Results from

# Noise Amplification in VQE Optimized Circuit (4.1)

Noise Amplified by Randomized addition of pairs of similar gates

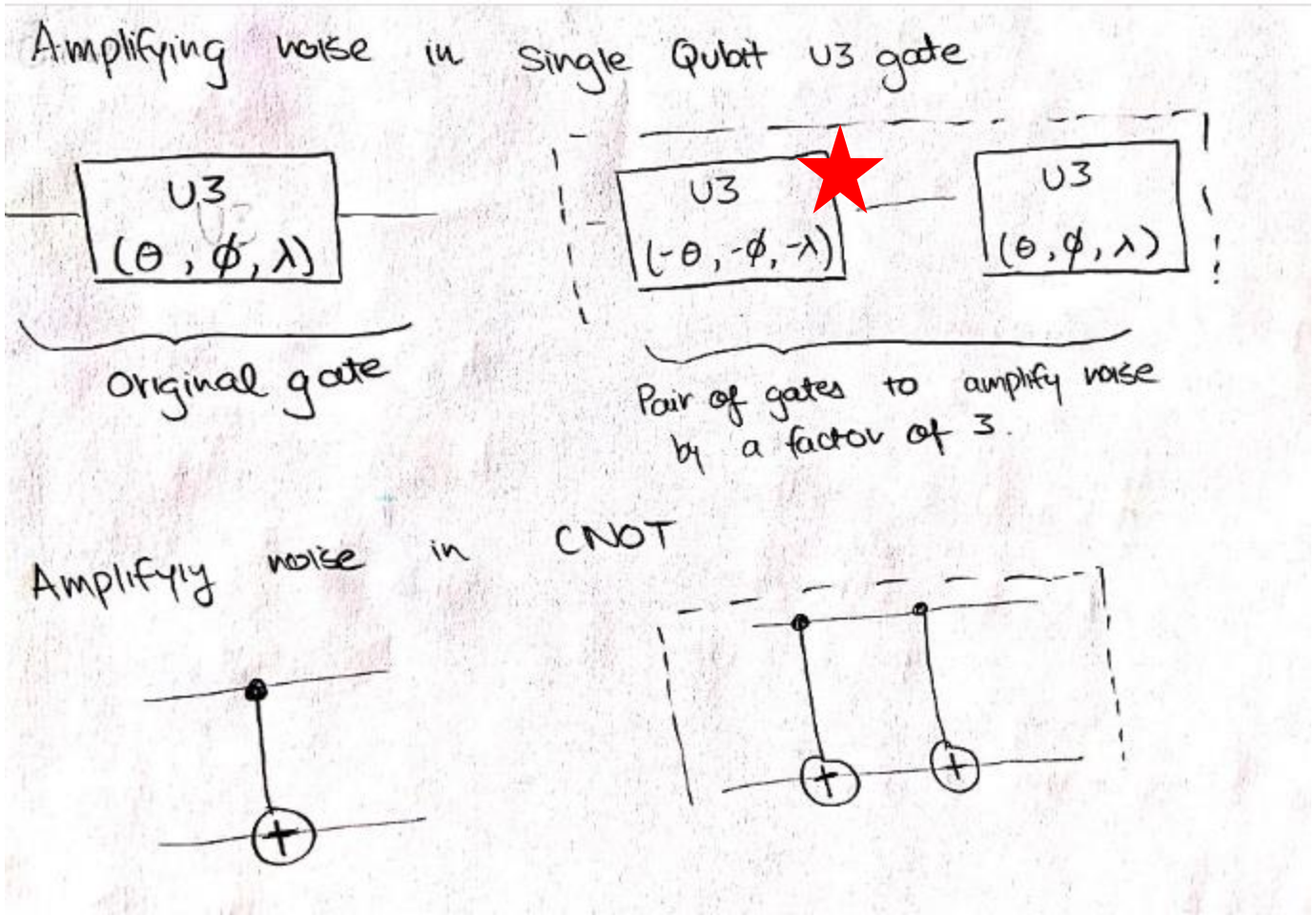
Meeting with Professor Schnetzer and Rikab

August 10, 2020

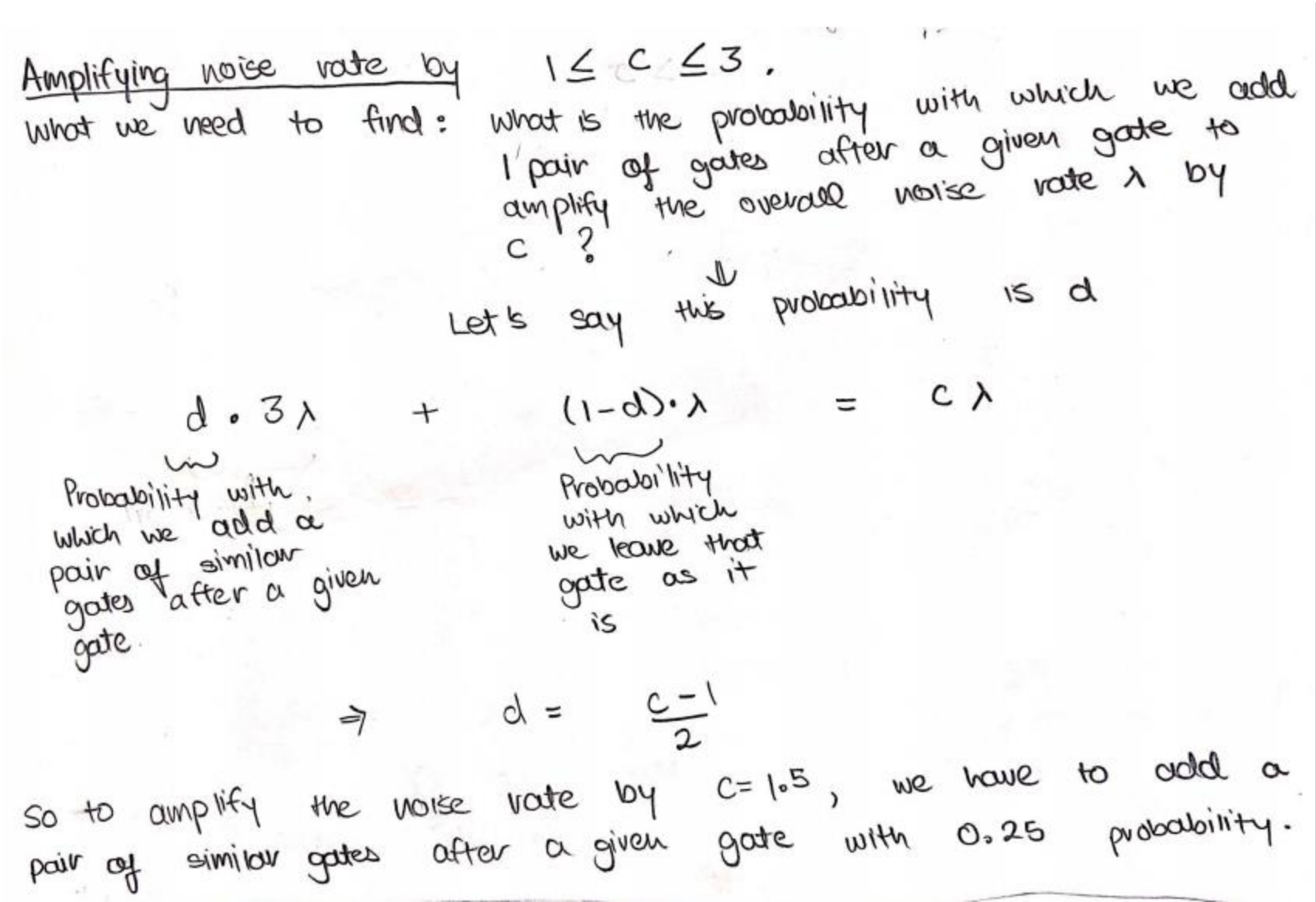
# Noise Amplification Procedure

- 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 $\lambda$ by $c$ ?

Let's say this probability is $d$

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

Probability with which we add a pair of similar gates after a given gate.

Probability with which we leave that gate as it is

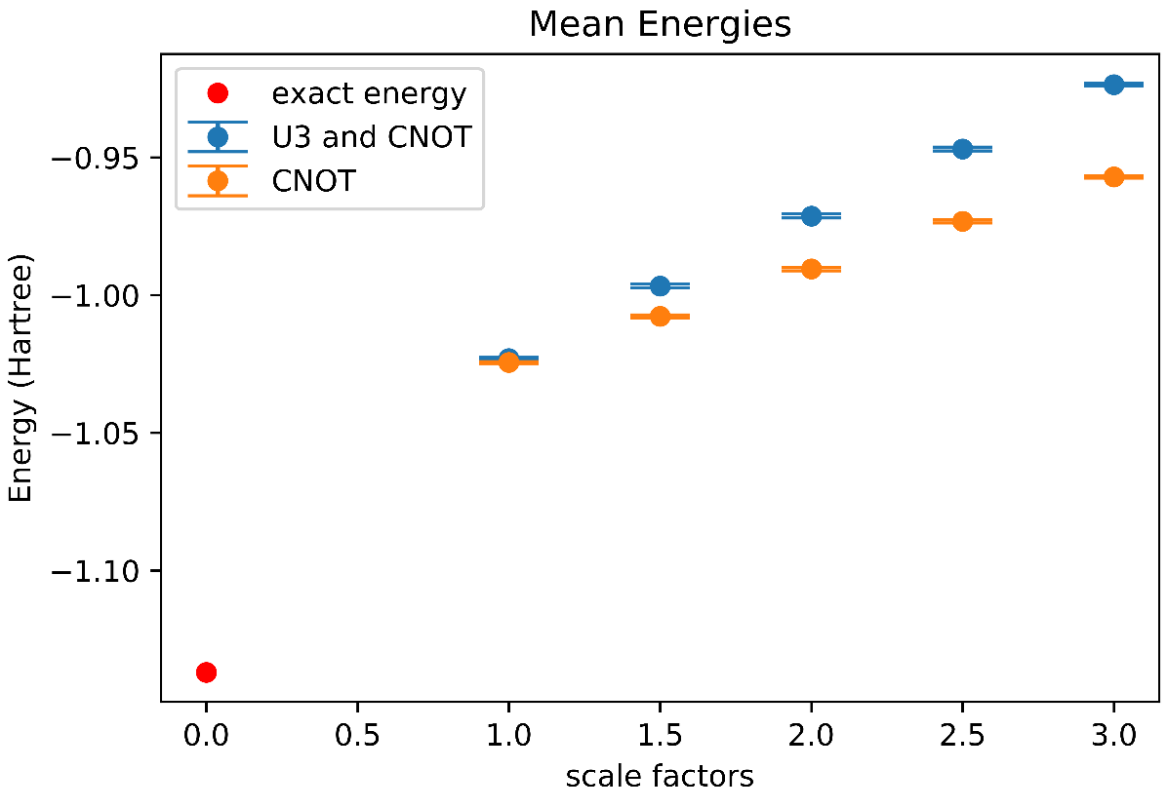
$\Rightarrow d = \frac{c-1}{2}$

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

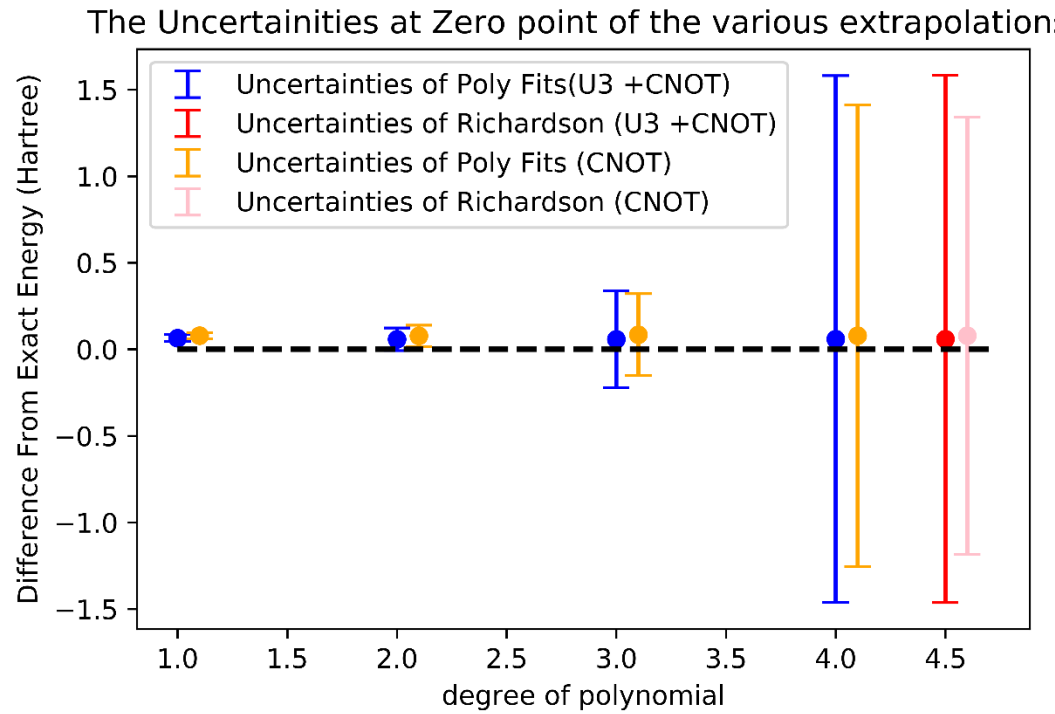
**London Noise Simulator**

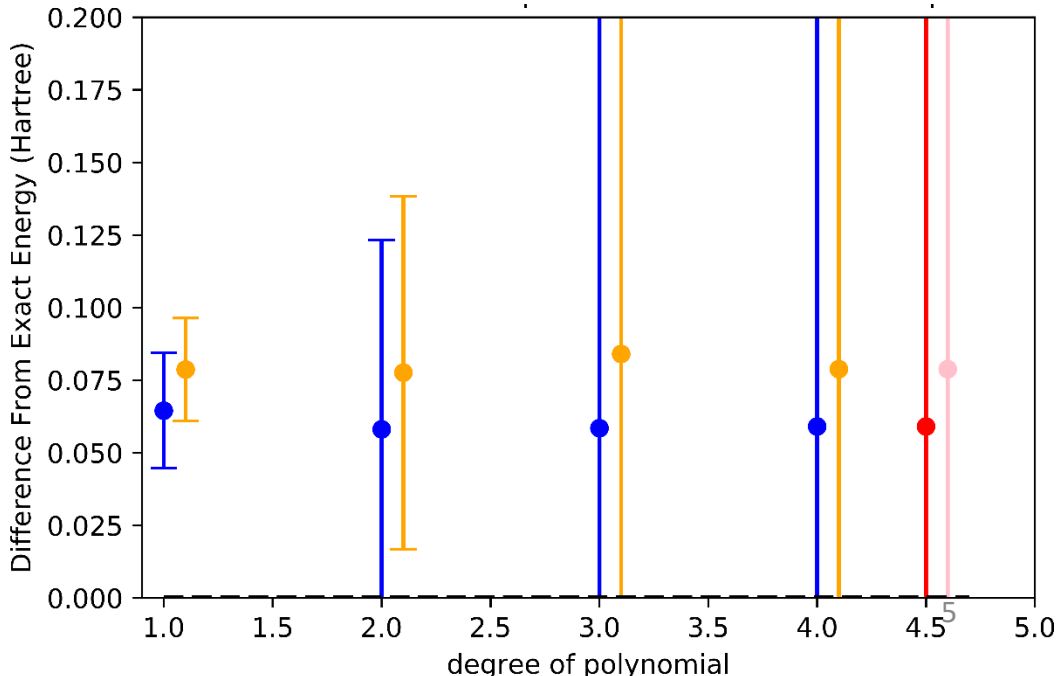
**1000 samples**



# Adding a pair of gates randomly

**Extrapolation**

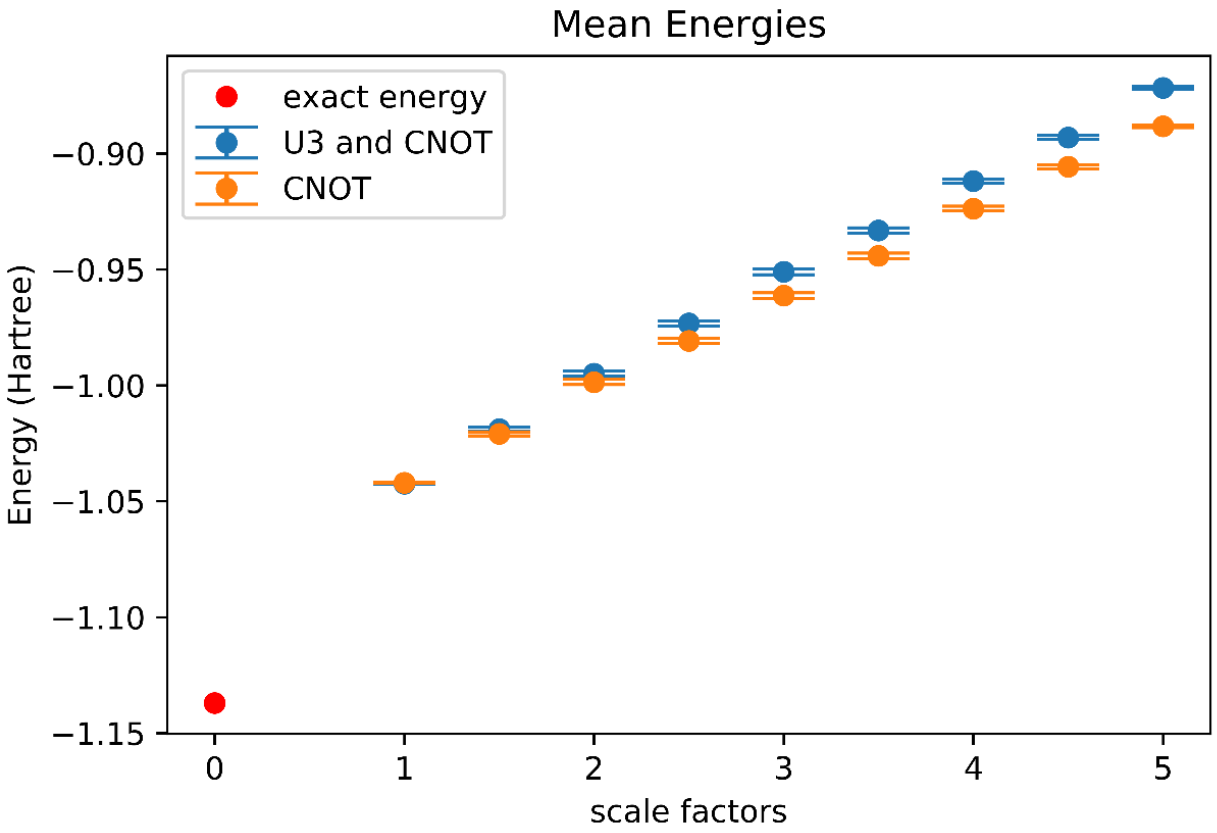


# Adding *2 pairs* of gates randomly

**London Noise Simulator**

**1000 samples**



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

**Extrapolation**