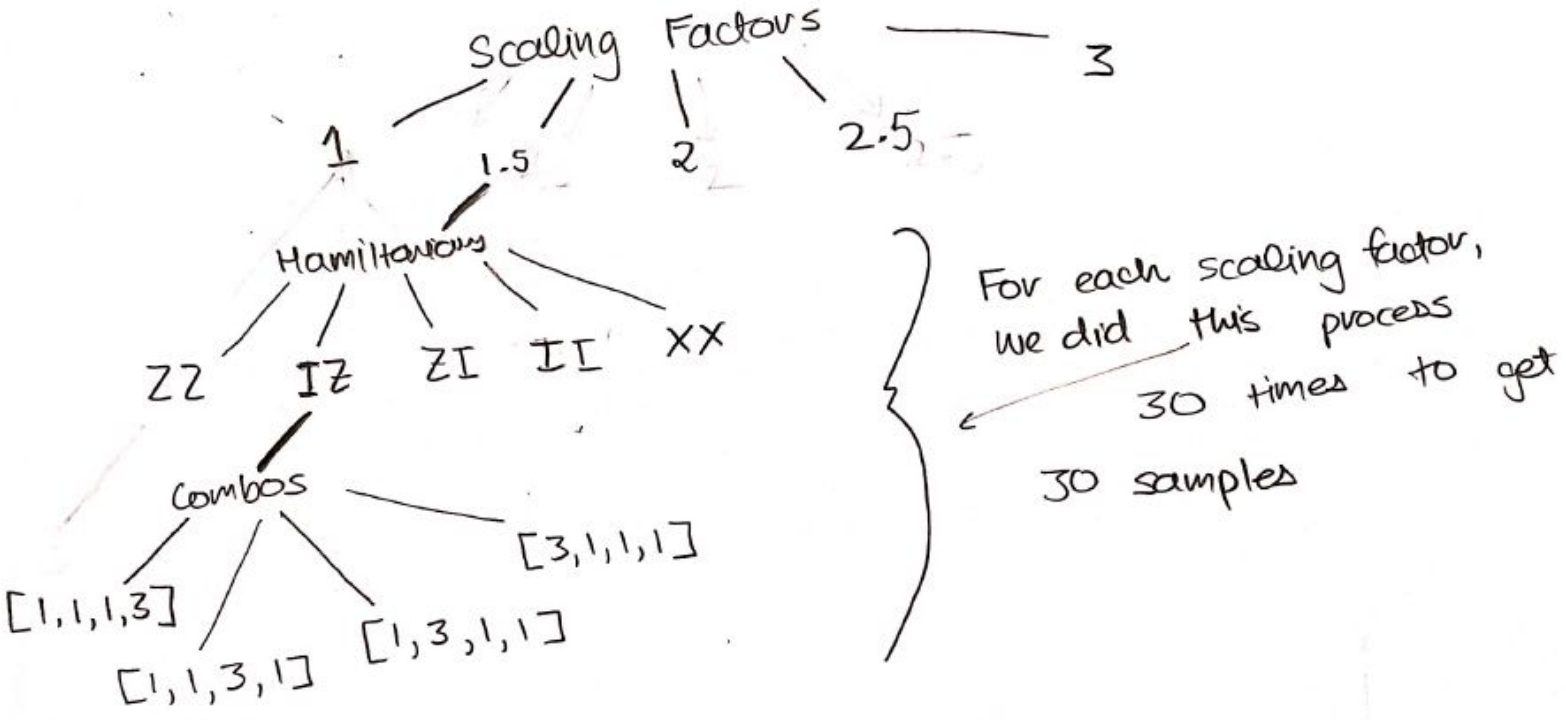
July 29, 2020

Approach

Illustrated in Slide 3

- Used Noise Scaling factors 1, 1.5, 2, 2.5 and 3
- Optimized Circuit contained 4 CNOT gates
- So to achieve 1.5, there were 4 possible ways :[1,1,1,3], [1,1,3,1] , [1,3,1,1], [3,1,1,1]
- If there were 4 possible ways, then for each circuit, I got 1024/4 shots.
- After getting these results, I combined the counts and then computed the expectation value

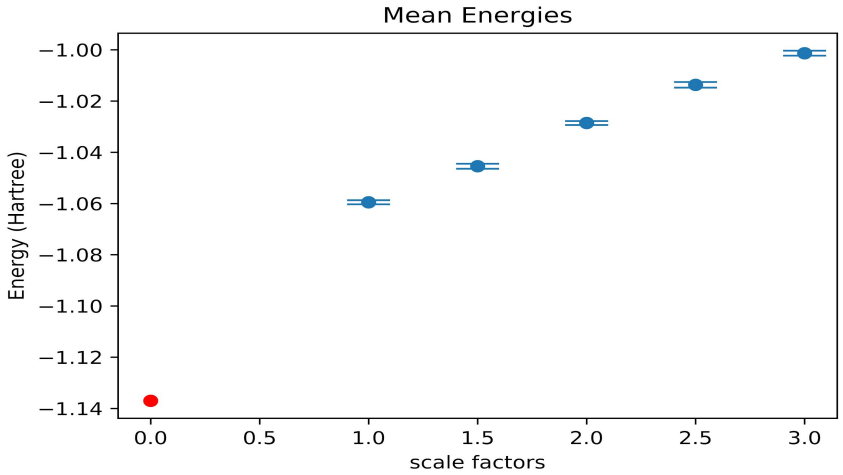
Procedure

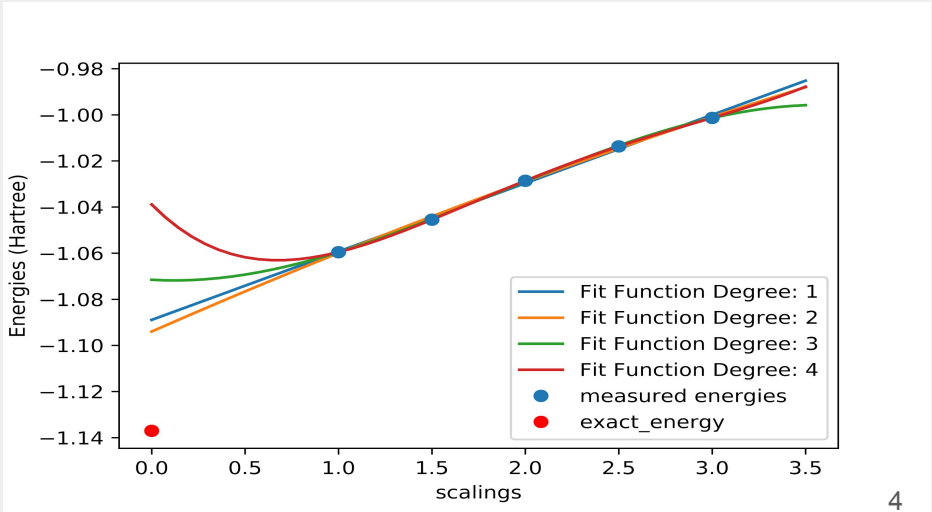

Scaling Factors
1
1.5
2
2.5
3
Hamiltonians
ZZ
IZ
ZI
II
XX
combos
[1,1,1,3]
[1,1,3,1]
[1,3,1,1]
[3,1,1,1]
For each scaling factor, we did this process 30 times to get 30 samples

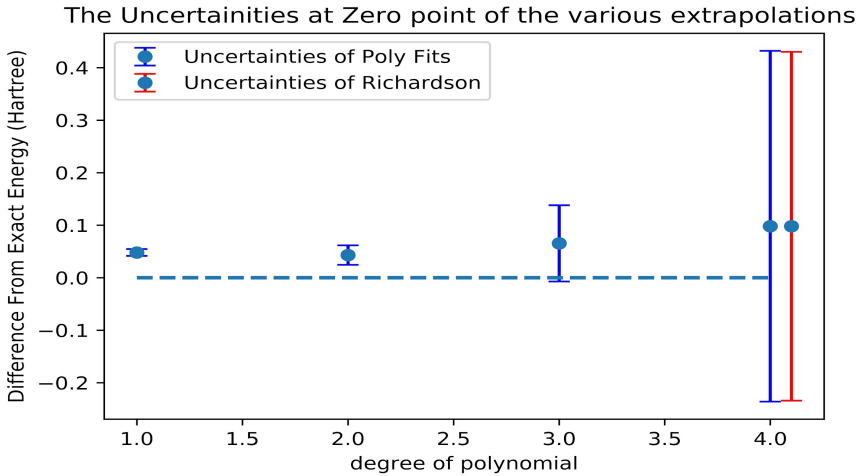
Results on London Noisy Simulator

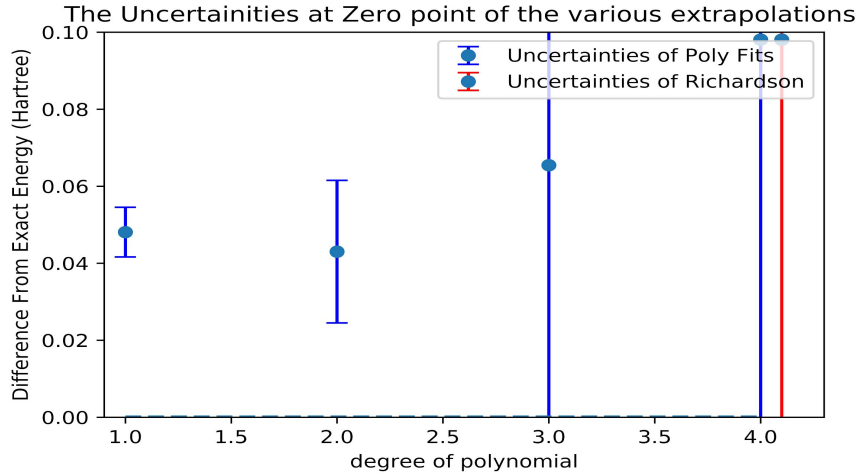
(30 samples)

Why a huge leap from 0 noise to 1 but not from 1 to 2 or 2 to 3? It seems that adding in extra CNOT gates is not enough to increase the overall error rate.







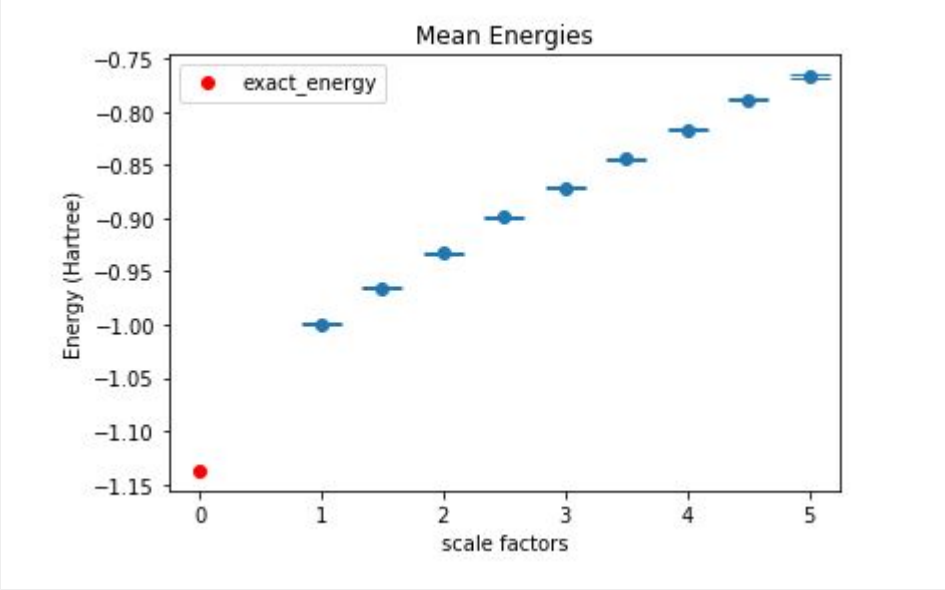


- Points extrapolated by lower degree polynomials are doing better in terms of accuracy and precision than points extrapolated via Richardson
- However, the accuracies have not improved; on par with when we scaled noise with odd integer factors (1,3,5,7)

More Fractional Scaling factors on London Noise Model Simulator

(30 samples)

The trend is clear but the accuracies are off!



There is something wrong with the procedure

London Noise Model Simulation

London Quantum Computer

30 samples for both