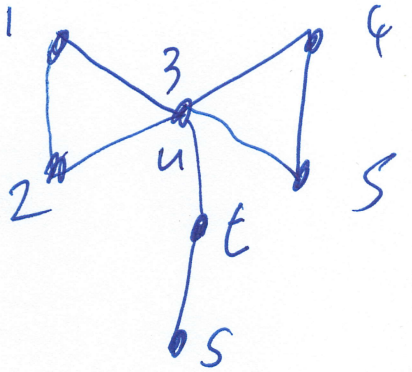
CSE 596 Lecture Wed 12/5 Fall 2018

Bowtie Graph



30-minute demo of both Dary Wybiral's Quantum Circuit Simulator and my "qci" pgm with chawen on metallica in /projects/regan/QCSAT/

Example for HW7, Problem (6).
Note: It would not matter if t and s were attached to a corner vertex instead - which means different "Graph States" can give the same quantum behavior.

Supremacy - General-Purpose Tasks.

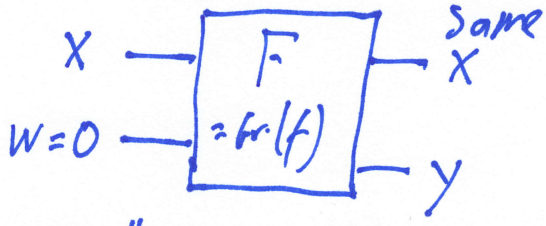
Quantum Advantage - A task performable by a QC with less effort than any classical computation can do.

David Deutsch's Task: Make an inference about a black-box Boolean function.

Function $f(x) = y$ "Graph" $F(x,0) = (x,y)$

Graphs: (x w → x y)

f_0: 00 ↦ 00, 10 ↦ 10, 01 ↦ 01, 11 ↦ 11 (identity permutation)



Generally, $y = W \oplus f(x)$

For a one-bit Boolean fn $f: \{0,1\} \to \{0,1\}$, four choices:

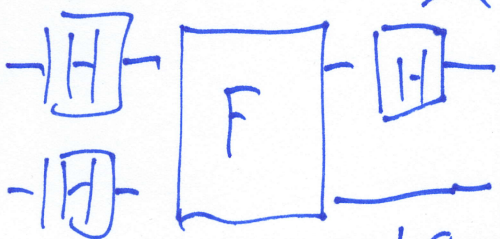
$f(0)=0$	$f(0)=1$	$f(0)=0$	$f(0)=1$
$f(1)=0$	$f(1)=1$	$f(1)=1$	$f(1)=0$
f_0	f_1	id.	NOT

id: (x w → x $y = w \oplus x$, $f(x) = x$)

00 ↦ 00, 01 ↦ 01, 10 ↦ 11, 11 ↦ 10 (F = CNOT)

Task: Tell with one evaluation of F whether
- f is one of the constant functions f_0 or f_1,
- vs. f is one of the balanced fns id or NOT

Cannot be done with one evaluation on a Boolean string.
Can be done with $x = H^{\otimes 2}|01\rangle$ by a QC:



"Maze" diagrams help visualize the +1, -1 cancels.

One superposed Quantum eval of gate F. (!)

TO BE CONTINUED ...