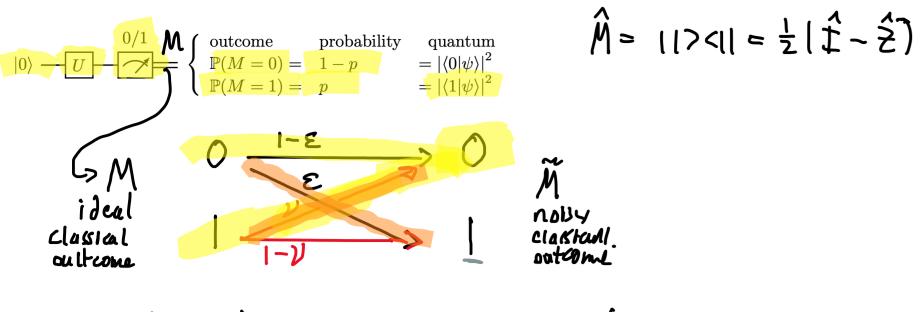
## Introduction to quantum noise

## Measurement error

Qiskit Global Summer School on Quantum Machine Learning Zlatko K. Minev



authors

$$P_{M} = \begin{pmatrix} P(M=0) \\ P(M=1) \end{pmatrix} = \begin{pmatrix} I-P \\ P \end{pmatrix}$$

$$P_{M} = \begin{pmatrix} P(M=0) \\ P(M=1) \end{pmatrix} = \begin{pmatrix} I-P \\ P \end{pmatrix}$$

$$P(M=0) = P(M=0) P(M=0) + P(M=0) P(M=1) P(M=1)$$

$$P(M=1) = P(M=1) P(M=0) + P(M=1) P(M=1) = E(I-P) + I-W) P = P$$

$$P_{M} = A P_{M}$$

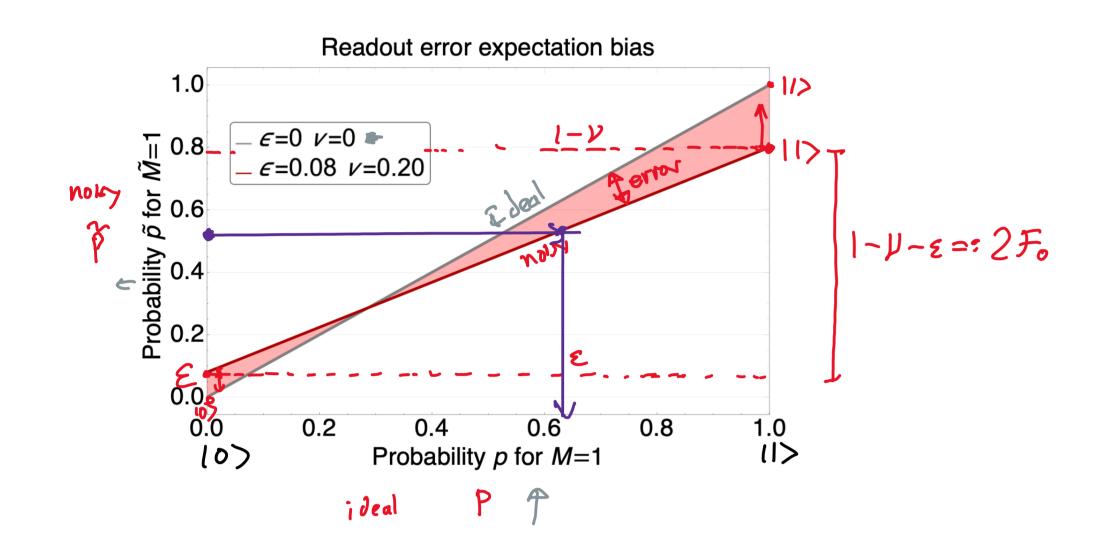
$$M = 0$$

$$A = M = 0$$

$$P(M=0 | M=0)$$

$$P(M=0 | M=1)$$

$$\begin{array}{lll}
\sum_{m} A_{mn} = 1 & \text{for any } n & \text{Stochastic matrix} \\
p = & \epsilon (1-p) + (1-v)p \\
= & \epsilon - p\epsilon + p - \nu p \\
= & p + \epsilon - (\nu + \epsilon) p
\end{array}$$



## Bonus section content:

## Reconstruct A matrix

$$|0\rangle - |M = 0| = |M|$$

$$|0\rangle - |M| = 0| = |M|$$

$$|0\rangle - |M| = |M| = |M| = |M| = |M|$$

$$|0\rangle - |M| = |M| = |M| = |M| = |M| = |M|$$

Noise mitization

We know A

measure 
$$P$$
,  $P_m$  noisy

 $P_m = A P_m$ 
 $P_m = A^{-1} P_m$ 

find  $P$ ,  $P_m$  ideal

 $P = A^{-1} P_m$ 
 $P_m = A^{-1} P_m$ 

Assiblement Fidelity

$$\mathcal{F}_{0} = 1 - \frac{1}{2} \left[ P(M=1|M=0) + P(M=0|M=1) \right]$$

$$= \frac{1}{3} Tr(A)$$

$$= 1 - \frac{1}{2} (M+D)$$

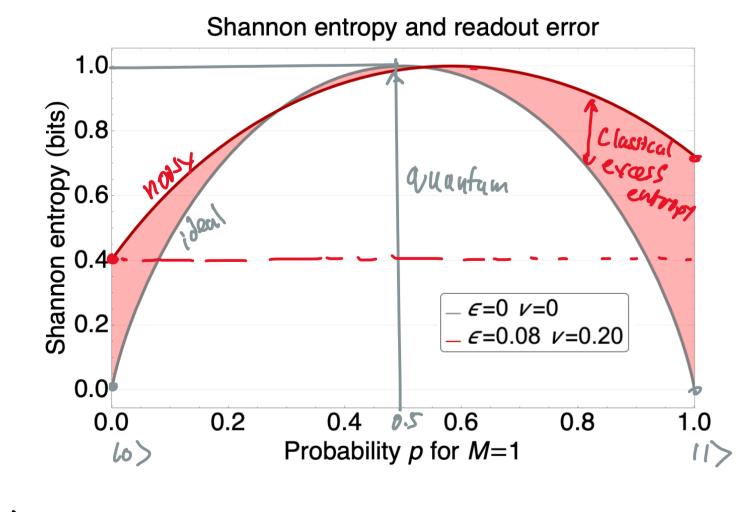
$$= 1 - \frac{1}{2} (M+D)$$

Shannon Entrosy

$$H(\Lambda) = H(PM) = - E Pm log_2 Pm = - (1-p) log_2 (1-p) - p log_2 P$$

$$B mary en from$$

https://onedrive.live.com/redir?resid=7D929860B6ED6387%212419&page=Edit&wd=target%28QGSS-2021.one%7C9a7745c5-4a4e-9e42-85bf-39c23dfa6fee%2FMeasurement noise%7Cfee28ff3-5360-ac41-9da2-4bfd2af27e59%2F%29



arger System

Name of 
$$M$$

O  $M$ 

O