QuantA&M Informational

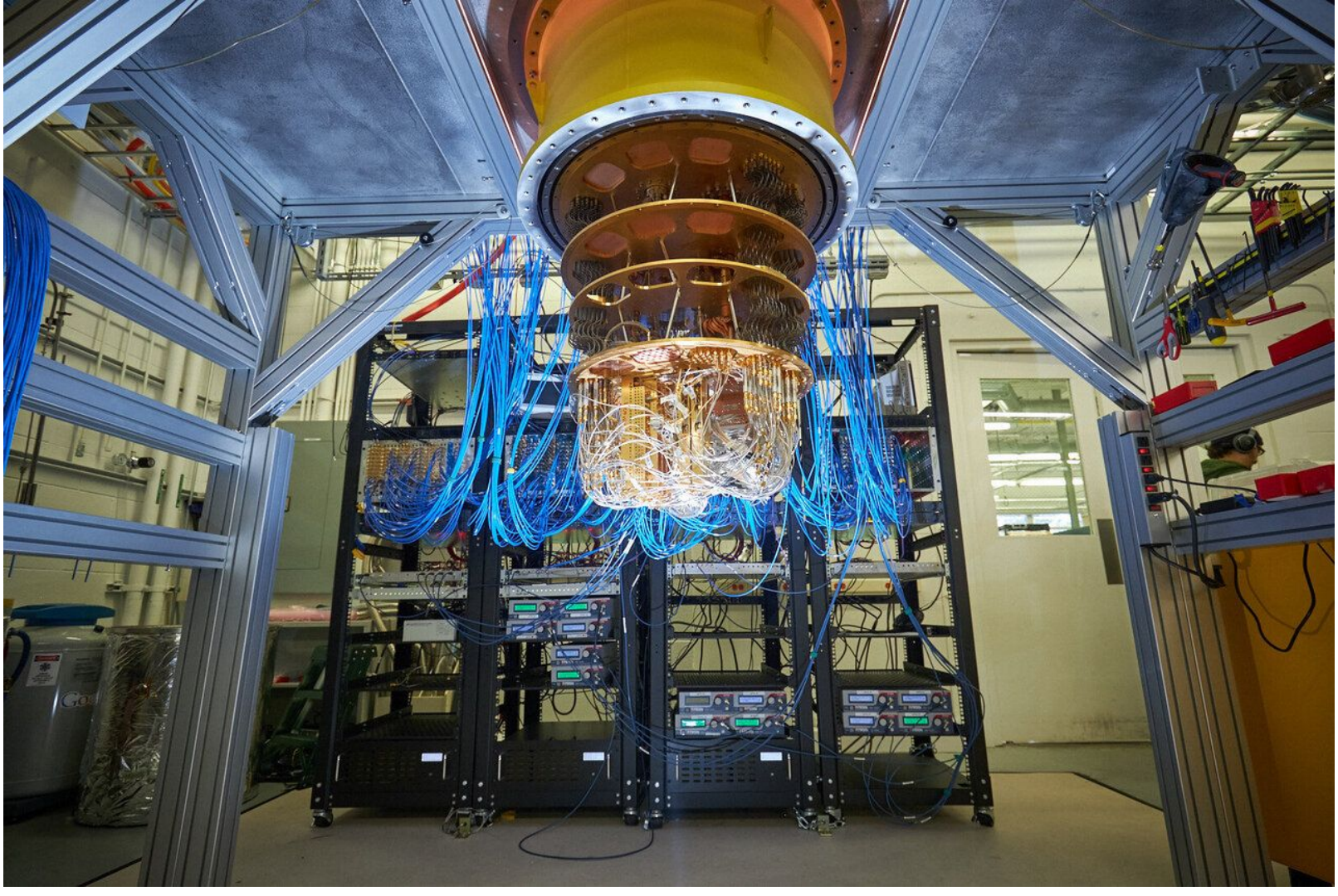
Welcome!

David Tanase - President

What is our mission?

The mission of QuantA&M is to connect students with the resources they need to learn more about the development, implementation, and application of quantum computing technology.

The organization also hopes to bring a new generation of inquisitive students to the forefront of quantum computing innovation as we enter a society which uses quantum computing as a mainstream method of solving complex problems.



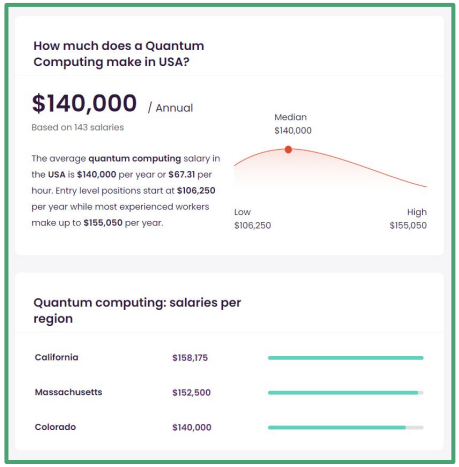
Background

- Founded Dec. 2022 by David Tanase, Mac Morrison, and Sam Bieberich
- Supported by faculty advisor Dr. James Cai:
  - Associate Professor, Veterinary Medicine & Biomedical Sciences
  - Affiliated Faculty, Electrical & Computer Engineering
  - https://cailab-tamu.github.io/
- Inspired by the lack of infrastructure A&M boasts in the field of Quantum Computing compared to other Universities
  - TU Quantum Collective - 600 members
  - Q-Munity (HS) - 12,000 members

"Our research lies at the interface of human genetics, computational statistics, and data science. Current research focuses on understanding diverse behaviors of cells using machine learning, network theory, and quantum computation."

Yeah but why else should I care?

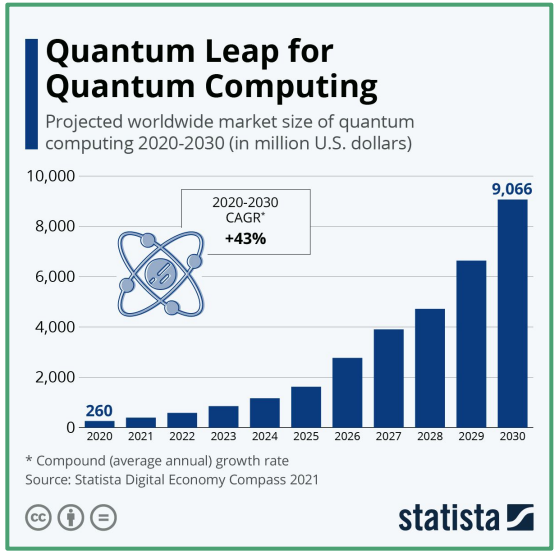
Samuel (Sam) Bieberich, Vice-President

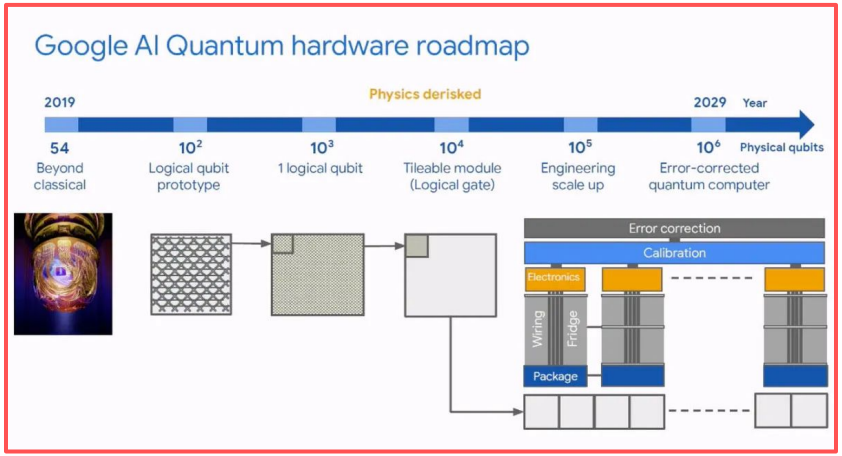


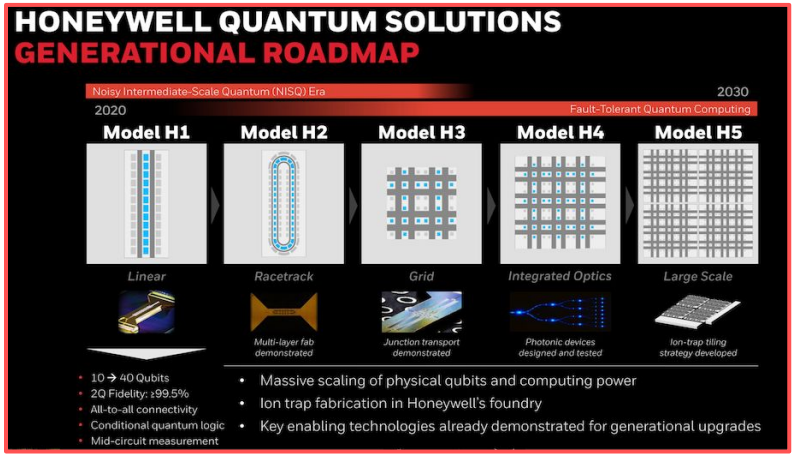
EMPLOYER	JOB TITLE	BASE SALARY	LOCATION	SUBMIT DATE	START DATE
IBM CORPORATION	QUANTUM COMPUTING APPLICATIONS RESEARCHER	250,000	SAN FRANCISCO, CA	02/26/2019	03/12/2019
JPMORGAN CHASE & CO	QUANTUM COMPUTING SCIENTIST	150,000	NEW YORK, NY	03/11/2019	09/10/2019
IBM CORPORATION	QUANTUM COMPUTING APPLICATIONS RESEARCHER	145,000	SAN JOSE, CA	03/26/2019	09/04/2019
RIGETTI & CO INC	QUANTUM ENGINEER	140,000	BERKELEY, CA	03/13/2019	09/09/2019
ALIBABA GROUP (US) INC	QUANTUM RESEARCH SCIENTIST	138,000	BELLEVUE, WA	03/11/2019	09/07/2019
IBM CORPORATION	QUANTUM SOLUTIONS DEVELOPER	125,445	YORKTOWN HEIGHTS, NY	03/20/2019	09/19/2019
PSIQUANTUM CORP	QUANTUM ARCHITECT	123,261	PALO ALTO, CA	03/12/2019	09/10/2019
PSIQUANTUM CORP	QUANTUM ARCHITECT	123,261	PALO ALTO, CA	03/12/2019	09/10/2019
RAYTHEON BBN TECHNOLOGIES CORP	QUANTUM COMPUTING THEORIST	121,555	CAMBRIDGE, MA	03/08/2019	08/08/2019
IBM CORPORATION	QUANTUM SOLUTIONS DEVELOPER	120,000	YORKTOWN HEIGHTS, NY	02/04/2019	08/06/2019

	MSc(grad)	POST DOC (2 years)	1-2 years (industry)	2-3 years (industry)	3-4 years (industry)	5+ years +
Quantum Algorithm Scientist	$90k +	$115k - $145k	$130k - $150k	$155k - $180k	$190k - $225k	$250k +
Quantum Hardware Engineer	$80k +	$95k - $125k	$115k - $130k	$125k - $160k	$160k - $180k	$200k +
Quantum Software Engineer	$90k +	$115k - $145k	$130k - $150k	$155k - $180k	$190k - $225k	$250k +
Optomechanical Engineer	$85k +	$110k - $125k	$125k - $140k	$145k - $155k	$160k - $180k	$200k +
Superconducting Circuit Designer	$90k +	$110k - $125k	$125k - $140k	$145k - $155k	$160k - $180k	$200k +
Business Development	$75k +	$90k - $110k	$105k - $115k	$120k - $135k	$140k - $155k	$175k +

For more information or to discusss career opportunities contact Connor@quantum-futures.com







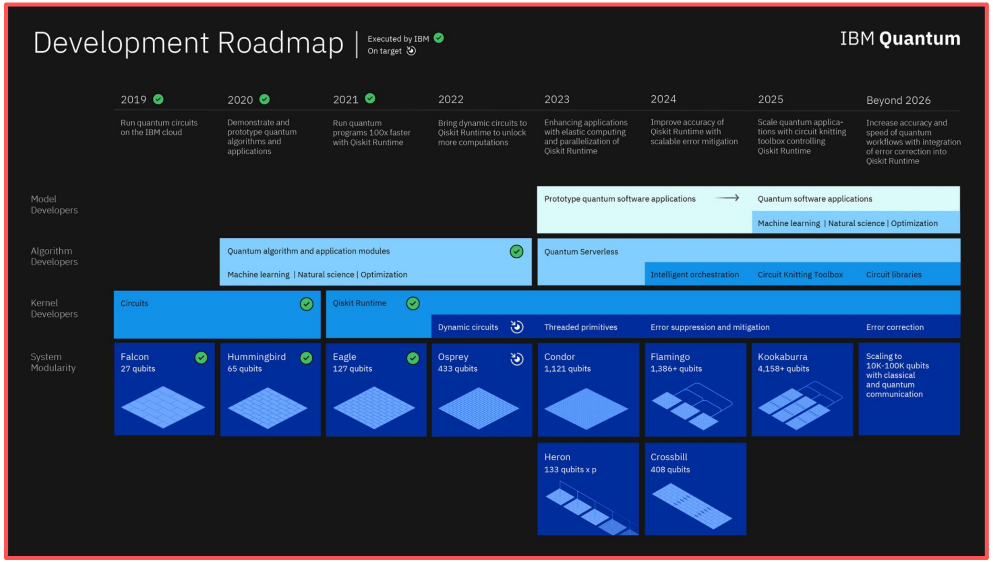
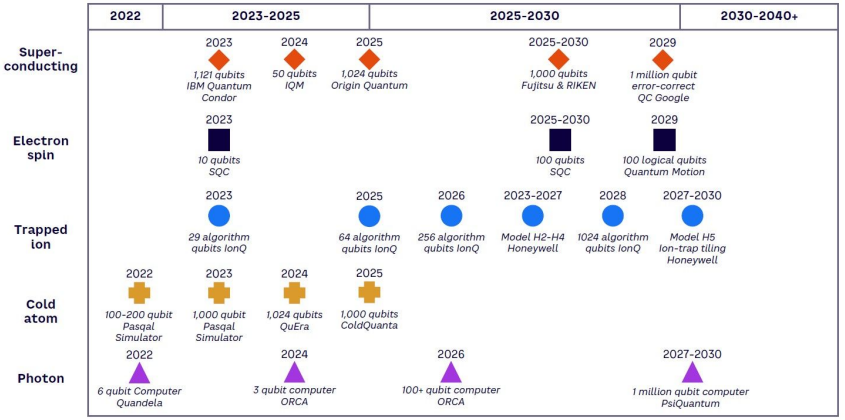
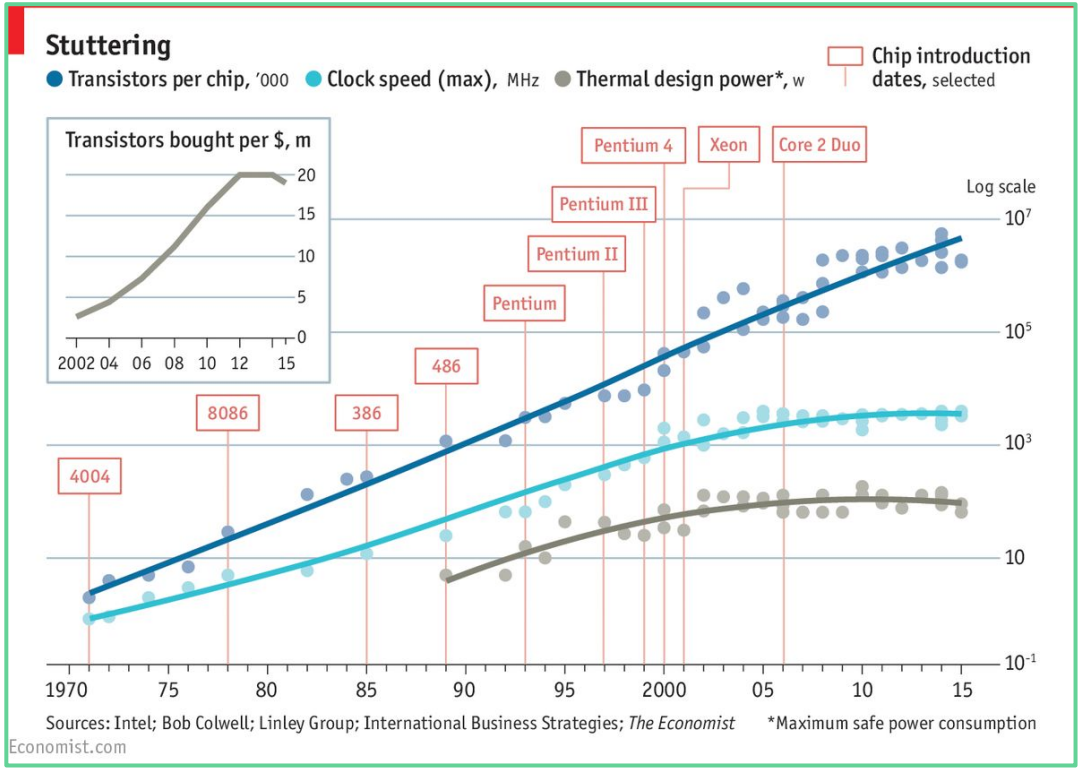


Figure 2. Quantum computing prototypes announced on vendor roadmaps



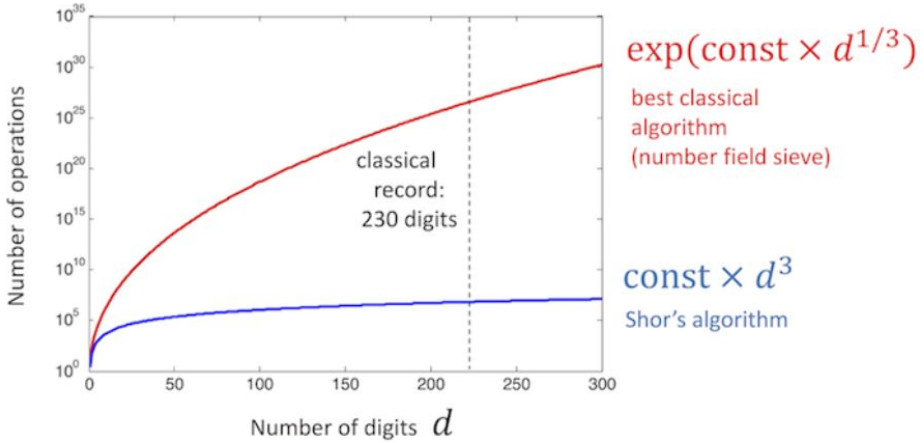
Source: Arthur D. Little, Olivier Ezratty

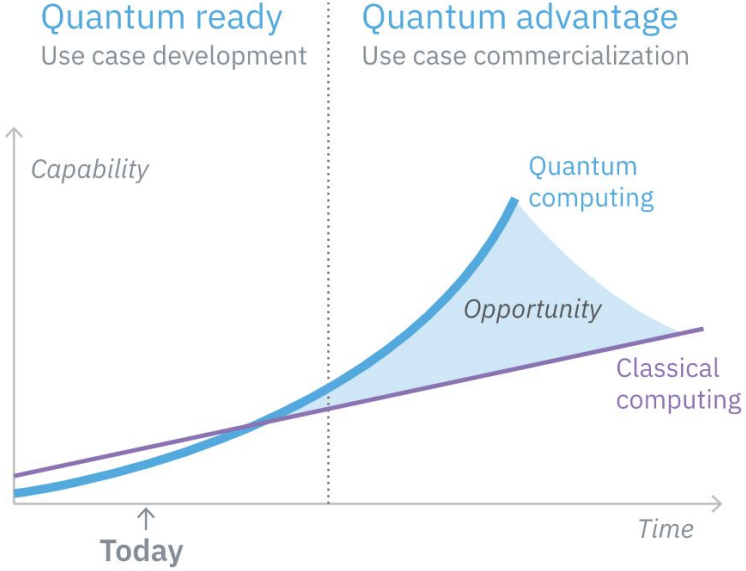
Moore's Law


Stuttering
Transistors per chip, '000
Clock speed (max), MHz
Thermal design power*, w
Chip introduction dates, selected
Transistors bought per $, m
20
15
10
5
0
2002 04 06 08 10 12 15
Pentium 4
Xeon
Core 2 Duo
Pentium III
Pentium II
Pentium
486
8086
386
4004
Log scale
10^7
10^5
10^3
10
10^{-1}
1970 75 80 85 90 95 2000 05 10 15
Sources: Intel; Bob Colwell; Linley Group; International Business Strategies; *The Economist*
*Maximum safe power consumption
Economist.com


THE END IS
NIGH

We-Chih Huang - Graduate Mentor





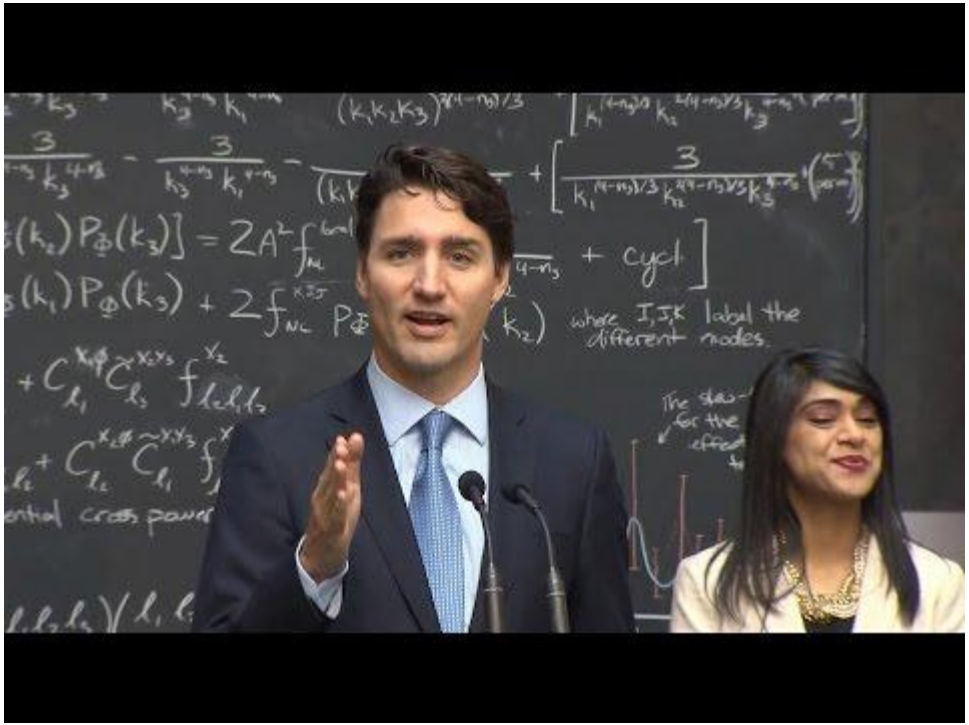
Quantum Computing Vs. Classical Computing

Quantum Computing	Classical Computing
Calculates with qubits, which can represent 0 and 1 at the same time	Calculates with transistors, which can represent either 0 or 1
Power increases exponentially in proportion to the number of qubits	Power increases in a 1:1 relationship with the number of transistors
Quantum computers have high error rates and need to be kept ultracold	Classical computers have low error rates and can operate at room temp
Well suited for tasks like optimization problems, data analysis, and simulations	Most everyday processing is best handled by classical computers

CBINSIGHTS

	Two prime numbers		The product	
piece of cake	73797149 * 82268713	→	6071196471299237	
Hard	73797149 * 82268713	←	6071196471299237	until QC....

What is Quantum Computing anyways?



Future plans

Book club/Study group

- We want to begin to harbor a learning program for the field of QC
  - To do so, we will start with the Qiskit textbook this semester, and by the end of the year we hope that you will be qualified to take the IBM Qiskit Advocate exam
  - Free at https://qiskit.org/learn/

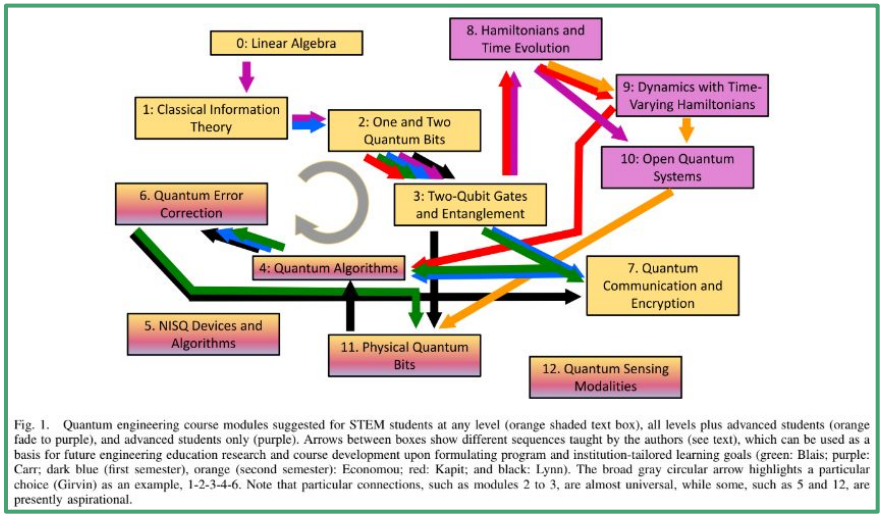
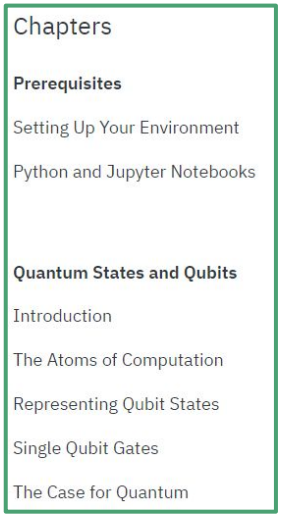
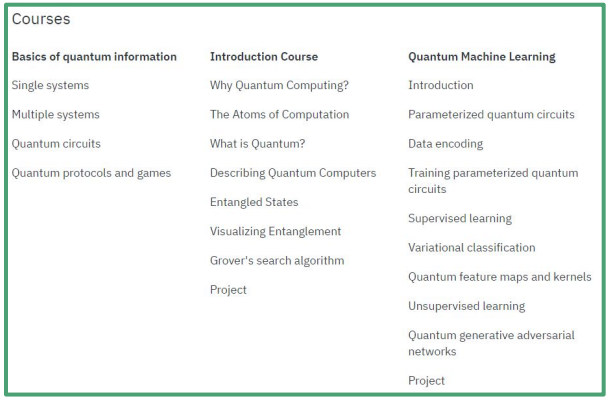


Fig. 1. Quantum engineering course modules suggested for STEM students at any level (orange shaded text box), all levels plus advanced students (orange fade to purple), and advanced students only (purple). Arrows between boxes show different sequences taught by the authors (see text), which can be used as a basis for future engineering education research and course development upon formulating program and institution-tailored learning goals (green: Blais; purple: Carr; dark blue (first semester), orange (second semester): Economou; red: Kapit; and black: Lynn). The broad gray circular arrow highlights a particular choice (Girvin) as an example, 1-2-3-4-6. Note that particular connections, such as modules 2 to 3, are almost universal, while some, such as 5 and 12, are presently aspirational.





Independent or Team projects

Because quantum computing is a small, but growing field, there are limited opportunities at the moment, meaning only those with good resumes will be accepted to the most enviable positions. This is why we encourage our members to take part in an individual or group project, sponsored by QuantA&M, which they may use on their resumes or for future reference with applications in the field.

Some potential ideas for a project are as follows:

- Quantum Blog Post
- Undergraduate research paper submission
- Github code projects with Quantum languages (Qiskit, Q#, Cirq, etc.)

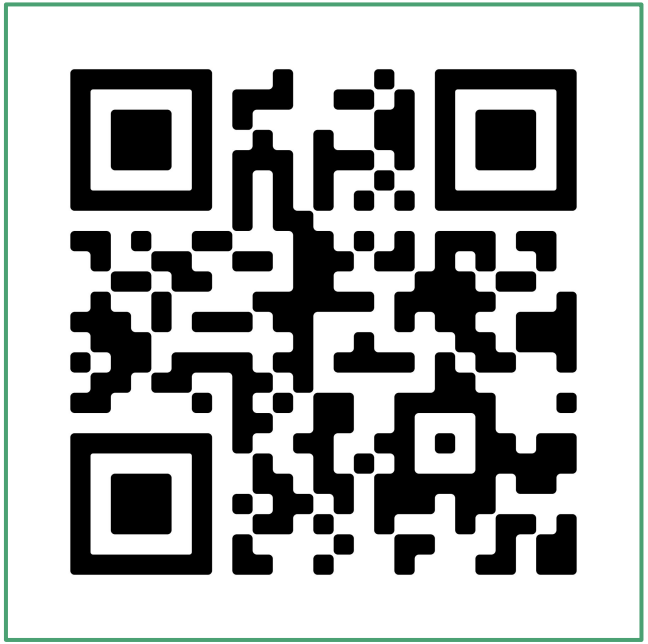
A lot more information about these opportunities is available on the Discord channel for projects, accessible by assigning yourself the role Interested in a Quantum Project

Speaker events

- Hosted by QuantA&M, come to listen to a speaker or a panel of speakers from either A&M or Industry talk about QC
- First event will be this month, date pending, with 2-3 graduate students at A&M working in the field of Quantum Physics (related to QC)

Thanks for giving us a shot!

- Discord
  - Main source of information until website is live
- Newsletter
  - Publishing announcements and dates of events
  - Posted weekly in the Discord, and via email



Upcoming Events:

- Feb. 8 First Book Club meeting (7-8 pm approx.) on Zoom
  - How to set up and run a job on a real quantum computer
- Feb. 13 QHack introductory event (time pending) @ Peterson Building