

# The Future of Data Science

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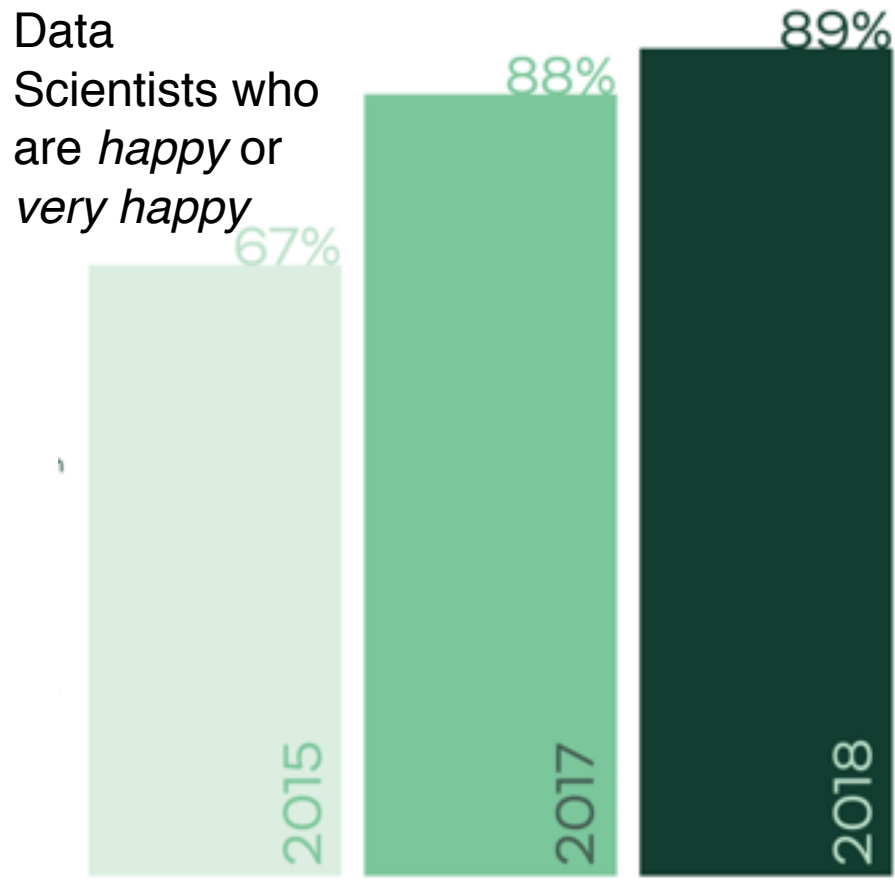
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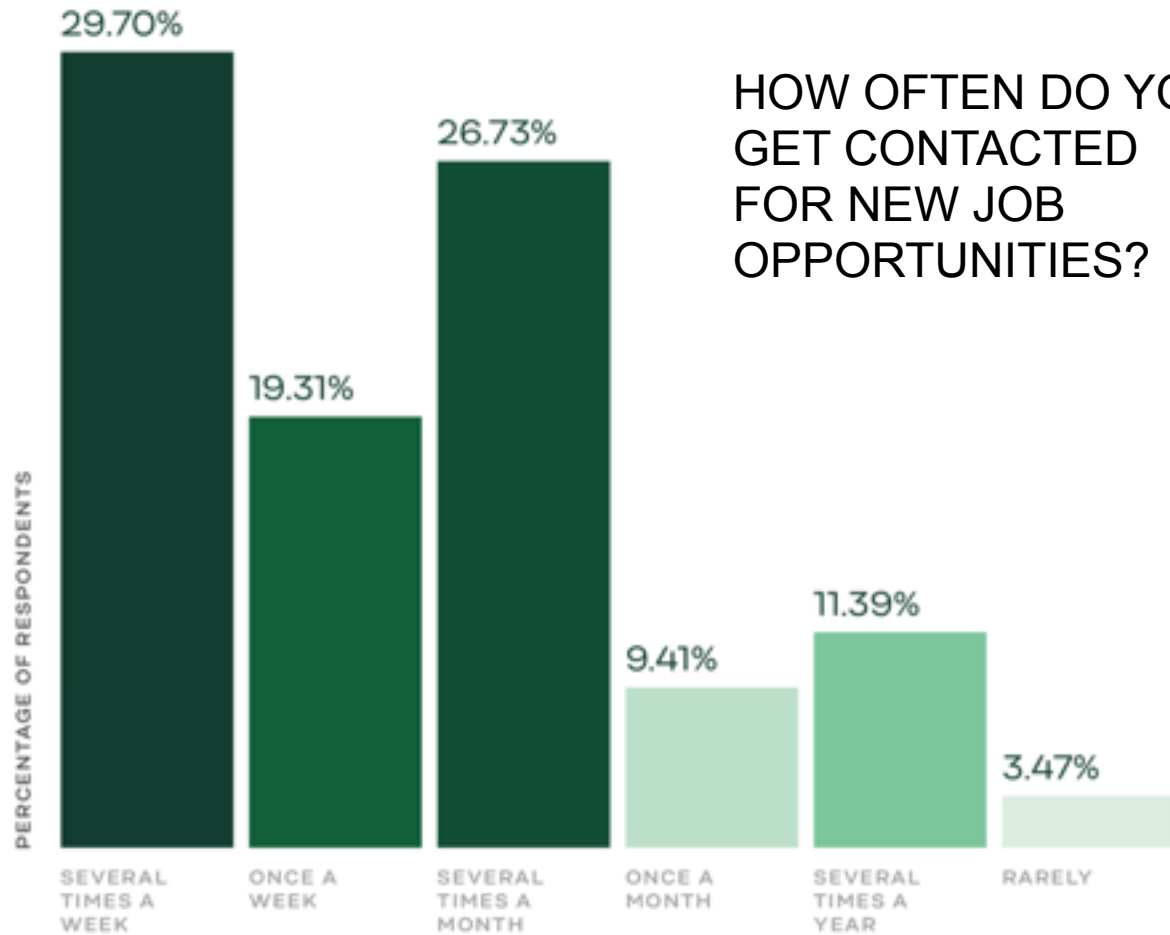
Where we are now

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Job Title	Median Base Salary	Job Satisfaction	Job Openings
#1 Java Developer	\$90,830	4.2/5	10,103
#2 Data Scientist	\$113,736	4.1/5	5,971
#3 Product Manager	\$121,107	3.9/5	14,515



## HOW OFTEN DO YOU GET CONTACTED FOR NEW JOB OPPORTUNITIES?



## The Ten Most Common Data Science Skills in Job Postings

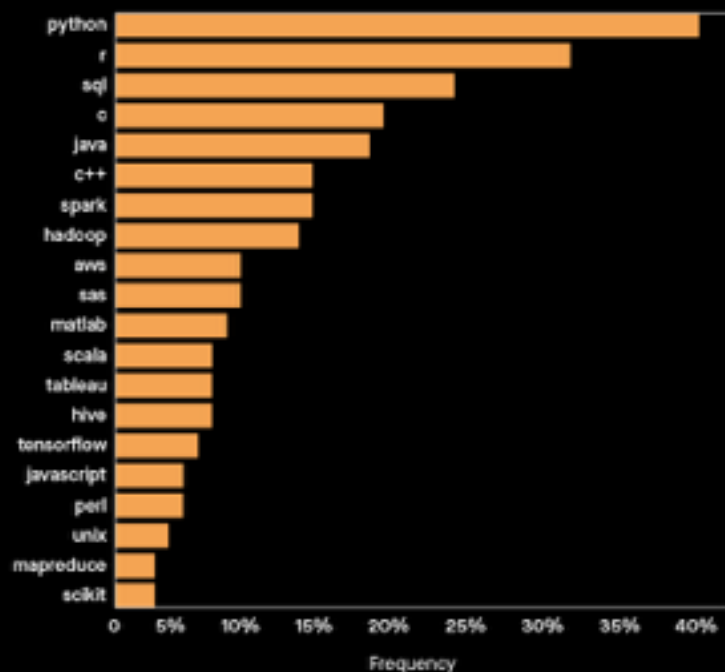
Skill	Percentage of Job Listings
Python	72%
R	64%
SQL	51%
Hadoop	39%
Java	33%
SAS	30%
Spark	27%
Matlab	20%
Hive	17%
Tableau	14%

Source: Glassdoor Economic Research.

glassdoor

## Top Data Science Technologies

An analysis of over 7000 job postings shows which technologies appear most frequently in data science job descriptions.



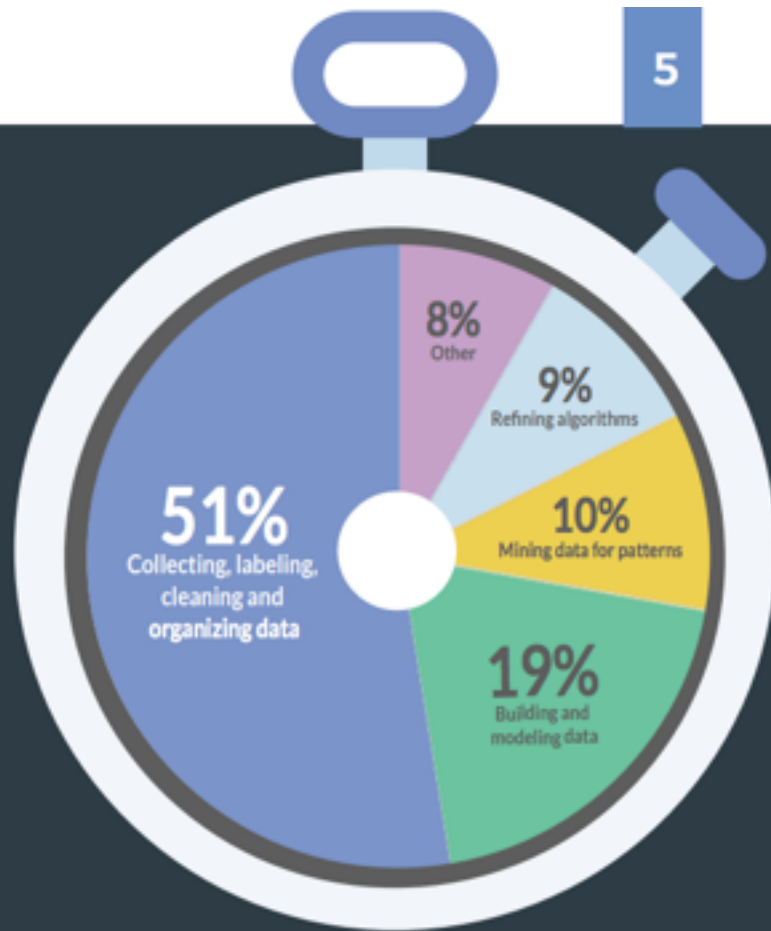
Sources: 1. docs.wolfram.com/ug5/ee73e4\_56322067e4599e9c31671a16cbcf.pdf  
2. kaggle.com/16144/data-scientist-job-market-in-the-us/home

THINKFUL

# WHAT KEEPS DATA SCIENTISTS HAPPY?

(and why aren't they doing more of it?)

What activity takes up most of your time?



# Factors that keep Data Scientists happy

- Rapid technology growth
  - Exciting, at the forefront of technology
- Non-stagnant dynamic environment and interesting computer coding
- Job for builders - constantly analyzing and developing tools, techniques, and solving problems
- Great salary and benefits
- You get to do all the cool stuff together - math, research, coding, writing and rapid results



## Glut of new data scientists

First, let's talk about the oversupply of junior data scientists. The [continuing media hype cycle around data science](#) has enormously exploded the amount of junior talent available on the market over the past five years.

This is purely anecdotal evidence, so take it with a large grain of salt. But, based on my own participation as a resume screener, mentor to data scientists leaving boot camps, interviewer, interviewee, and from conversations with friends and colleagues in similar positions, I've developed an intuition that the number of candidates per any given data science position, particularly at the entry level, has grown from 20 or so per slot, to 100 or more. I was talking to a friend recently who had to go through 500 resumes for a single opening.

This is not abnormal. More anecdotal evidence comes from job openings [like this one](#), from machine learning's godfather, Andrew Ng, whose AI startup demanded 70-80 hours a week. He was flooded with applications, after blithely noting that previously many people had tried to volunteer for free. As of this latest writing, they [ran out of space](#) in their current office.

It's very, very hard to estimate the true gap between market demand and supply, but [here's a starting point](#).

# Don't be discouraged to try

- On the one hand many are doing data science
- On the other we need people to do data science
- It doesn't appear to be going away, in fact it's ever-evolving how we use and improve society with data science
- Find what you are passionate about, you'll find ways to express it and earn a living with it



Hard things are hard.

On the one hand, there are  
no easy answers

On the other hand, if there  
were, would it be so  
stimulating?

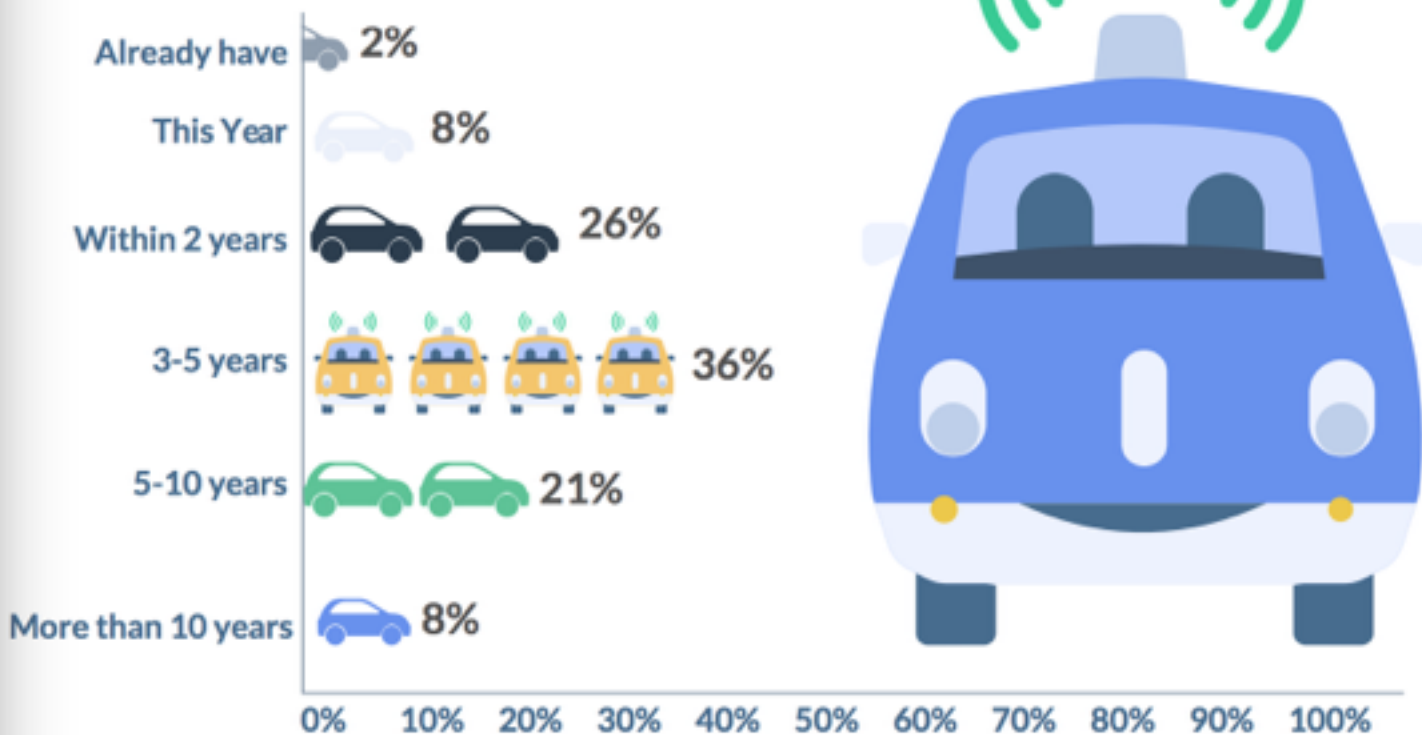
# COGS 108: Final Project Lessons

1. Asking the right question up front really helps
  - a. It's a challenge to develop a narrow question/hypothesis
2. Finding the data you need is a skill
  - a. ...so is knowing if the data are reliable
  - b. ...and if they can answer your question
  - c. ....and recognizing what information you don't have
3. Data Visualization and storytelling are important skills.
4. Determining which analytical approach is best is HARD.
5. Programming is merely a piece of the puzzle for data scientists.

...so where are we going?

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## When do you think you'll first ride in a SELF-DRIVING CAR?



# Increased data and automation in society

- Chatbots
- Computational complexity vs. expense
- Robotics in human spaces/everyday lives
- Next higher level programming reducing effort



Algorithms are fragile

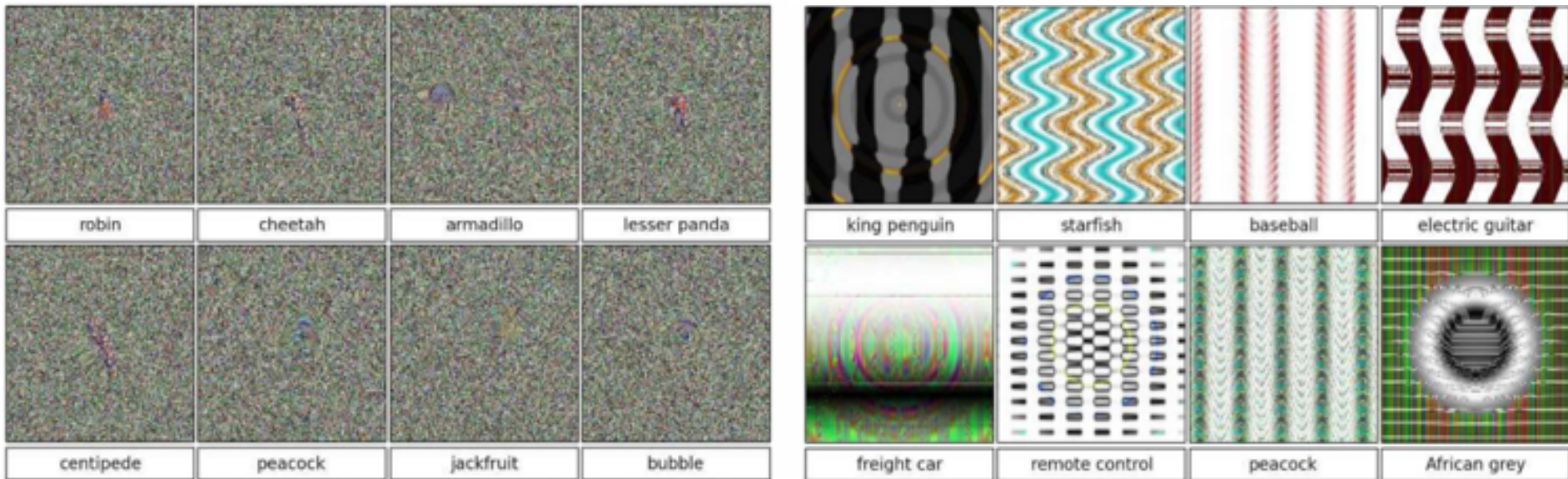


Figure 1. Evolved images that are unrecognizable to humans, but that state-of-the-art DNNs trained on ImageNet believe with  $\geq 99.6\%$  certainty to be a familiar object. This result highlights differences between how DNNs and humans recognize objects. Images are either directly (*top*) or indirectly (*bottom*) encoded.

# Trading program sparked May 'flash crash'



Automatic computerized traders on the stock market shut down as they detected the sharp rise in buying and selling. (NYT)

Government regulators say a trading program was behind the massive stock slide on May 6.

Algorithms are fragile & powerful

# Human-based computation

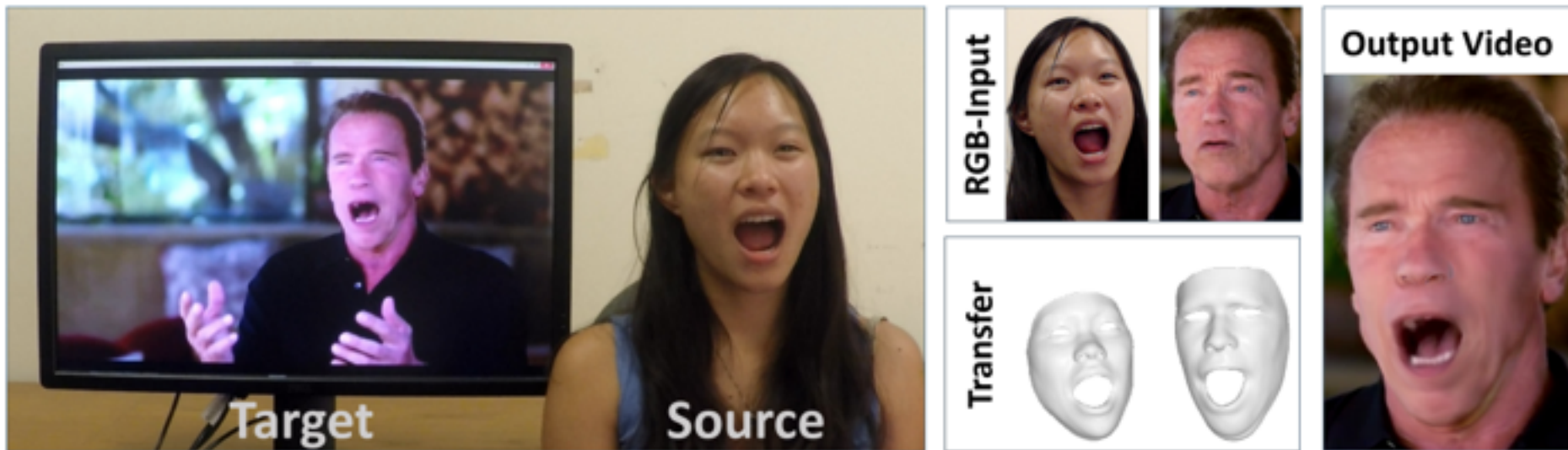


Levelers critics

Type the two words:

reCAPTCHA™  
stop spam.  
read books.

# Reality manipulation



Proposed online reenactment setup: a monocular target video sequence (e.g., from Youtube) is reenacted based on the expressions of a source actor who is recorded live with a commodity webcam.

Finishing our jobs discussion

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# Academic

- PhD - professor, scientist, staff, lecturer, research professor, teaching professor
- MS - Staff scientist (higher rank), lecturer (some programs)
- BS - Staff scientist (initially lower rank)



# Working with Startups

- **Start a company**
- **Work with startups**
- **Consult**
- Funding
- Opportunity
- Excitement
- Impact
- Risk
- Be careful

# Creative

- Art and entertainment
- Writing, content creation

# Where to go from here?

- Career
  - **Academic** - cogsci, CSE, engineering, psychology, art
    - Research - get involved, reach out, talk to people, professors, graduate students, administrators, don't be discouraged by negatives, move on
    - Graduate school - MS is short, PhD for deeper dive, both can be useful beyond
    - Can work in research even with BS though higher degree is ultimately good
  - **Industrial** - work for large or small company, apply directly, industrial partner programs with school, online professional social media like linkedin, create professional portfolio, work on resume and share with experts for feedback
  - **Entrepreneurial** - do your own thing! Create a company, product, - starts with an idea nobody else wants to do or thinks of, try many things, don't be afraid to fail early and often to succeed sooner
  - **Creative** - AI art, aesthetics and design, writing, film, music, more!

# Where to go from here?

- Life is not linear, don't worry
- You don't know your whole future - can have a plan but expect unknowns, that's life and it's amazing
- Opportunities cannot be predicted, some can be sought out, but often serendipity brings things together to present opportunity - open eyes
- Failure is part of the process, and you do not know the ultimate outcome of your life. Have faith, always keep learning, study great people

# Some parting advice

- Be persistent
- Be polite
- Be Indomitable
- Ignore naysayers
- Keep your integrity and your ethics, use those as your center
- Always keep learning
- Aim to live in balance of mind, body and spirit

## Some of my advice - Be persistent

- Remember we learn from all types of experiences.
- Whatever happens pay attention to it, learn, grow, and then it's never a failure
- Just because one place or individual rejects you, it doesn't necessarily reflect upon you, it was not the right match
- When the right thing comes along, things just flow - you'll learn to feel that out early and separate from when people/companies are looking for a mutually beneficial arrangement or are trying to maximize their advantage only

## Some of my advice - Be polite

- It doesn't help anyone to be rude
- It tends to come back on you and reflect poorly upon you
- If you are rejected or not valued, simply thank them for their time and move on.

# Some of my advice - Be indomitable

- You can lose a position but it doesn't have to defeat you.
  - You can be accepted, you can be rejected, but the external does not define you.
  - Make your own choices for your life, never let anyone dictate what you can and cannot do.



# Some of my advice - Learn from feedback

- Use accurate feedback to improve
- Opinion may be inaccurate and is not a rigorous measure of external variables
  - Well established in research
- Pay attention to all the variables, to the reality, not arbitrary judgment
  - Keep context in mind

# Thinking different as scientists and persons

- Whenever you think differently than others you will have some people get it and some people not.
- At times those people will be critical, we call them 'naysayers' and there's a long rich history of such individuals.
- They will tell you you're stupid, wrong, don't know anything, it's been done before, discount and discredit you.
- Usually that means you're saying or thinking something unique, and when all the group is quiet or positive only that's great, but it often means you might need to rethink whatever it is you are doing!
- History makes its own judgments, just do good work
- So if you study people who have been successful or achieved great things, you will hear them all say don't listen to the naysayers, don't be afraid to fail, don't assume you'll get the crowd approving of you.
- Find what is meaningful to you, and then go out and do it.
- It might be your vision, your goal, it might be something instinctual, but when you feel it and find it and are moving toward it, life doesn't feel like a struggle.

# Keep your integrity and your ethics, use those as your center

- Life is complicated and confusing at times
- Filled with uncertainty as well as certain certainties
- If you live with integrity, with good ethics, this gives you clarity

# Always keep learning

- The world is always moving forward
- Your education is a beginning, not an end
- Life is about learning, growing and contributing to the world
- Continuing to develop continues to keep your skill relevant, but also keeps life interesting!

# Seek the balance of Mind, Body and Spirit

- For when one is out of balance, the others are as well
- If you are in conflict, find your way to resolve it
- If you are injured, heal yourself
- Sleep, eat, rest, exercise and living in cycles is very important
- Seek to be at peace inwardly in order to clarify your thoughts and mind

What is the future of Data Science?

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# You all are the future of data science!

So, if you remember anything from this course...



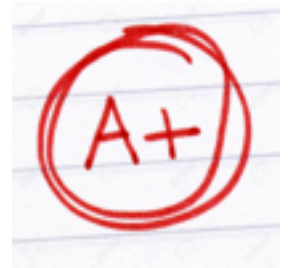
Ethics should always be a priority in your work.



Data wrangling is a puzzle and a big part of the job. When done well, it's not boring!



Data science is a competitive, but rewarding field. You have a chance to make a big difference!



You have seen how it's possible to succeed with data science. Carry that into your life

# COGS 108 Thank You's!

TAs: Abhishek Tanpure, Hari Yadavalli, Rounak Sen

IA: Antara Sengupta

All of you for your patience, feedback, and time!



- *It has been an honor to teach you, a pleasure to be here, and I have learned a great deal.*
- *I hope you always learn your whole life, always feel free to reach out in the future*
- *I'll be in touch with those who signed up in terms of research, industry etc*

As always, thank you for your  
attention.

It's a small world, I'll see you next time!