Results from

Noise Amplification in VQE Optimized Circuit (4.1)

Noise Amplified by Randomized addition of pairs of similar gates

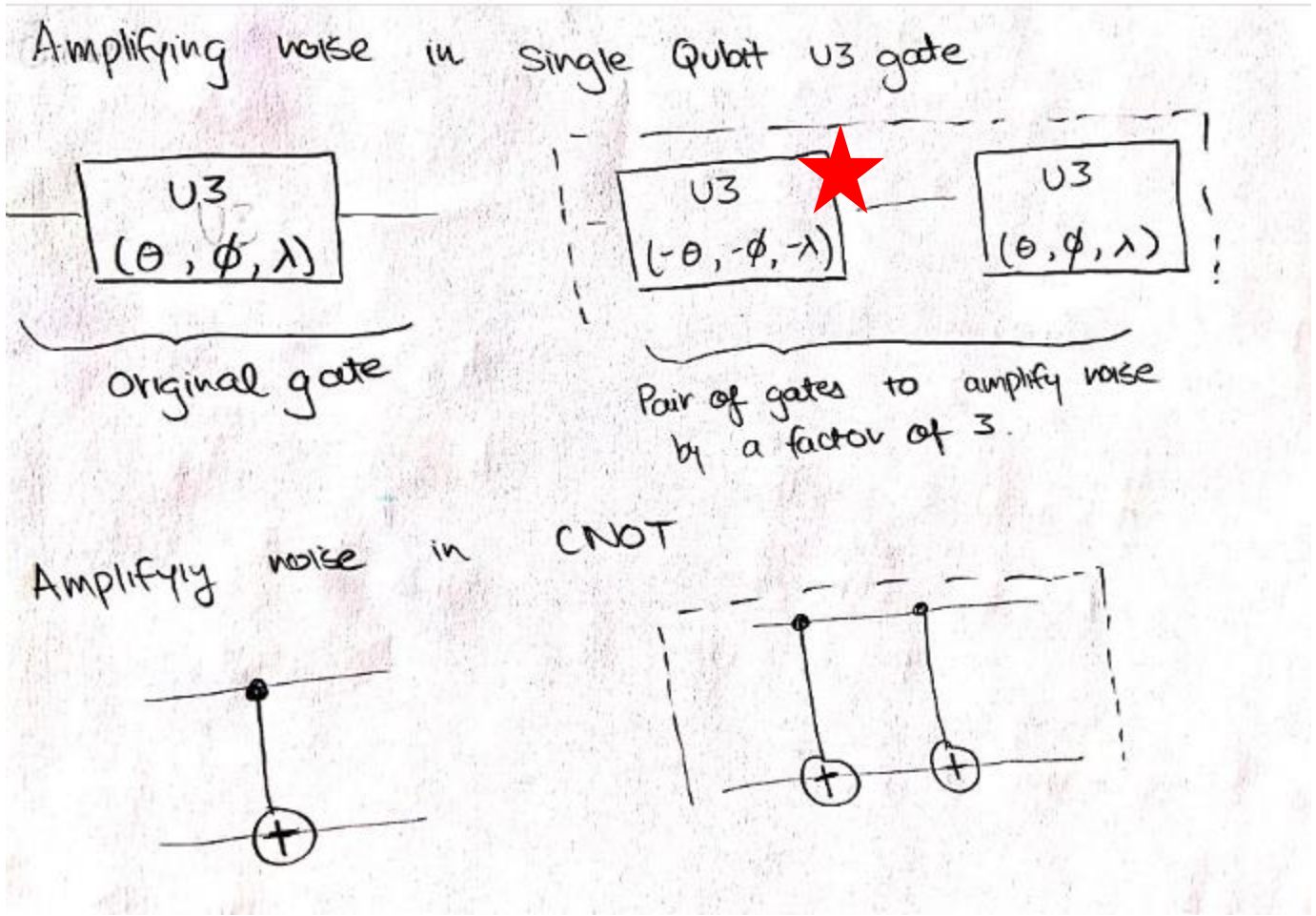
Meeting with Professor Schnetzer and Rikab

August 10, 2020

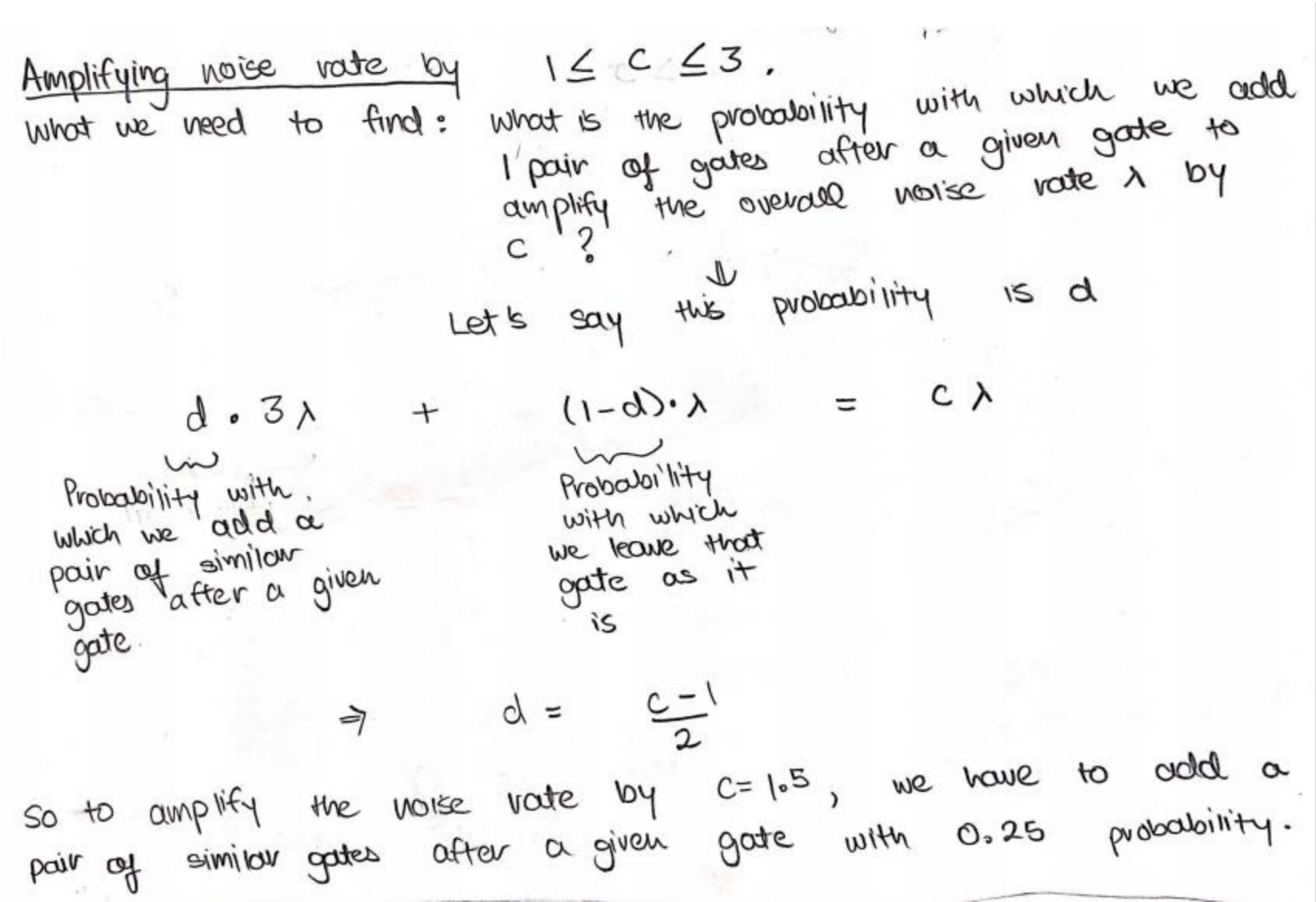
Noise Amplification Procedure

- Correction:

$$U3^{-1}(\theta, \phi, \lambda)$$
$$=$$
$$U3(-\theta, -\pi - \lambda, -\pi - \phi)$$



Noise Amplification Rate ≠ Probability of adding a pair of gates



Amplifying noise rate by $1 \leq c \leq 3$.

What we need to find: What is the probability with which we add 1 pair of gates after a given gate to amplify the overall noise rate λ by c?

Let's say this probability is d

$d \cdot 3\lambda + (1-d) \cdot \lambda = c\lambda$

$d \cdot 3\lambda$: Probability with which we add a pair of similar gates after a given gate.

$(1-d) \cdot \lambda$: Probability with which we leave that gate as it is

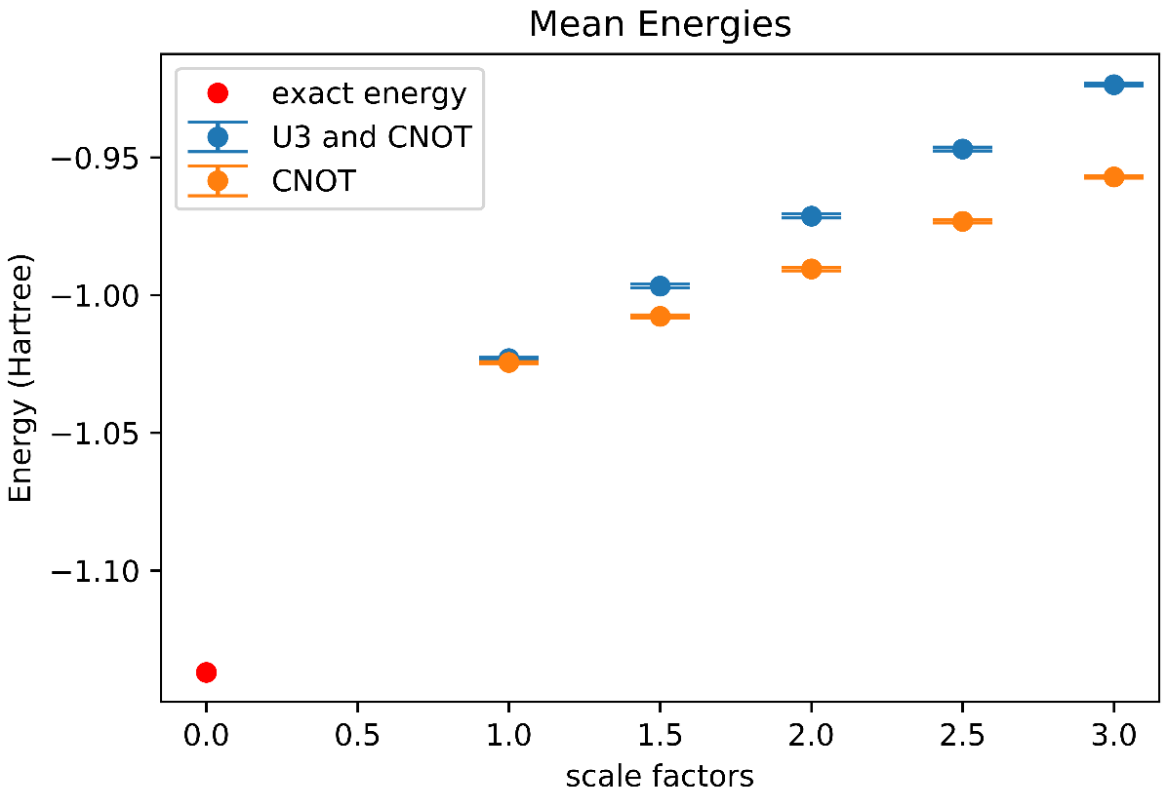
$\Rightarrow d = \frac{c-1}{2}$

So to amplify the noise rate by $c = 1.5$, we have to add a pair of similar gates after a given gate with 0.25 probability.

Adding a pair of gates randomly

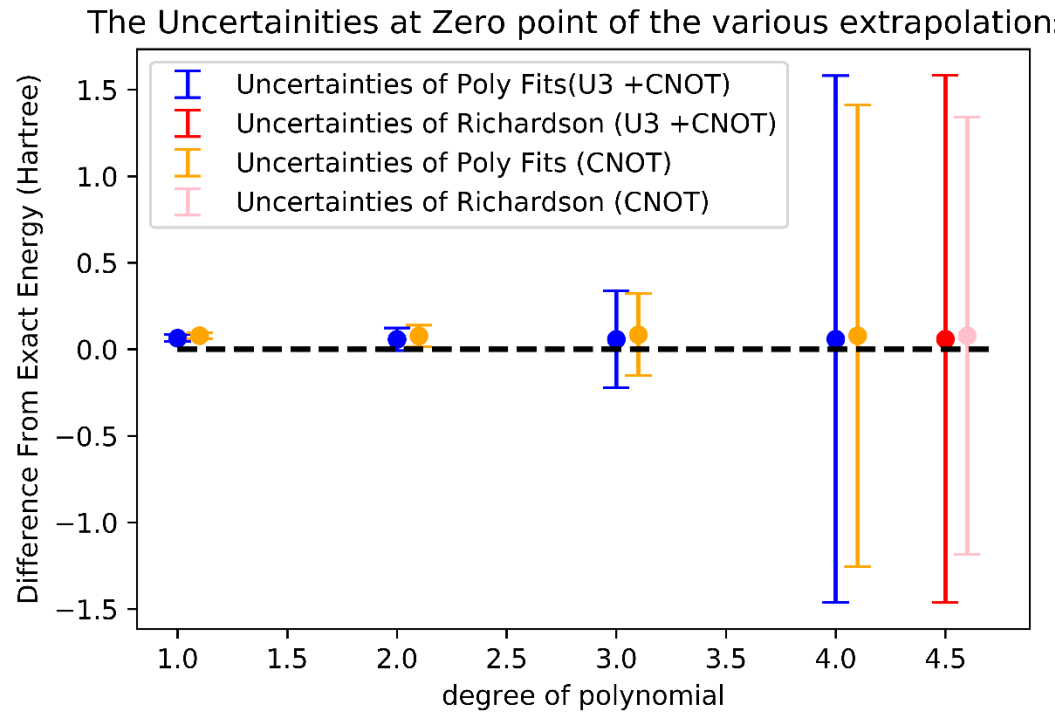
London Noise Simulator

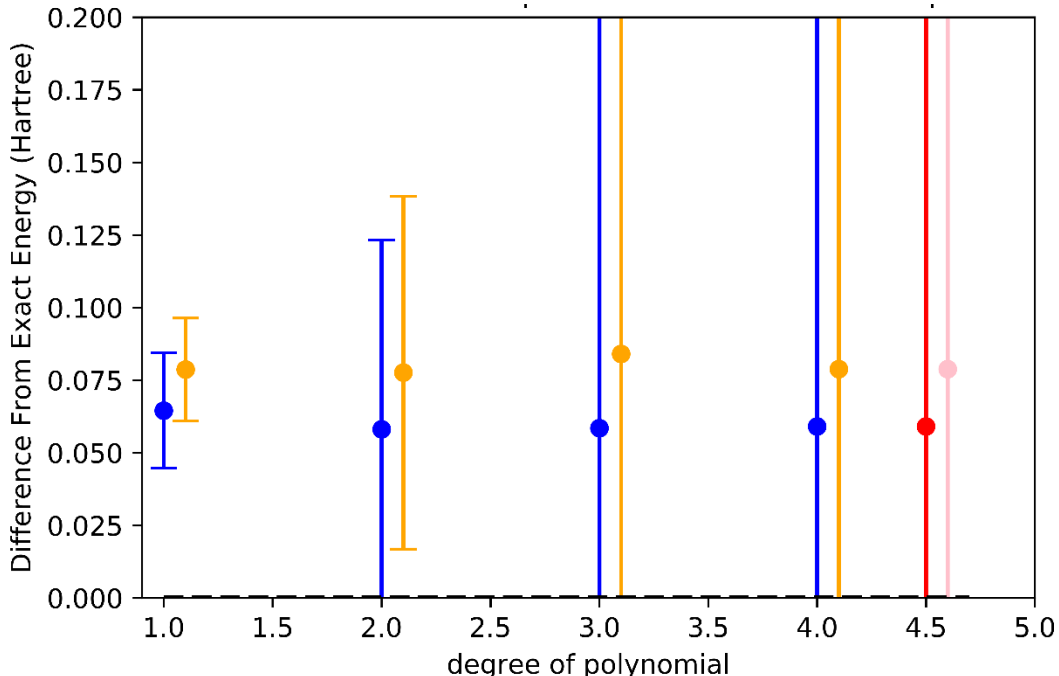
1000 samples



Adding a pair of gates randomly

Extrapolation

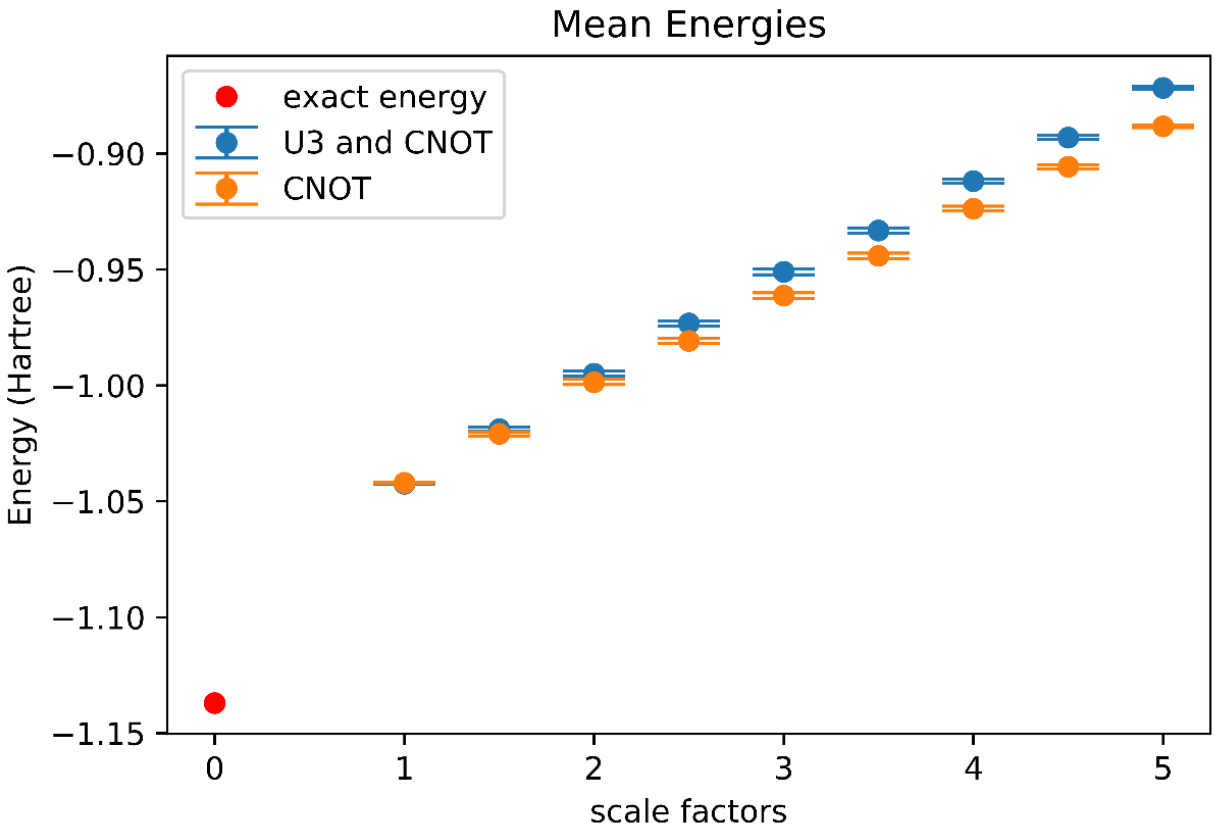




Adding *2 pairs* of gates randomly

London Noise Simulator

1000 samples



Adding ***2 pairs*** of gates randomly

Extrapolation