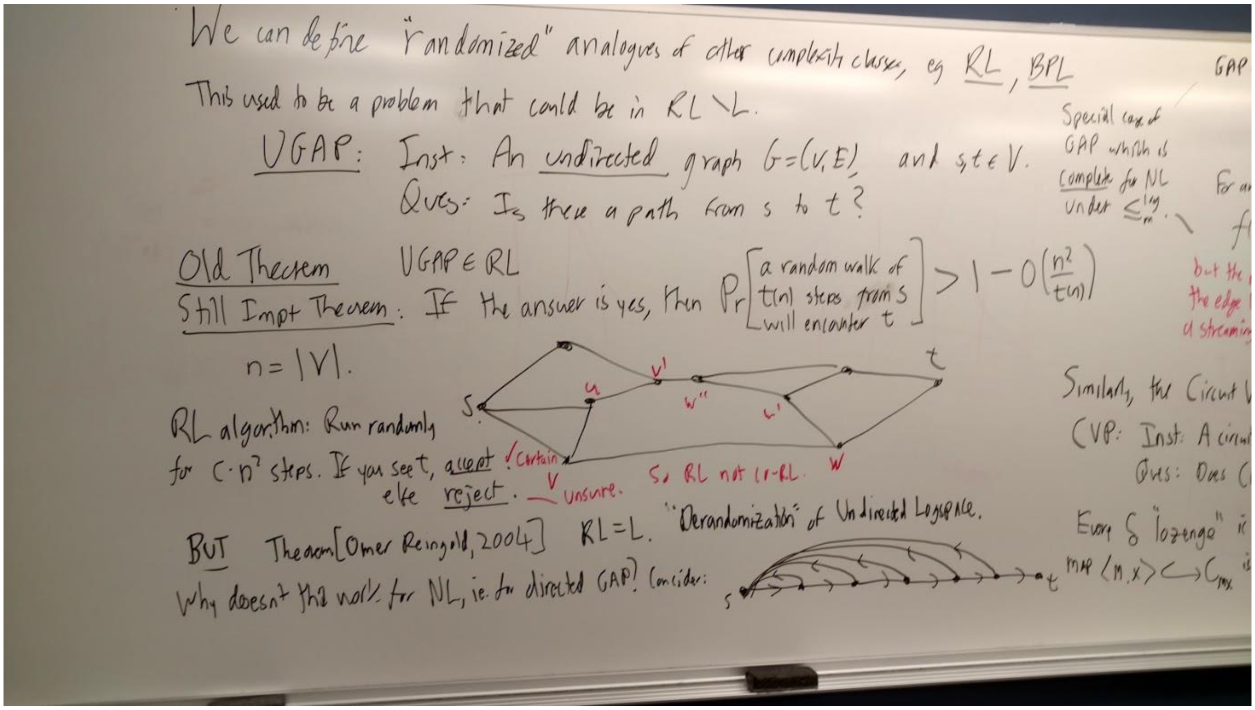
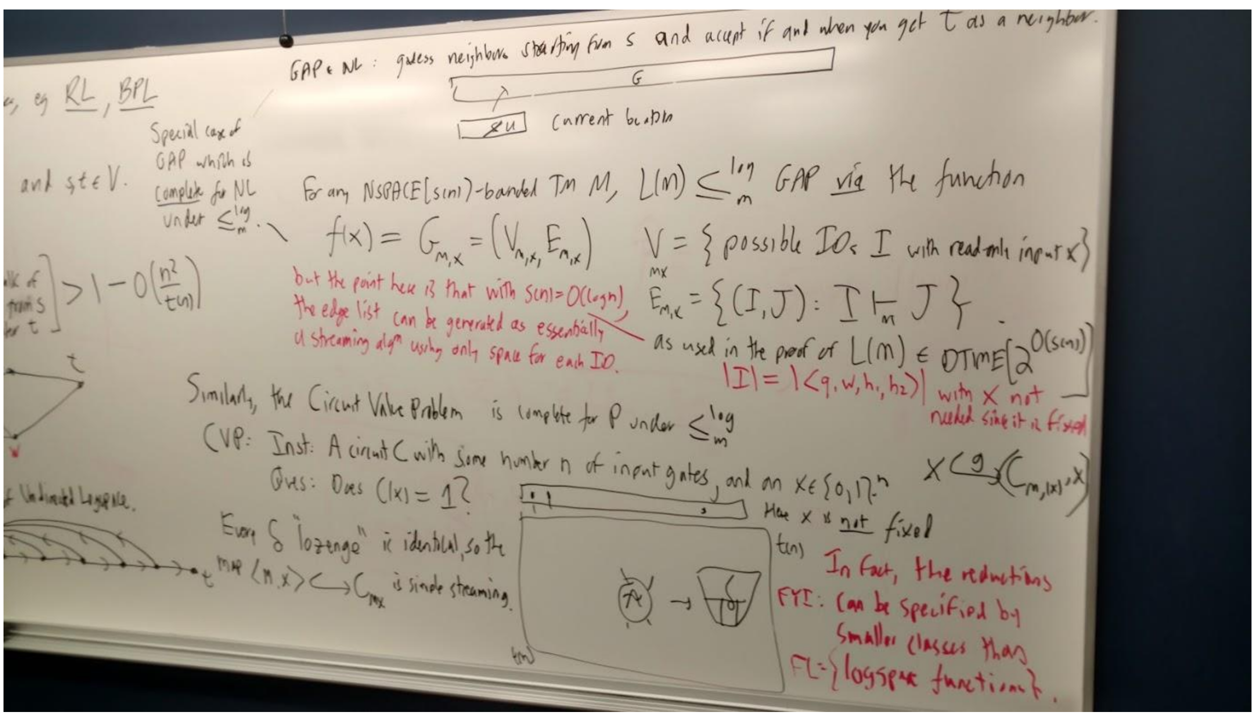
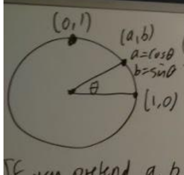
CSE596 Lecture Wed. Nov. 20, 2019







If you pretend a, b are real numbers, you can visualize a qubit on the unit circle.

<u>Quantum Computing</u>: The analogue of a <u>char</u> is a <u>qubit</u> (a,b): $a,b \in \mathbb{C}$ and $|a|^2+|b|^2=1$.

A qubit is a 2-vector in the Hilbert Space $\mathbb{C}^2$ of <u>norm</u> 1. The examples $(1,0)$ and $(0,1)$ are the <u>standard basis</u> vectors of $\mathbb{C}^2$. Since it is a basis every (other) vector is a linear combination of them:

$$(a,b) = a\cdot(1,0) + b\cdot(0,1)$$

<u>As chars</u>, $(1,0)$ is called $|0\rangle$ and $(0,1)$ is called $|1\rangle$

<u>Dirac</u> notation

Confusing? We index $(0,1)$ before $(1,0)$ but $|0\rangle$ comes before $|1\rangle$.

How does Nature concatenate these generalized chars? $(a,b)\cdot(c,d)$

Nature does $(a,b)\otimes(c,d) = (a\cdot c,\ a\cdot d,\ b\cdot c,\ b\cdot d) \in \mathbb{C}^4$.

<u>Dirac</u>: $(a|0\rangle + b|1\rangle)\otimes(c|0\rangle + d|1\rangle) = ac\underbrace{|00\rangle}_{e_1} + ad\underbrace{|01\rangle}_{e_2} + bc\underbrace{|10\rangle}_{e_3} + bd\underbrace{|11\rangle}_{e_4}$.

GAP ∈ NL: guess neig

For any NSPACE[s(n)]-

$f(x) = G_{M,x} = ($

but the point here is that wi
the edge list can be generated
a streaming alg^n using only spa

Similarly, the Circuit Value Problem is (

CVP: Inst: A circuit C with some num
Ques: Does $C(x) = 1$?

Every δ "lozenge" is identical, so the map $\langle M,x\rangle \hookrightarrow C_{Mx}$ is simple streaming.