

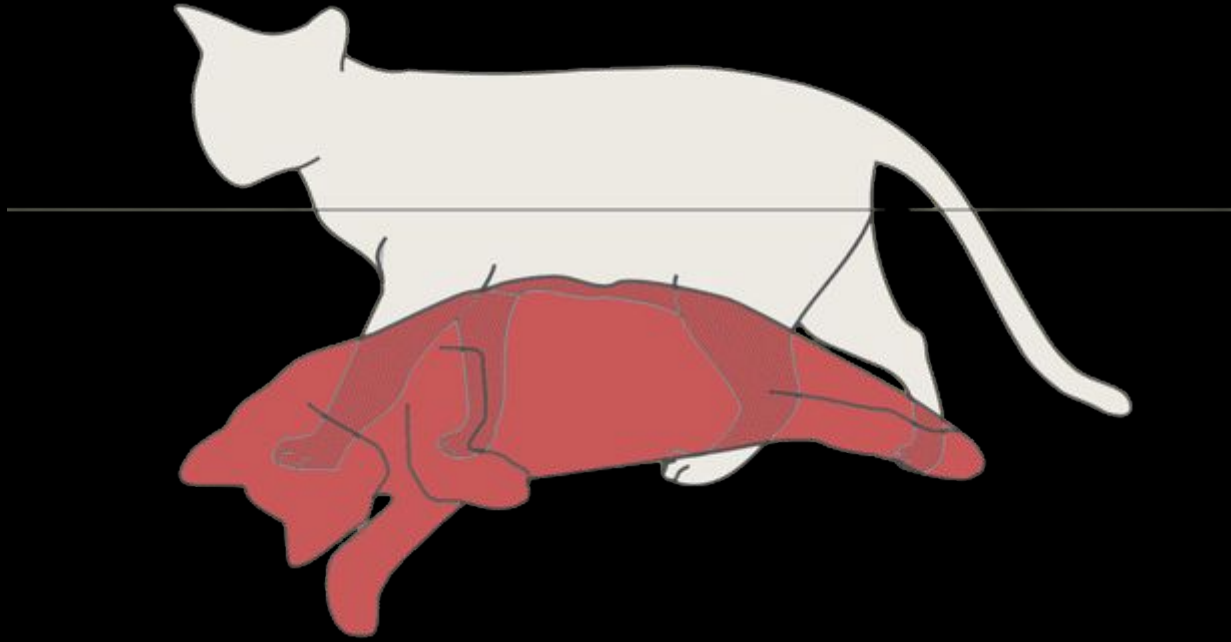
QUANTUM COMPUTING

Rishik Chakraborty
Innovator at TKS

“Spooky Action at a Distance”

- Albert Einstein





Is the cat dead? Alive? **Both?**

HOW'S YOUR
QUANTUM COMPUTER
PROTOTYPE COMING
ALONG?

GREAT!

THE PROJECT EXISTS
IN A SIMULTANEOUS
STATE OF BEING BOTH
TOTALLY SUCCESSFUL
AND NOT EVEN
STARTED.

CAN I
OBSERVE
IT?

THAT'S
A TRICKY
QUESTION.

It's tricky...

There are levels to QC:

Level 1 - Classical Review

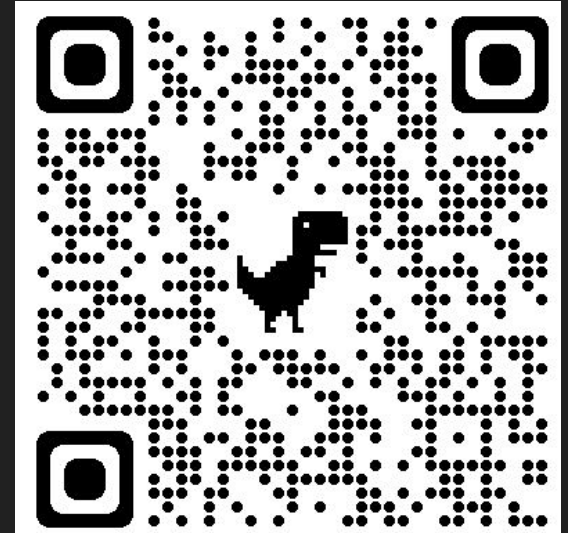
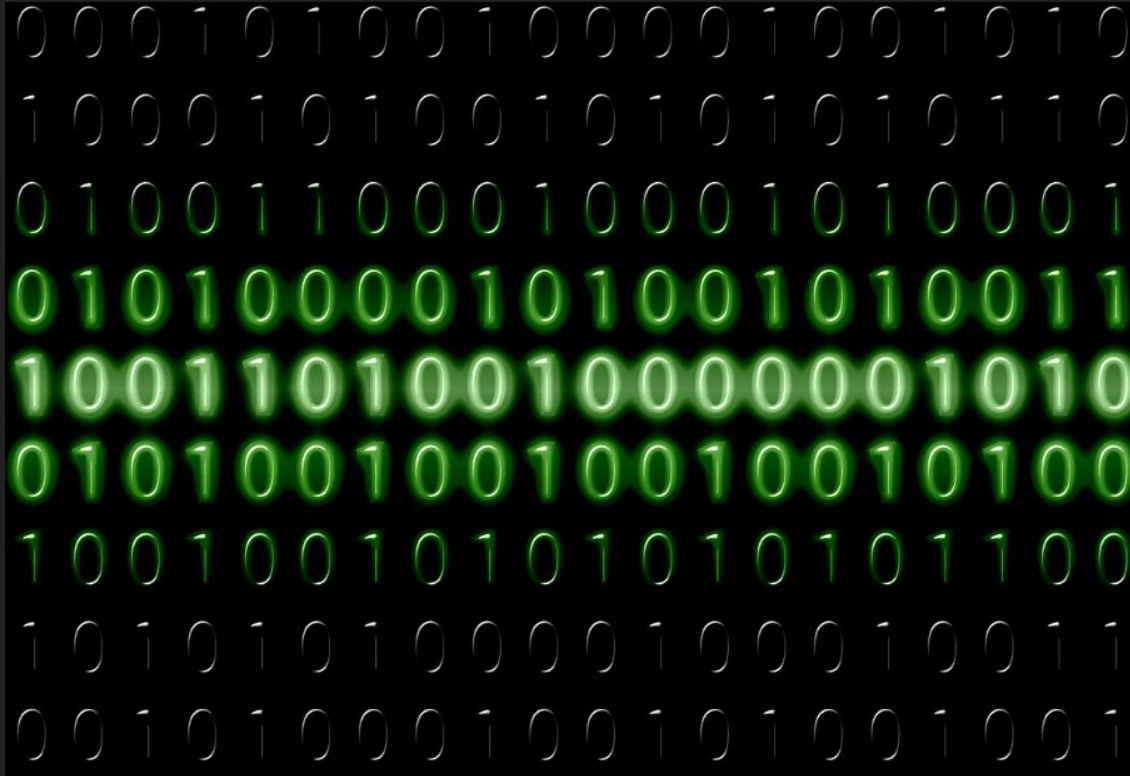
Level 2 - Superposition

Level 3 - Entanglement

Level 4 - Real Life Uses



L1 Classical computing systems

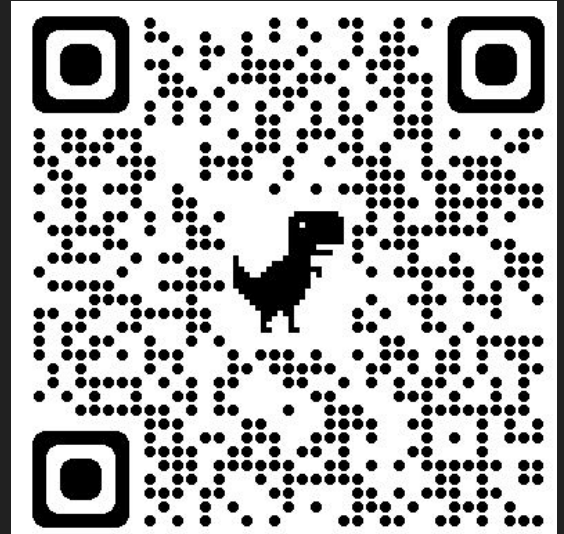


**Something I wrote a
while back**

L1 Classical computing systems



Transistor



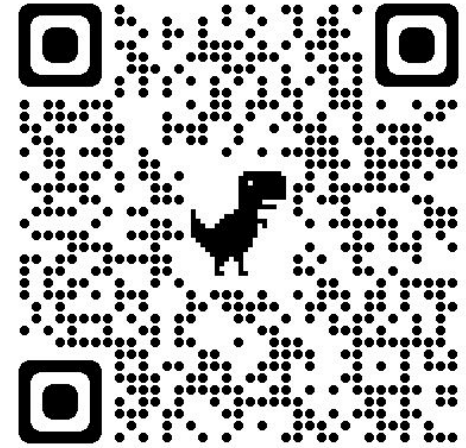
**Something I wrote a
while back**

L1 Binary Conversion

1	0	1	1
2^3	2^2	2^1	2^0
8	4	2	1

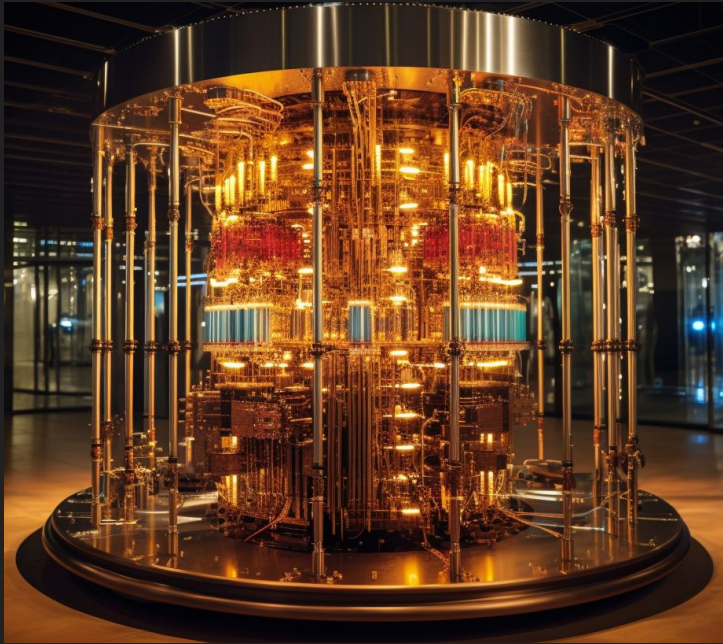
$$8+2+1 = 11$$

$11 / 2 = 5$	R	1
$5 / 2 = 2$	R	1
$2 / 2 = 1$	R	0
$1 / 2 = 0$	R	1

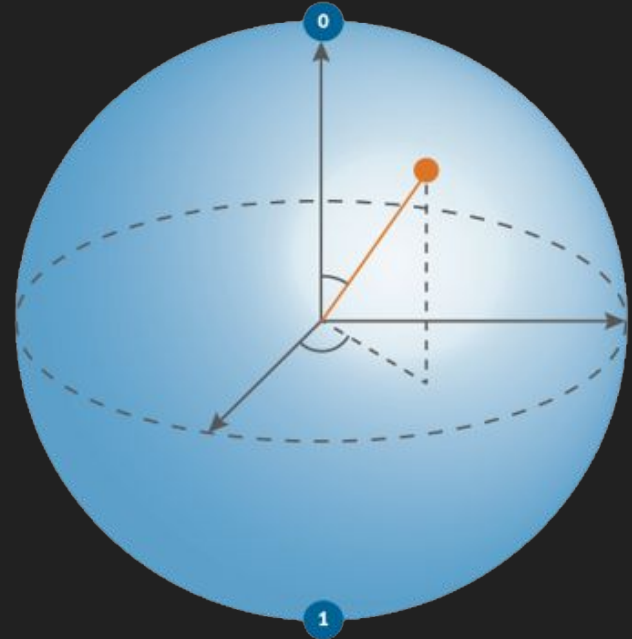


Binary Blog

L2 Quantum Systems



AWS Quantum Computer



Qubit



L2 The comparison

Bit

(Classical Computing)

0



1

Qubit

(Quantum Computing)

0



1

Classical Computing

Black and White
1 thing at a time

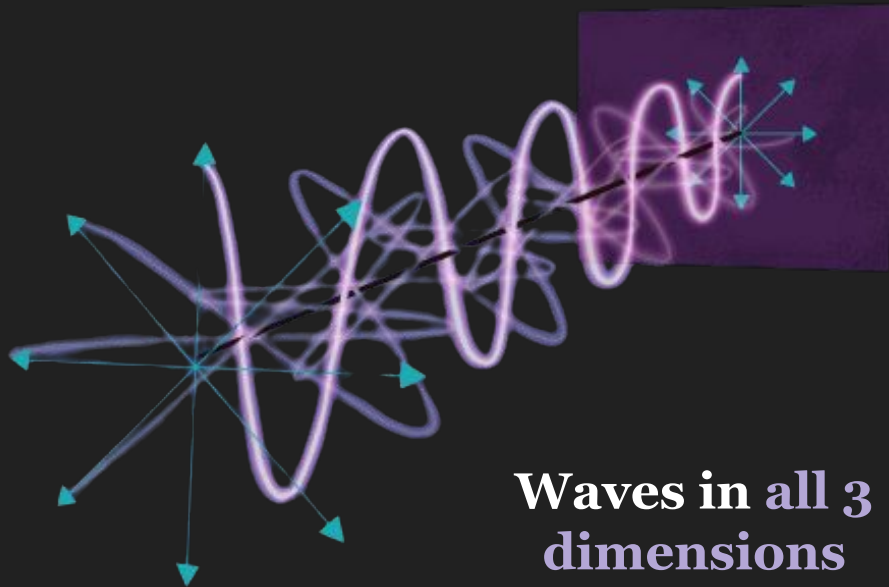
Quantum Computing

Very gray

L2 Superposition

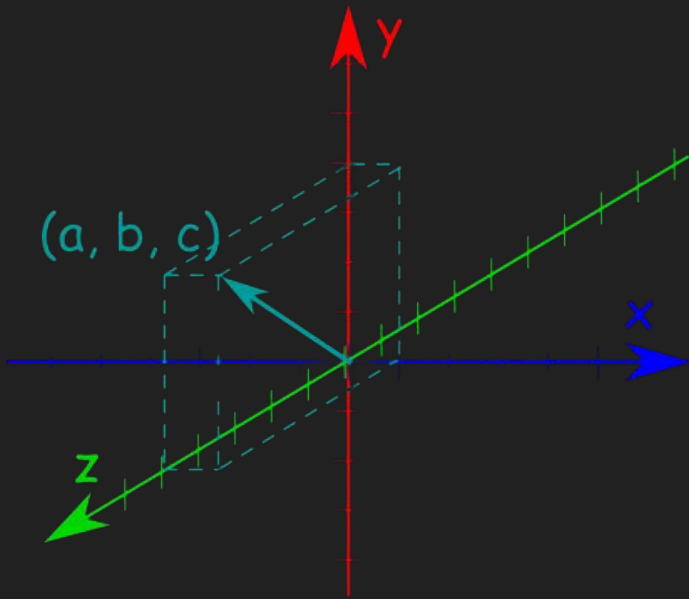


Heads? Tails?



Waves in all 3
dimensions

L2.5 Bra (Bra-ket) Notation



Quantize this line

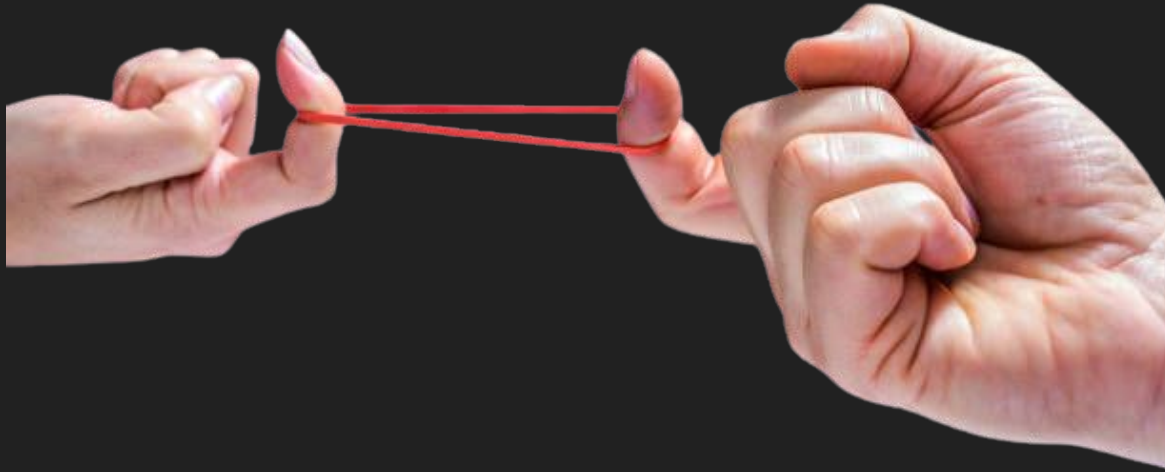
$$\mathbf{r} = \begin{bmatrix} a \\ b \\ c \end{bmatrix}$$

Using Matrix
Form

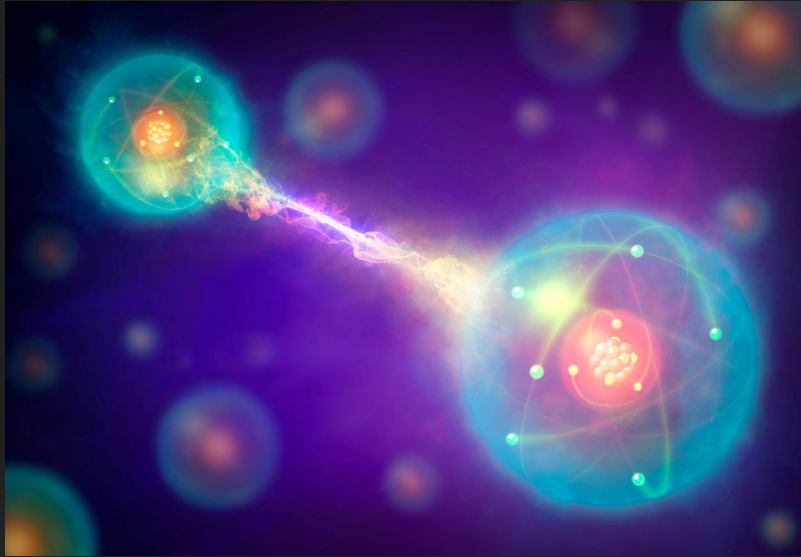
$$\langle a| = \begin{bmatrix} 2+3i & 6-4i & 3+i \end{bmatrix}$$

Or Bra form

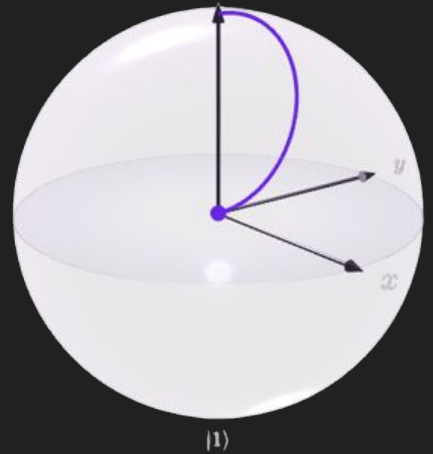
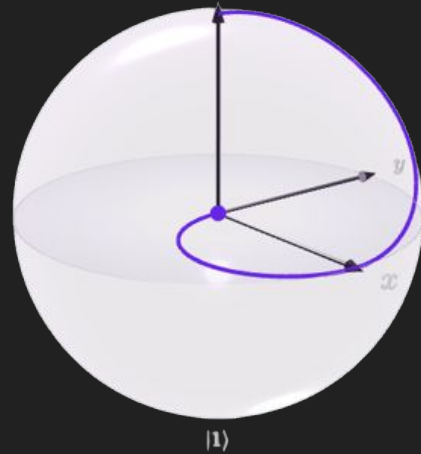
L3 A Quantum Relation



L3 Entanglement

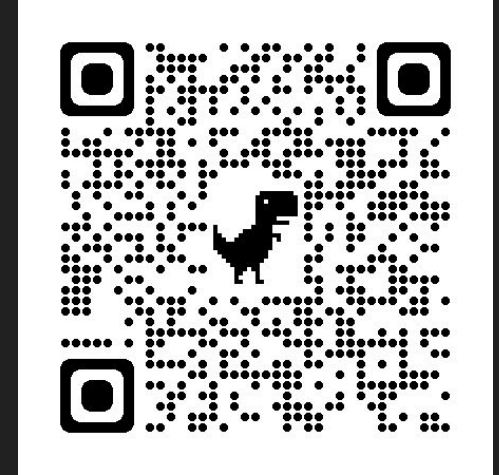


String theory anyone?



Qubits are connected

L3 Observation issues...

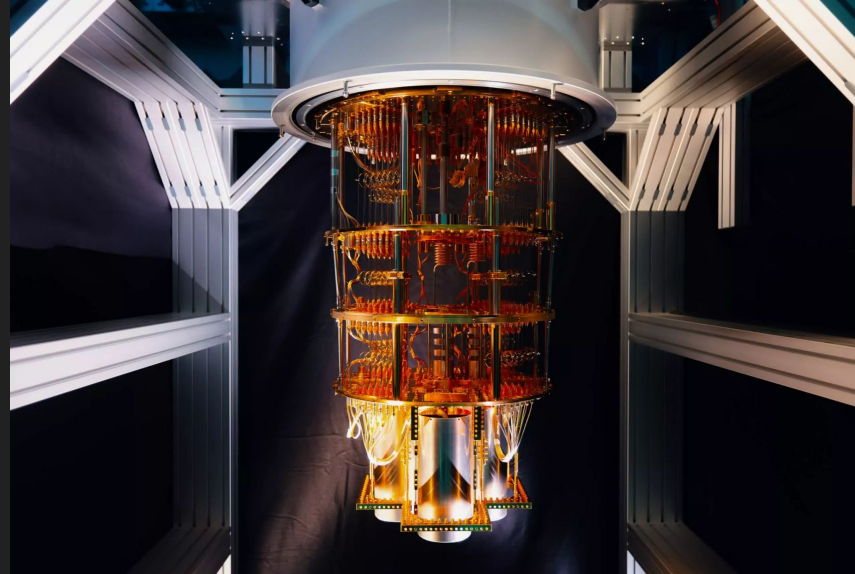


More interested?
Watch **this!**

Observing quantum information **changes the outcome**

L4 Uses of Quantum Computing

Security + Simulation
Improved Use of Logistics
Quantum Chemistry
RSA Encryption





WORKSHOP AT 3:30!!!