

# Physicist in the Business World

Sharing what I learned as a Ph.D. student, Physicist, Quant,  
Data Scientist, Software Engineer and Educator

Alex Pang  
NC State, Oct 7<sup>th</sup>, 2022

Disclaimer: This is not meant to be any formal advice. The opinions expressed is solely based on my own experience with possible bias. I do not benefit in any forms from the presentation, or anyone mentioned or reference in the presentations

## Your Speaker

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Who is Alex Pang?

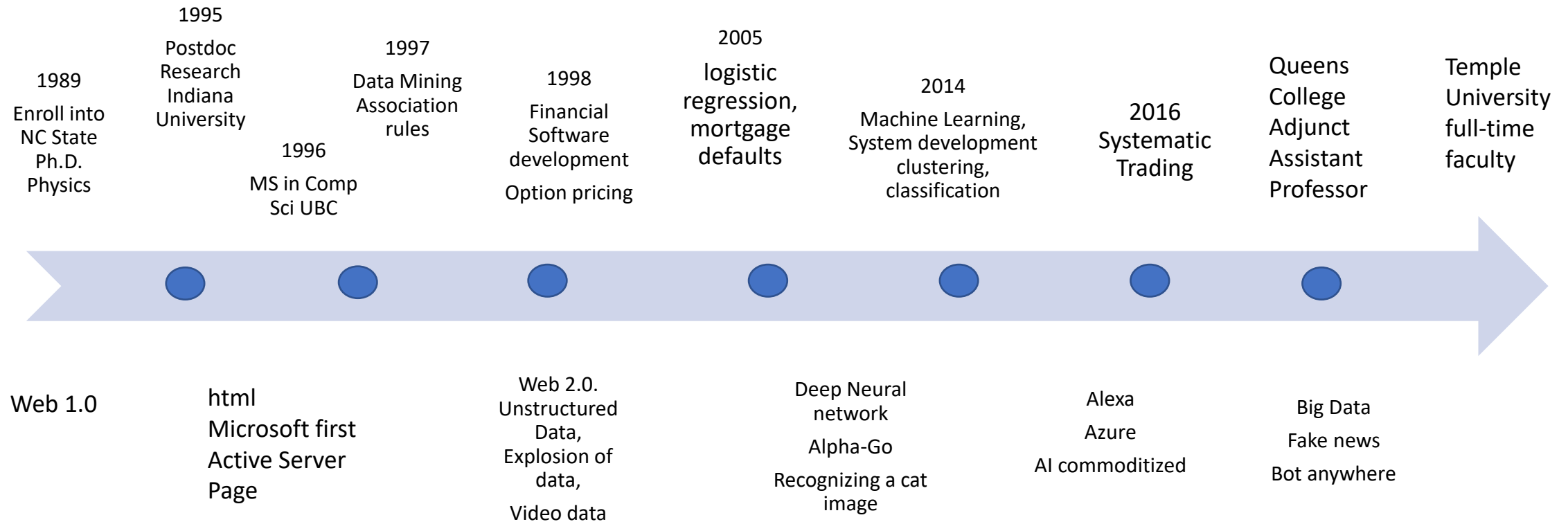


<https://www.linkedin.com/in/alex-pang-phd-cfa-a2bb984/>

# Alex Pang Bio

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## My Life As a Physicist, Quant, Data Scientist, Software Engineer and Educator



Nice Picture, isn't it?

Nice long straight arrow

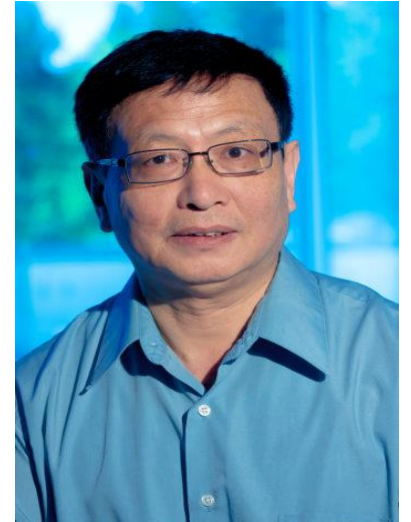
In reality, it is far, far away from a straight line

# Story of Yitang Zhang

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## [Unheralded Mathematician Bridges the Prime Gap | Quanta Magazine](#)

- Graduated with a Math Ph.D. from Purdue in 1991
- Had difficulty in finding an academic position
- Had worked as an accountant, a delivery worker and in a Subway sandwich shop
- Lived in his car. Finally find a lecturer position at University of New Hampshire in 1999
- Worked on his research at his spare time without research support
- Published a ground-breaking paper in 2013 to prove a conjecture on prime numbers which has been one of the great open questions in number theory for many years.



[Yitang Zhang - Wikipedia](#)

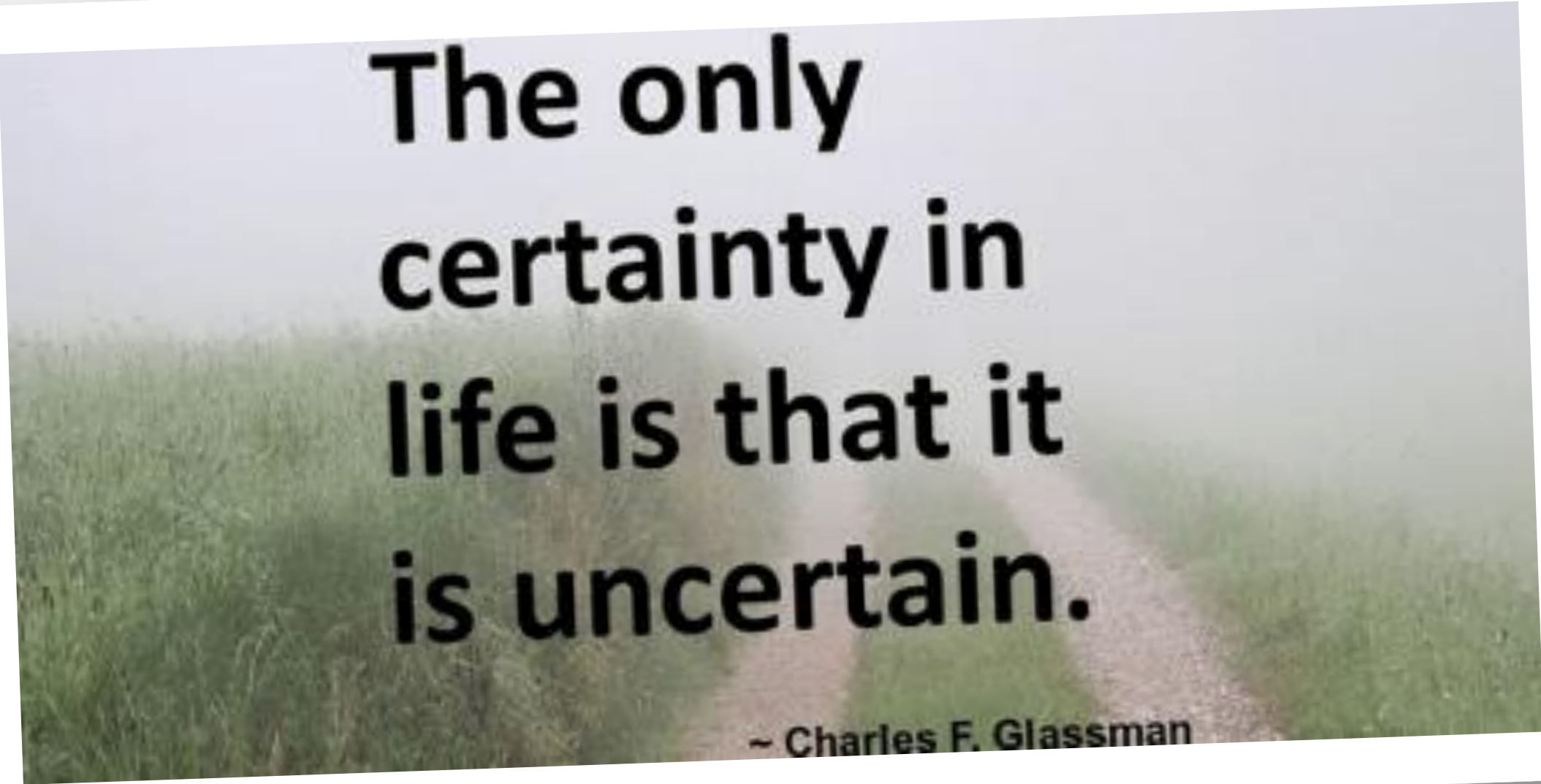
Expectation



Reality





A photograph of a dirt road winding through a field of tall grass, shrouded in thick fog. The road is reddish-brown and leads into the distance, disappearing into the mist. The grass is green and tall, lining both sides of the road. The fog is thick and white, covering the upper half of the image and obscuring the horizon.

**The only  
certainty in  
life is that it  
is uncertain.**

**~ Charles F. Glassman**

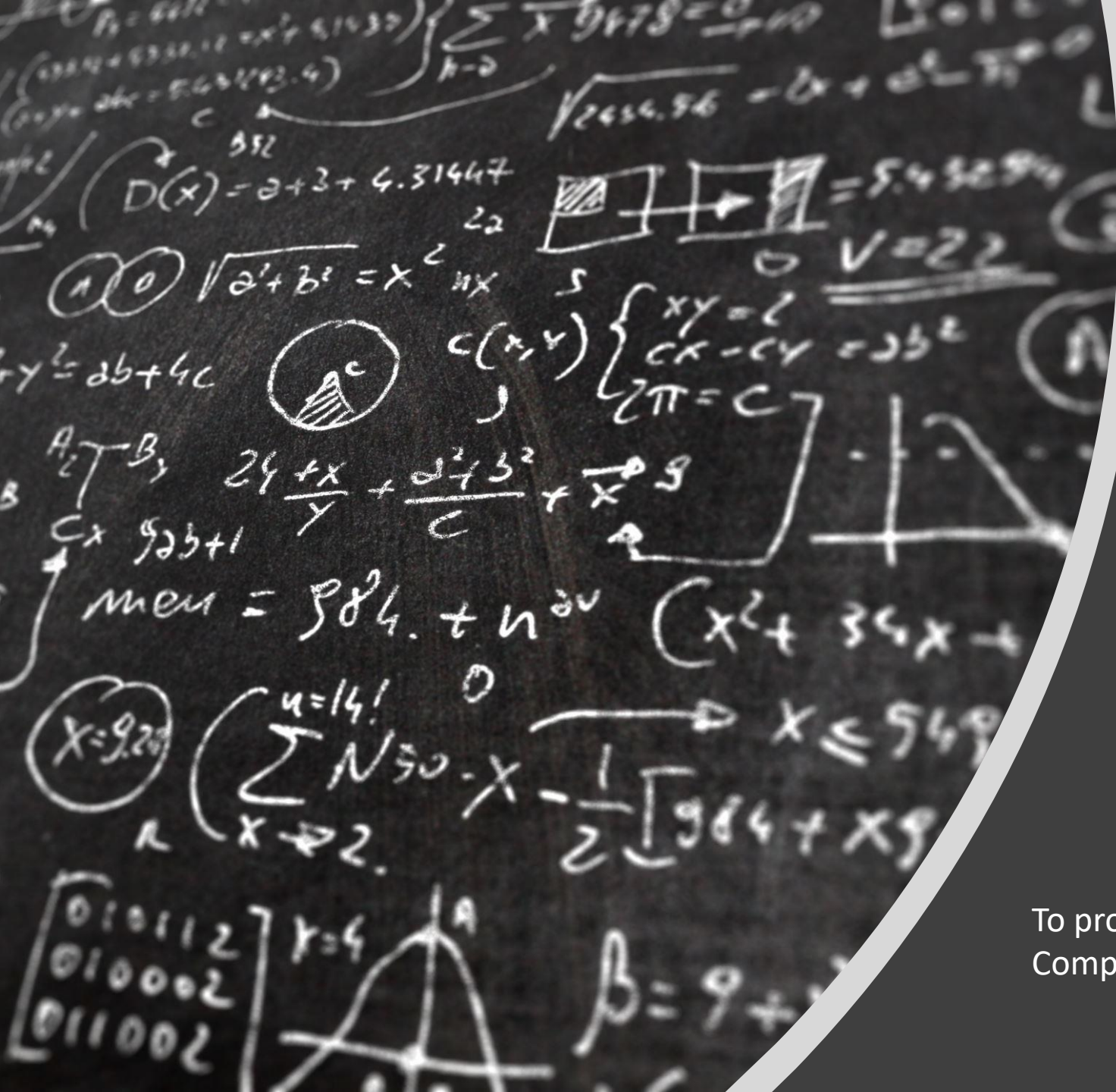


No one knows your future



# Accept Uncertainty and Reality

You cannot solve the problem if you  
do not know what the problem is



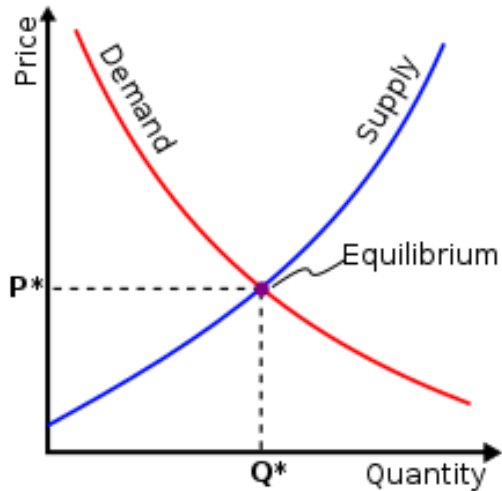
But there are  
thing that are  
invariant

To prove whether an algorithm is correct or not in  
Computer Science, we rely on the Loop Invariant

# Things that you can hold on to

← (THE LAW OF LARGE NUMBERS)

$$\frac{N_n(\text{outcome})}{n} \rightarrow P(\text{outcome}) \quad \text{as } n \rightarrow \infty$$



*Work Hard with Integrity*

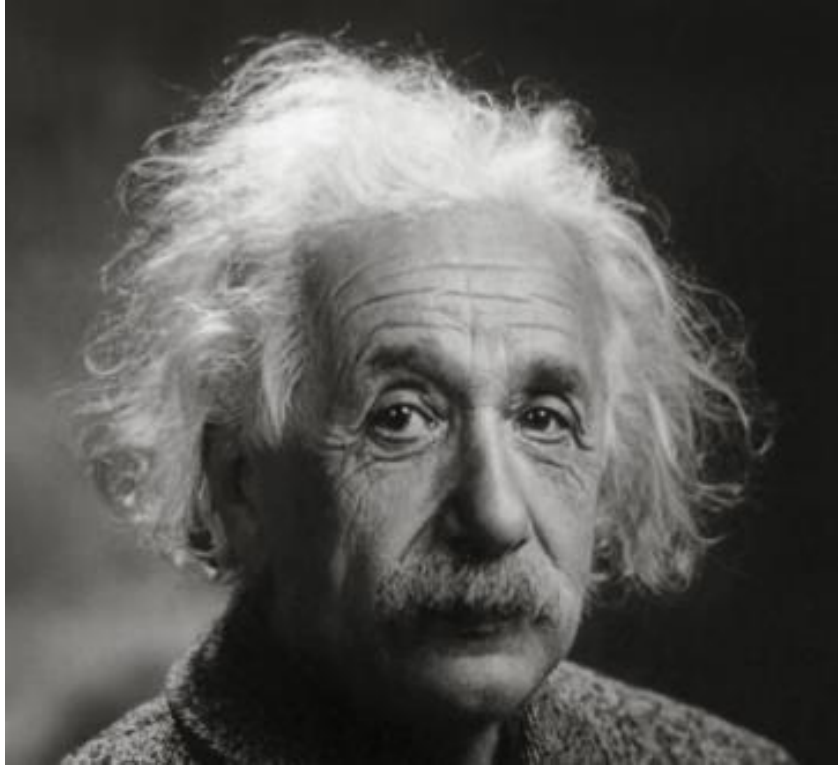
*Greed and Fear*

*Be Kind, Keep Learning*



# Things that you can hold to

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People with a Ph.D. degree in Physics is smart (if not the smartest)

# Best Education one can get

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## Ph.D. in Physics

- Logical Thinking
- Solid Mathematical Foundation
- Problem Solving Skills in never-seen settings
- Algorithmic Implementation
- Programming
- Ability to abstract and generalize, but also fall back to reality

NC State is the best and Dr. Chueng Ji is the best of the best

You are a great product and  
a hot commodity

If you are a good salesman of your product and  
are in the right place



# Practical Advice

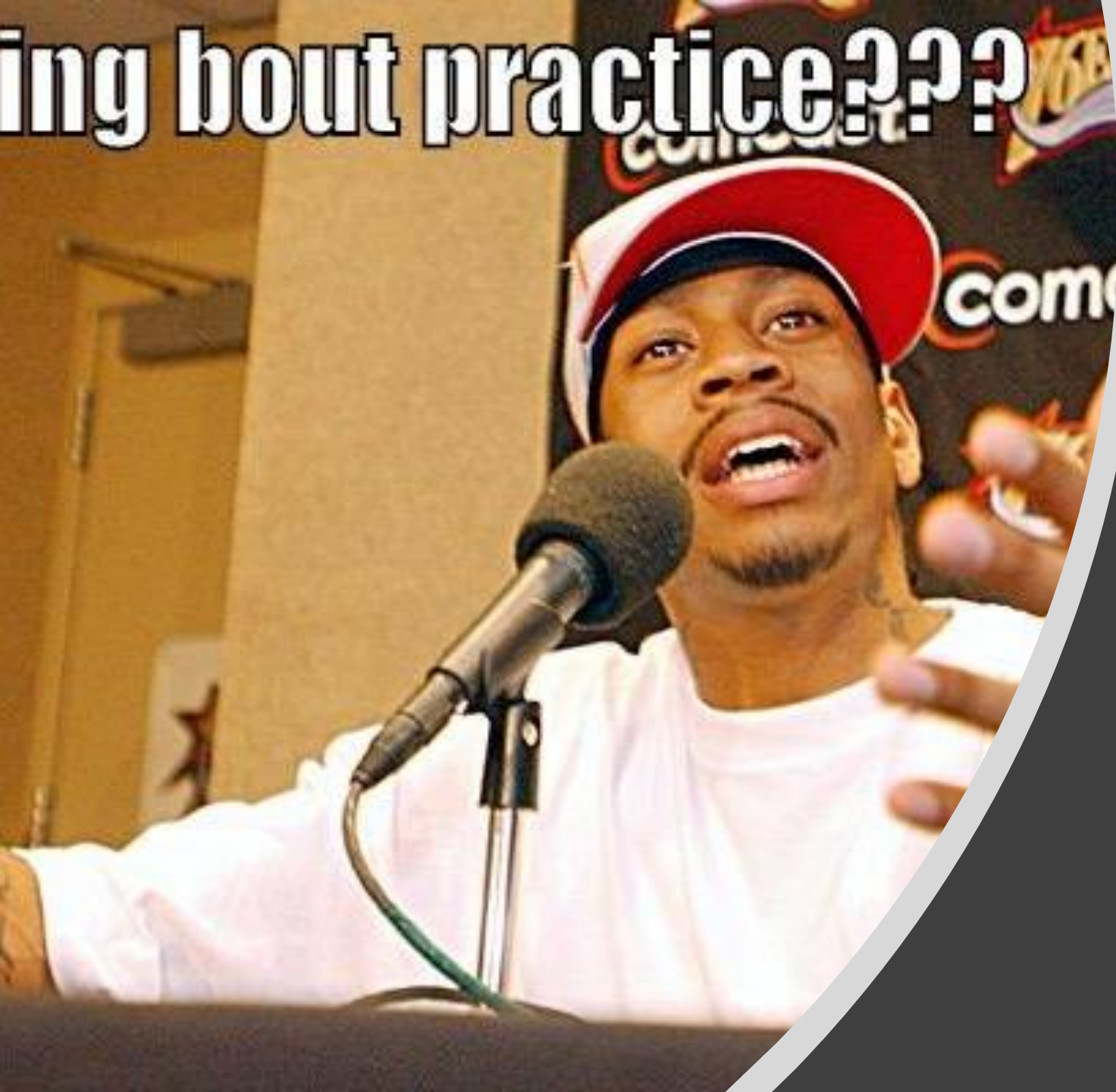
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- Be able to explain in layman terms what are you good at
- How did you solve a difficult problem
- How are you relevant to your listener

5 min Elevator Pitch

We are scientist.  
We do not have time for superficial things

If you cannot explain it in simple English terms, you do not understand it



ing bout practice???

Practice  
makes perfect

Unless you are Allen Iverson

# Nobel Prize in Physics 2022

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## What is this thing, Quantum Entanglement?

Two particles originated from the same source at the certain point in time, but they have been separated far apart. Now if someone make a measurement with one of them, say in New York, on their weight or to be more precise it's spin, then one can instantaneously know what is the weight or spin of the other particles, say, in London even though they are thousands of miles away or have been separated for a long time. They are “entangled” with each other.

Another way is to think about this is ...

A couple divorced 5 years ago with the husband now living in New York and the wife living in Paris. When you find out the net worth of the husband, you know immediately how rich his ex-wife is. They are separated but still entangled with each other...

... then you can talk about “especially with children” .. And talk about “Spooky” action etc.

# Practical Advice (continued)

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- You need to get through the first screening
  - Technical Interview, Online Coding Test
  - HR, Recruiter
  - Need professional LinkedIn Profile
  - Nice to have a Github account
  - Neat Resume
- How to be successful in interview
  - Put yourself in the interviewer's shoe
  - They have an explicit or implicit checklist
    - They don't want to make a mistake in their hiring
    - You comes across as too arrogance
    - You are too "independent", too stubborn
    - Not practical

## Some Useful Resources

- [LeetCode - The World's Leading Online Programming Learning Platform](#)
- [Cracking the Coding Interview: 189 Programming Questions and Solutions: McDowell, Gayle Laakmann: 1235264539136: Amazon.com: Books](#)
- [Amazon.com: A Practical Guide To Quantitative Finance Interviews: 9781735028804: Zhou, Xinfeng: Books](#)
- Google Top 10 or 100 Data Science Interview Questions
- MIT OpenCourseWare, Coursea
- [Learn R, Python & Data Science Online | DataCamp](#)

Remember there are tons and tons  
of resources

You can learn and find anything online

# What do you mean by “In the right Place”?

In 2012, Harvard Business Review said  
Data Scientist will be the Sexiest Job  
of the 21<sup>st</sup> Century

**Harvard  
Business  
Review**

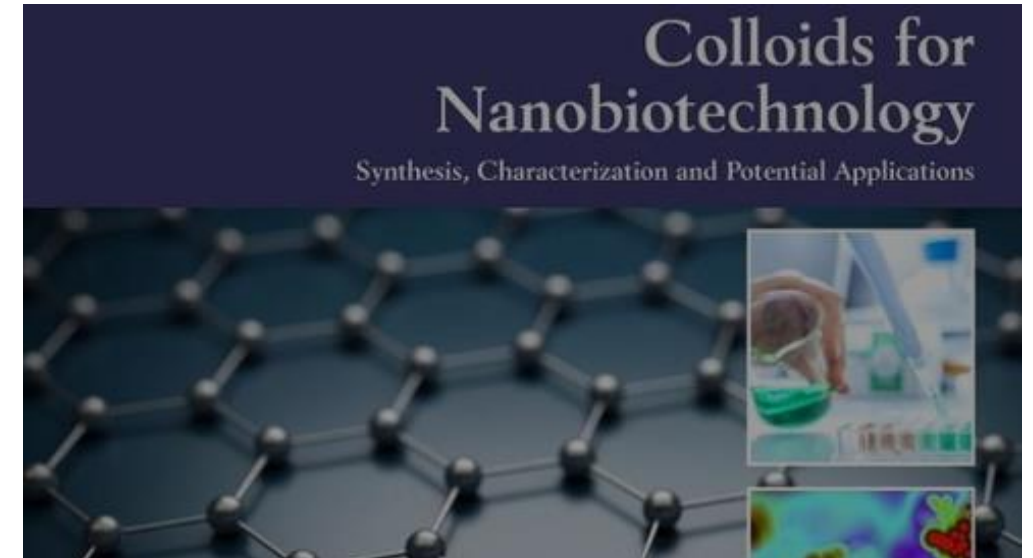


DATA

## Data Scientist: The Sexiest Job of the 21st Century

by Thomas H. Davenport and D.J. Patil

FROM THE OCTOBER 2012 ISSUE

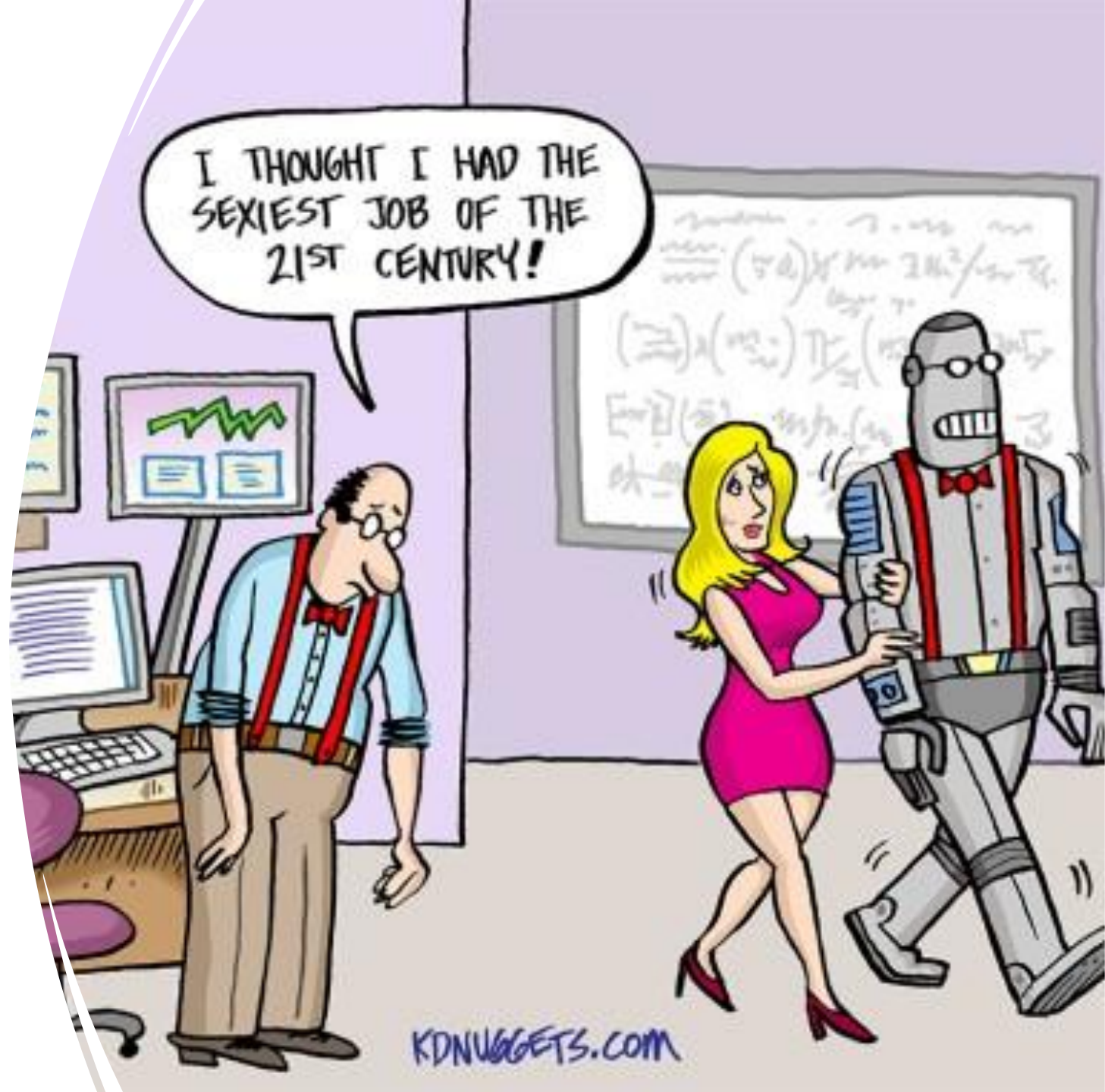




But remember  
what goes around  
comes around

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- Keep Learning
- Be ready to Adapt and Adjust



# Keep your mind open

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- Read the headline news
- Expand your network
- Expand your knowledge horizon
- LinkedIn
- Github

Remember who is your best friends or best teachers?



# Keep an open mind

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Use Machine Learning to help analyzing Physics

- [Speeding up machine learning for particle physics | CERN \(home.cern\)](#)

Use Physics Tools to help understand how Deep Neural Network works

- [The Principles of Deep Learning Theory \(May 10, 2022\) · Indico \(cern.ch\)](#)

The Sky is your limit

If you keep your curiosity alive

# Real life Physicists turned businessman

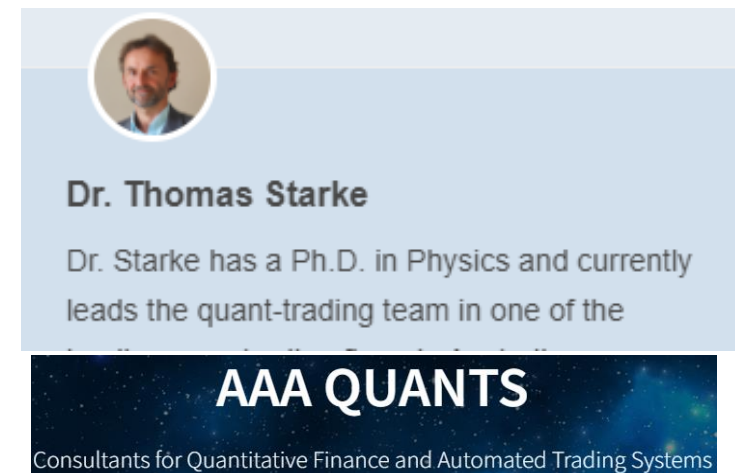
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[\(7\) Igor Halperin | LinkedIn](#)



[Arthur Berd | LinkedIn](#)



[\(7\) Dr Tom Starke | LinkedIn](#)

Note: I skip the famous ones such as Emanuel Derman and Stephan Wolfram and just quote a few that are under my radar in finance. I am sure there are a lot of other not-crazily-famous but equally successful Physicists-turned businessmen

Machine Learning in Finance  
Credit and Risk Modeling  
Risk Management

Stochastic Calculus  
Systematic Trading

Chat with Traders (great pod cast if you are into trading)

[147: Detective work leading to viable trading strategies, and the rise of AI w/ Dr Thomas Starke | Chat With Traders](#)

# Real life Physicists turned businessman

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[Physics and business share a bond | MIT News | MIT](#)

Jeff Evenson and Jeff Trester, who both received the S.B. in physics in 1988, use the tools of math and physics at work and relish the worldly success they found in business consulting and venture capitalism. They spoke in a Jan. 28 IAP session titled "Physics in Business: A Tale of Two Graduates and How They Made It Big in the Real World."

Everyone is different. Find your own path



People say College is your  
best time of your life

I say it's your graduate  
study years



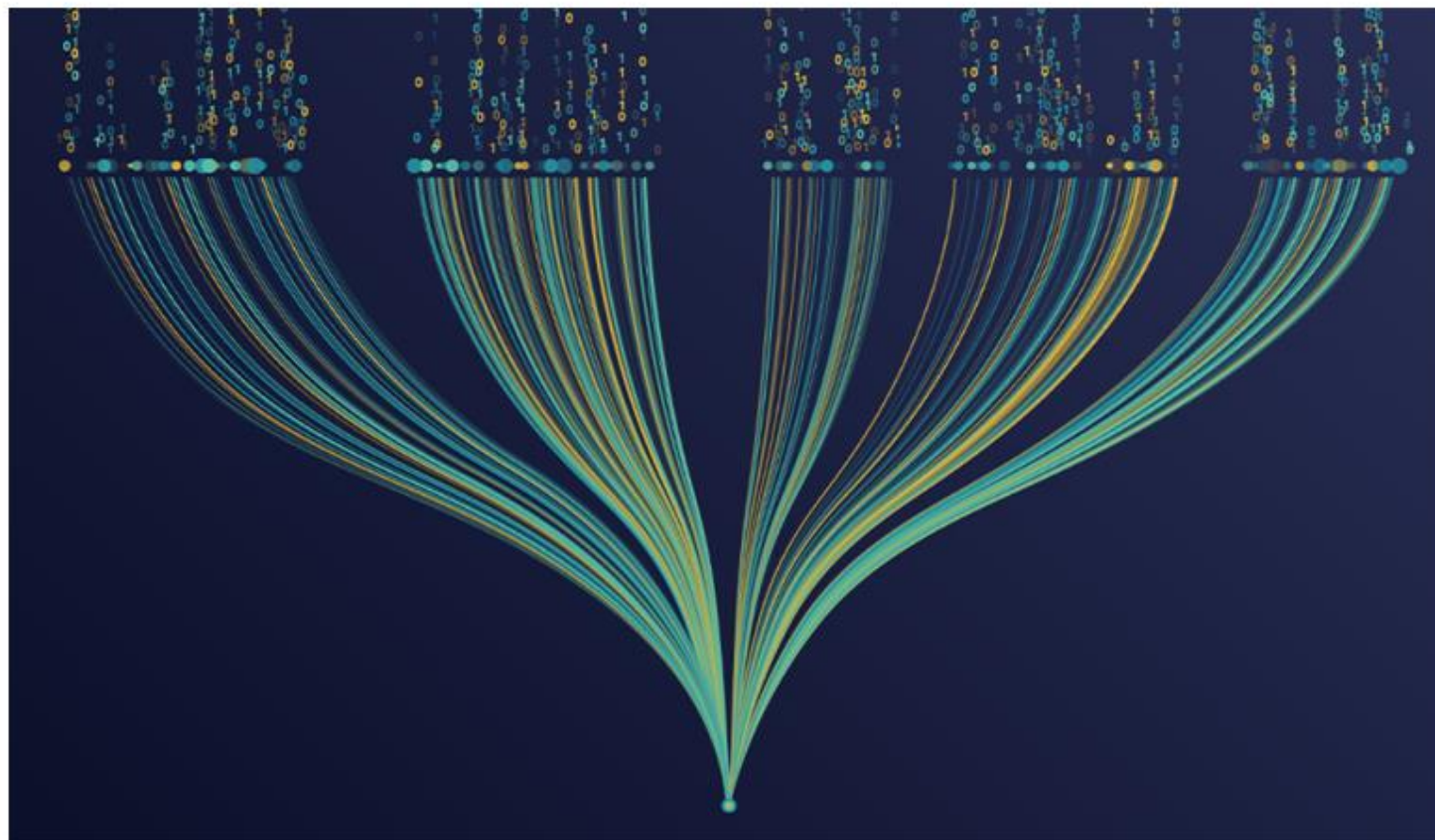
Enjoy your freedom in graduate  
school years

People say College is your best  
time of your life, I say it's your  
graduate study years

# Quantum AI breakthrough: theorem shrinks appetite for training data

Rigorous math proves neural networks can train on minimal data, providing 'new hope' for quantum AI and taking a big step toward quantum advantage

AUGUST 23, 2022



Contrary to previous assumptions, the size of the training data set will no longer be an obstacle for quantum AI. Credit: Dreamstime

## SHARE



## RELATED STORIES

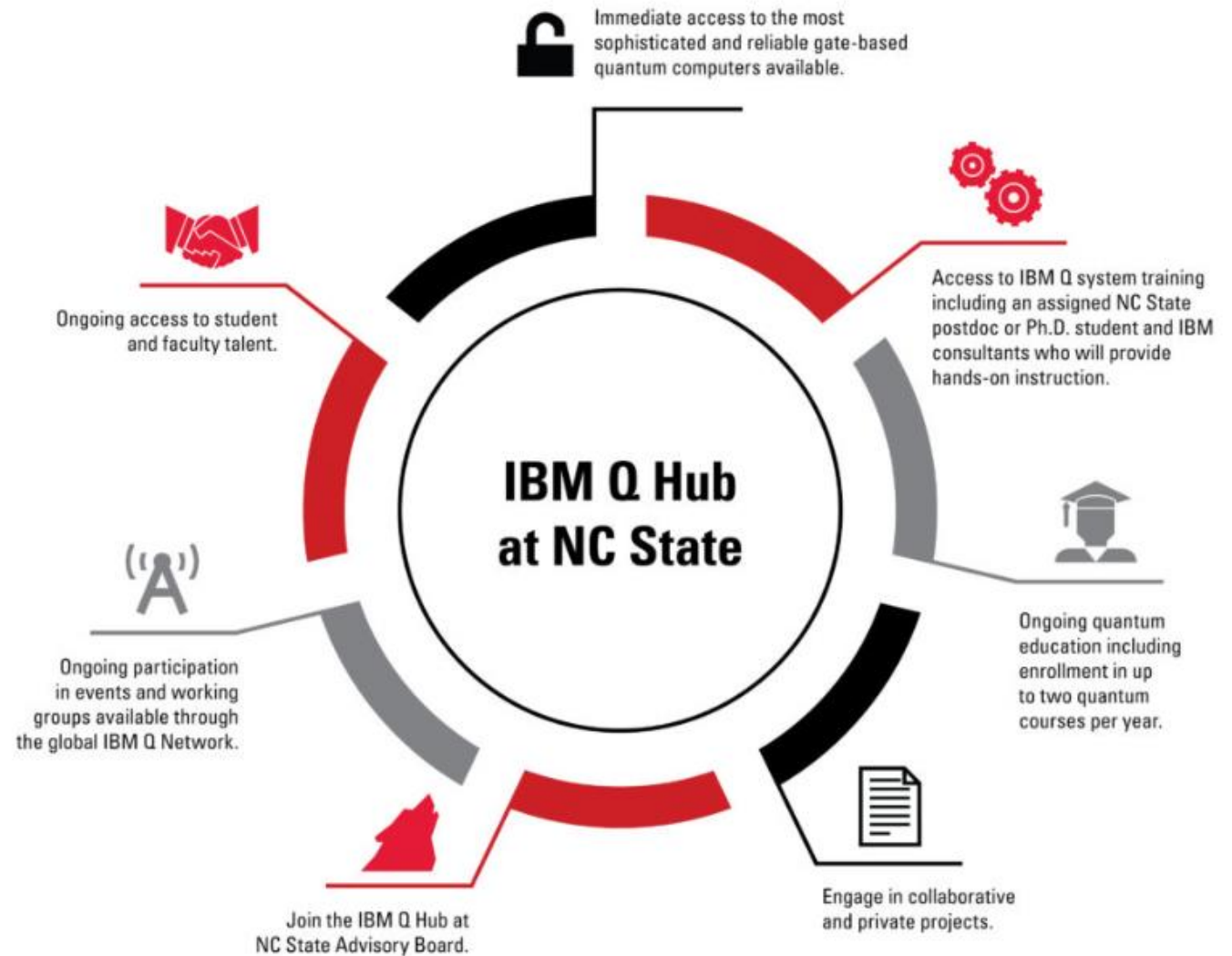
[Math error: A new study overturns 100-year-old understanding of color perception](#)

[Everything you wanted to know about quantum computing, but were afraid to ask](#)

[Los Alamos National Laboratory and SK hynix to demonstrate first-of-a-kind ordered Key-value Store](#)

# Resources in your backyard

[Quantum Seminars | IBM  
Quantum Hub at NC State |  
NC State University  
\(ncsu.edu\)](#)







quantum computer jobs



Past 3 days

Full-time

Work from home

No degree

Engineer

Research scientist



### Quantum Computing Scientist

Brookhaven National Laboratory

Upton, NY

via Brookhaven National Laboratory

Full-time Health insurance Dental insurance Paid time off



### Quantum Research Scientist (Yorktown Heights, NY)

IBM

New York, NY

via LinkedIn

2 days ago Full-time Health insurance Dental insurance Paid time off



### Compiler Engineer, Quantum Computing

2100 NVIDIA USA

New York, NY

via ZipRecruiter

2 days ago Full-time Health insurance Dental insurance Paid time off



### R&D FLARE Research Lead in Quantum Computing and Quantum

JPMorgan Chase Bank, N.A.

New York, NY

via Glassdoor

22 days ago Full-time Health insurance



### Applied Quantum Scientist, Amazon Braket

Amazon Web Services (AWS)

New York, NY

via LinkedIn

3 days ago Full-time



### IBM Quantum Sr. Product Marketing Manager (NYC, NY or Remote)

IBM

Anywhere

via IBM Global Careers

20 days ago Work from home

Remember why you are in need

Company needs you to solve problems

My wife said she will love me more if I do more house chores work