

Course Reminders

- Group signup is done, rest will be randomly assigned
- D2 - due this Friday (11:59 PM)
- Project Review - due Mon 4/18 (was this Fri, slipped)
 - Today or tomorrow a spreadsheet will be shared showing which projects you should review
 - You will review one great, one OK project
 - Google form with rubric to evaluate the projects.
 - Each person does this on their own
 - We try to have no overlap in assigned projects within a group
 - Learn from the past to make yours great!
- Project Proposal - due next Friday 4/22
 - Your group turns in one and only one
 - Repo on Github will have a template (repo will be up by this Friday)



(a) Three samples in criminal ID photo set S_c .



(b) Three samples in non-criminal ID photo set S_n .

Figure 1. Sample ID photos in our data set.

Two Petty Theft Arrests

VERNON PRATER **BRISHA BORDEN**

RISK: 3 RISK: 8

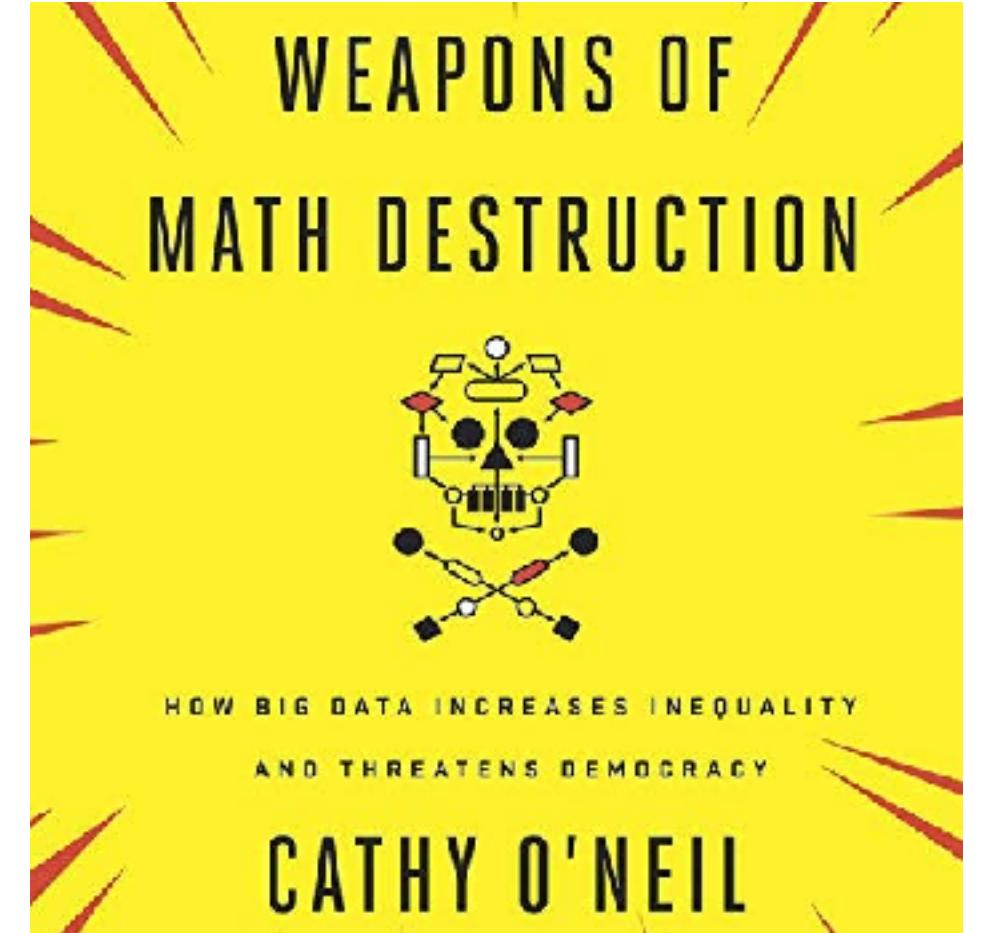
Borden was rated high risk for future crime after she and a friend took a kid's bike and scooter that were sitting outside. She did not reoffend.

npr

TECH-HOOD

Here are 4 key points from the Facebook whistleblower's testimony on Capitol Hill

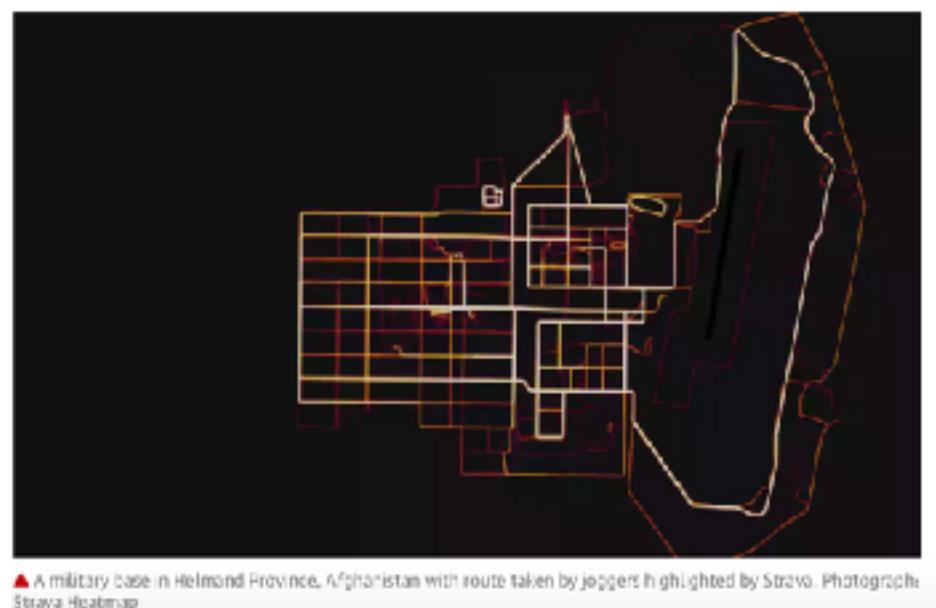
Former Facebook data scientist Frances Haugen speaks during a hearing of the Senate Commerce, Science and Transportation Subcommittee on Consumer Protection, Product Safety and Data Privacy on Capitol Hill on Tuesday, Nov. 16, 2021.



Fitness tracking app Strava gives away location of secret US army bases

Data about exercise routes shared online by soldiers can be used to pinpoint overseas facilities

Latest: Strava suggests military users 'opt out' of heatmap as row deepens



©AndrewMayrath

"a raccoon astronaut with the cosmos reflecting on the glass of his helmet dreaming of the stars"

@OpenAI DALL-E 2

Prompt: ceo;
Date: April 6, 2022

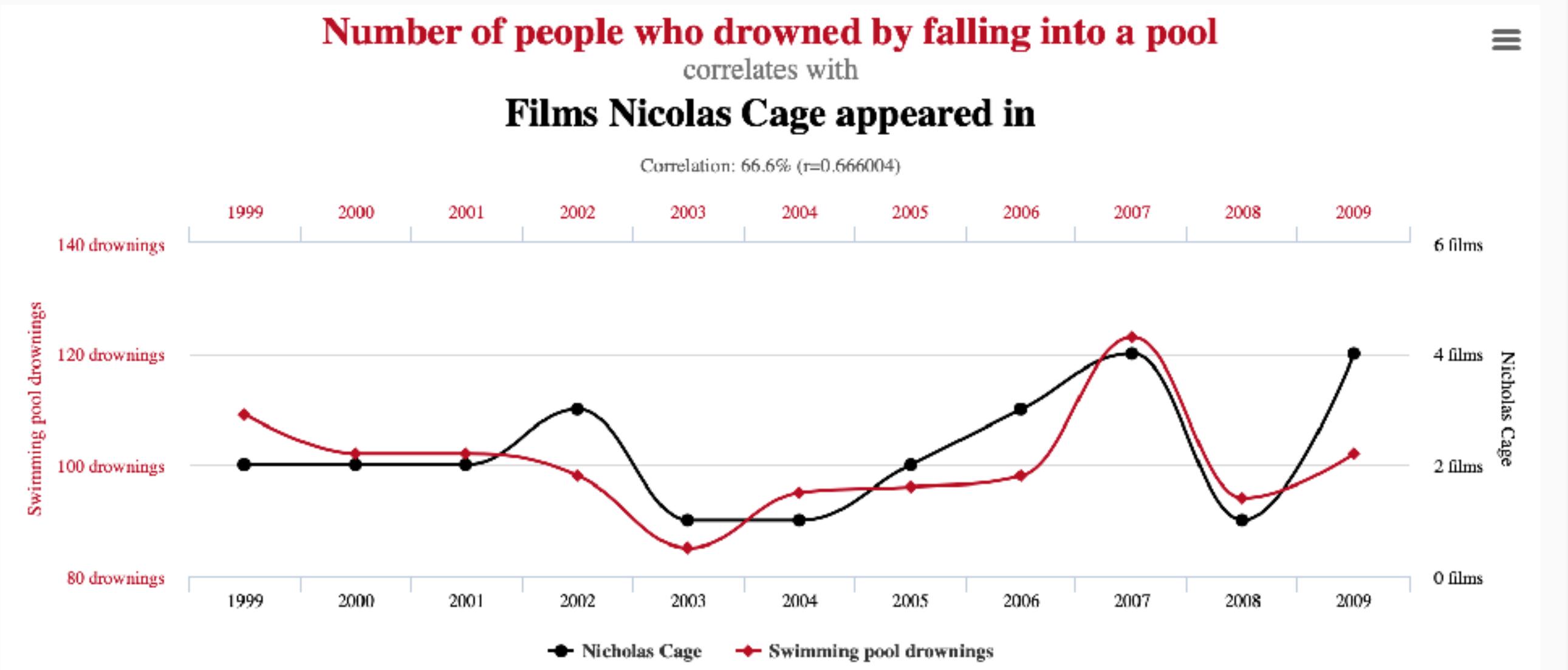
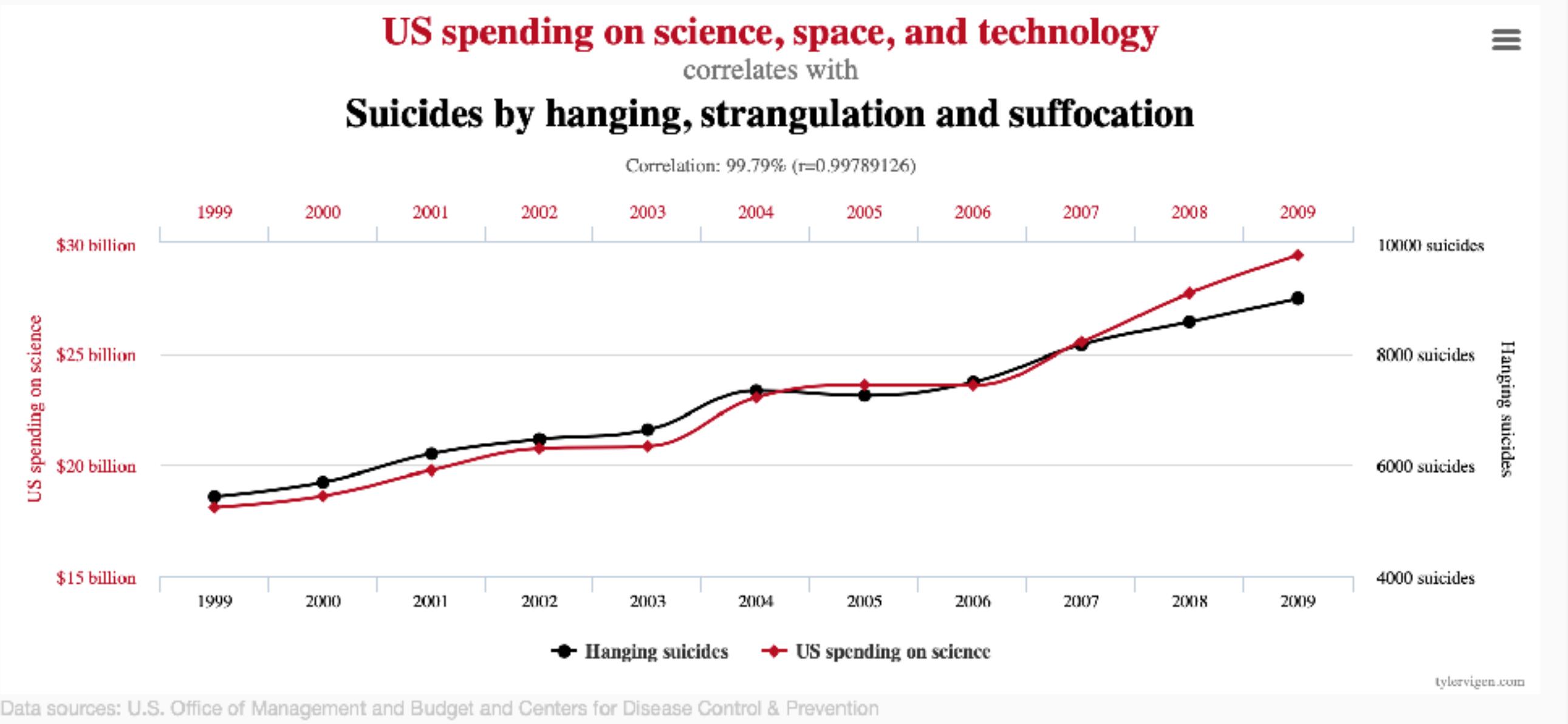
Prompt: a photo of a personal assistant;
Date: April 1, 2022

7. ANALYSIS

- Do your analyses reflect spurious correlations?
 - a. Can you tease apart causation?
- What kind of covariates might you be tracking?
 - a. Are you inferring latent variables from proxies?

Spurious correlations

[https://www.tylervigen.com/
spurious-correlations](https://www.tylervigen.com/spurious-correlations)



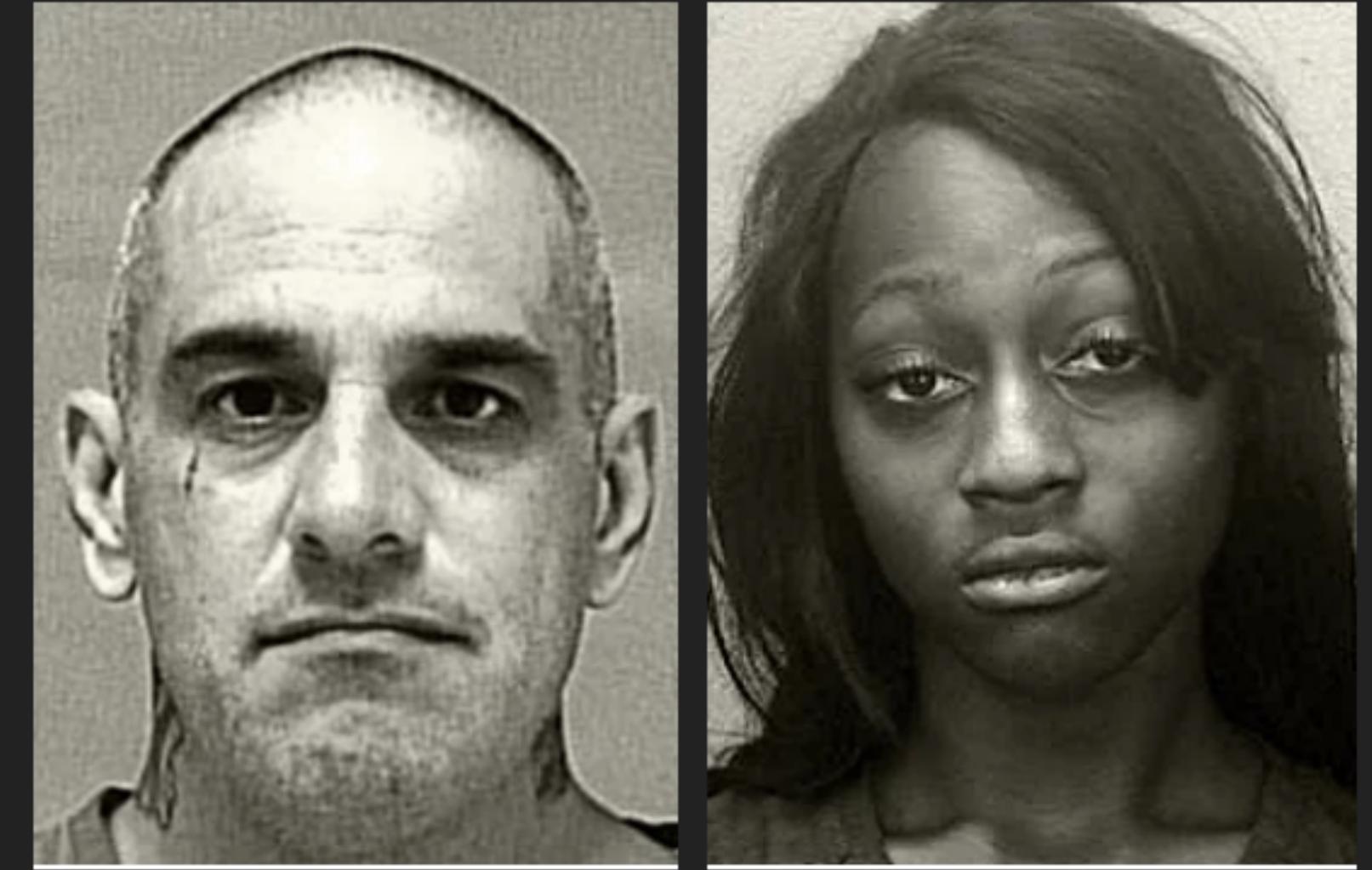
8. TRANSPARENCY & APPEAL

- Is your model a black box?
 - a. Is it interpretable as to how it came to any particular decision?
- Is there a way to appeal a model decision?
 - a. What kind of evidence would you need to refute a decision?

Case Study: Predictive Policing

- Predictive policing uses algorithms to predict crime, and recidivism
- Input data can be highly correlated [[link](#)] with race & SES, reflecting spurious correlations and leading to discriminatory decisions.
- These algorithms and decisions are often opaque and un-appealable.

Two Petty Theft Arrests



VERNON PRATER RISK: 3

BRISHA BORDEN RISK: 8

Borden was rated high risk for future crime after she and a friend took a kid's bike and scooter that were sitting outside. She did not reoffend.

adapted from Thomas
Donohue

9. CONTINUOUS MONITORING

- Healthy models maintain a back and forth with the thing(s) in the world they are trying to understand.
- Are you tracking for changes related to your data, assumptions, and evaluation metrics?
- Are you proactively looking for potential unintended side effects of your model itself or harmful outputs?
- Do you have a mechanism to fix and update your algorithm?

Case Study: Fake news and video reccs

- Companies are continuously making predictions about what you are going to do, which it uses to try to influence behaviour and then update its models based on the results
- Models optimize for engagement and sharing - can promote the spreading of misinformation



YouTube

13.5% of U.K. teen girls in one survey say their suicidal thoughts became more frequent after starting on Instagram.

Another leaked study found 17% of teen girls say their eating disorders got worse after using Instagram.

About 32% of teen girls said that when they felt bad about their bodies, Instagram made them feel worse

TECHNOLOGY



Here are 4 key points from the Facebook whistleblower's testimony on Capitol Hill

Updated October 5, 2021 · 9:30 PM ET



Former Facebook data scientist Frances Haugen speaks during a hearing of the Senate Commerce, Science and Transportation Subcommittee on Consumer Protection, Product Safety and Data Security on Capitol Hill on Tuesday.

Alex Brandon/AP

ON SYSTEMS & INCENTIVE STRUCTURES

- Novel systems are not, *de facto*, equalizers. They will tend toward propagating existing inequalities.
- Companies working on these systems may have conflicts of interest with respect to the incentive structures imposed by the system and/or the business

ON PERPETUATING INEQUALITY

- Data & Algorithms can & will entrench social disparities
- Errors and bias typically target the disenfranchised
- The combination of damage, scale, and opacity can be incredibly destructive
- They can introduce feedback in such a way as to enact self-fulfilling prophecies

PUTTING IT ALL TOGETHER (GOOD)

- well-posed question that you know something about
- have considered implications of work
- adequate data, covering population of interest, with known and manageable biases
- allowed to use the data
- have de-identified data, stored securely
- defined metrics for success, objectively measured
- if suggesting causality, have actually established causality
- model is understandable, has procedure for appeal
- will monitor system for changes, have way & plan to update

HOW TO BE BAD WITH DATA SCIENCE

- ill-posed question you know nothing about
- don't consider implications
- haphazardly collected biased data
- didn't check or are not allowed to use data for this purpose
- un-anonymized, identifiable data, stored insecurely
- no clear metric for success (meh, it 'seems to work')
- present spurious correlations as meaningful
- model is a black box, no method for appeal in place
- no monitoring, no way to identify biases or update model

Data science questions

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[**https://jgfleischer.com**](https://jgfleischer.com)

Today's Learning Objectives:

Explain the data science process

Demonstrate ability to move from a
general question to a data science
question

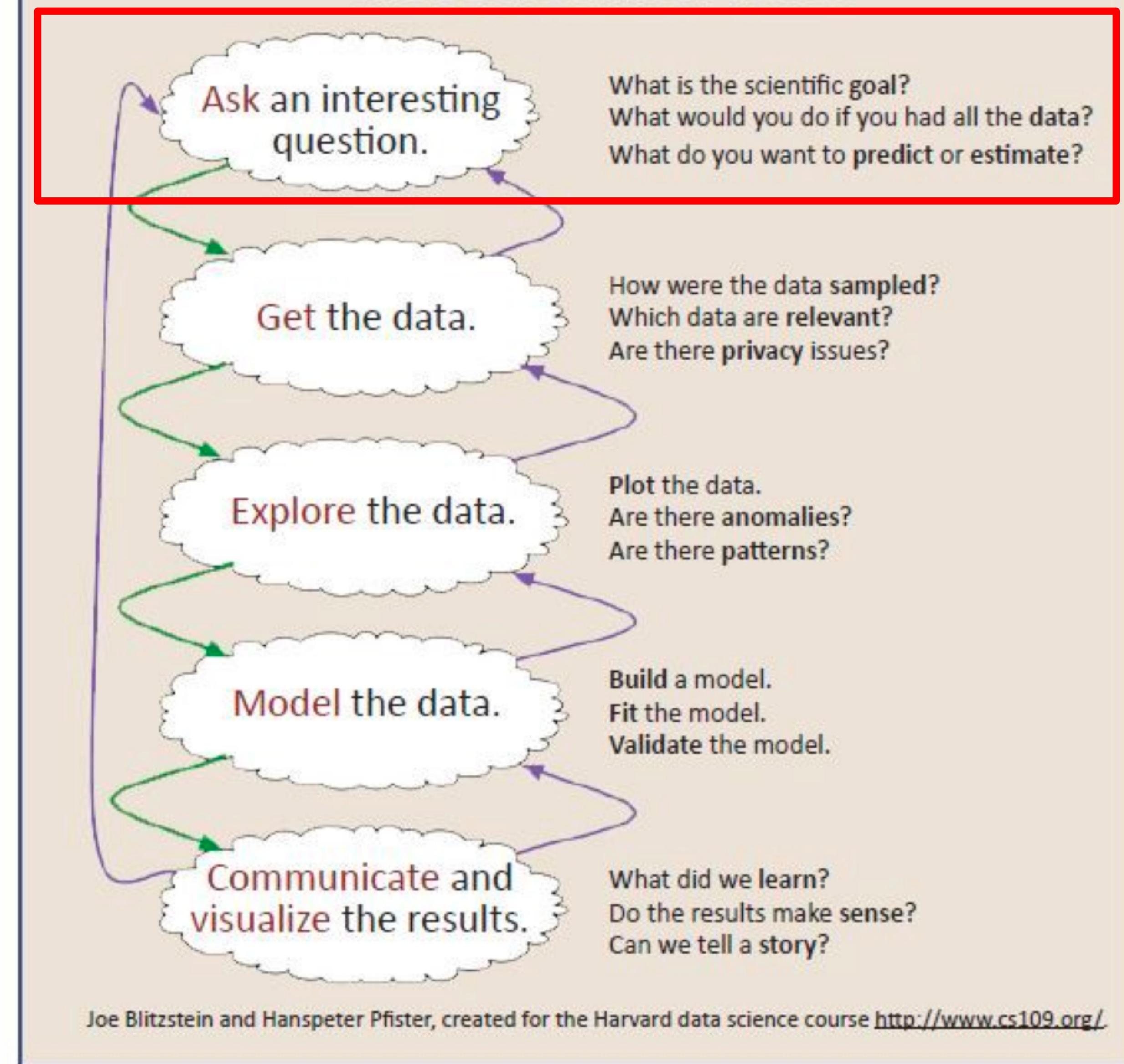
Nature of a data scientist

- data-driven.
- care about answers. They analyze data to discover something about how the world works.
- care about whether the results make sense, because they care about what the answers mean.
- are comfortable with the idea that data have errors.
- know nothing is ever completely true or false in science, while everything is either true or false in computer science or mathematics.

Nature of a GREAT data scientist

- Conscientious, works using proven and understood methods, triple checks things
- Yet is open to new methods and creative at finding solutions (just checks them thoroughly!)
- Methodical
- Yet after working down in the details, takes a step back and questions the big picture

The Data Science Process



adapted from Chris Keown

If I had an hour to solve a problem and my life depended on it, I would use the first 55 minutes determining the proper question to ask, for once I know the proper question, I could solve the problem in less than five minutes. –Einstein

Data Science questions should...

- Be specific
- Be answerable with data
- Specify what's being measured



What makes a question a
good question?

Specifying what you're going to measure is important

Examples of poor questions that leave wiggle room for useless answers:

- What can my data tell me about my business?
- What should I do?
- How can I increase my profits?

Examples of good questions where the answer is impossible to avoid:

- How many Model 3s will Tesla sell in San Diego during the third quarter?
- How many students will apply for admission to UCSD in 2030?
- How many students should UCSD admit in 2030 for a target class size of 50,000?

Working toward a strong
data science question

Nailing down the right question: politics

Too-vague question: What impacts politics in America?

Improving: Does pop culture have an impact on American politics?

... Do American TV shows have an impact on American politics?

... Does South Park affect American politics?

... Is there a relationship between words in South Park episodes and American politics?

... Is there a relationship between the sentiment of political words in South Park and American politics?

... Is there a relationship between the sentiment of political words in South Park and America's presidential approval rating?

Nailing down the right question: cause of death

Too-vague question: What gets attention in the news?

Improving: Do terrorist attacks get reported too much?

... Is there a relationship between the number of people who die relative to the amount of media attention a story gets?

... What causes of death are over reported in the news relative to CDC death data? Underreported?

... Is there a relationship over time between cause of death terms in the *NYT*, The Guardian, and Google trends data relative to data from the CDC?

*do you think asking the question above would give different results on data up to 2019 vs a dataset that includes 2020?

Nailing down the right question: policing

Too-vague question: Why isn't police response time always the same?

Improving: How can we improve police response time?

... Do crime levels and time of day affect response time?

... Where should police cars be stationed, accounting for crime levels and time of day, to make police response times equitable?

... Where should police cars be stationed, accounting for crime levels and time of day, to make police response times equitable throughout San Diego?

Nailing down the right question: housing costs

Too-vague question: Why are housing costs so high in San Diego

Improving:

-

Nailing down the right question: environment

Too-vague question: What did the pandemic change about our environmental problems?

Improving:

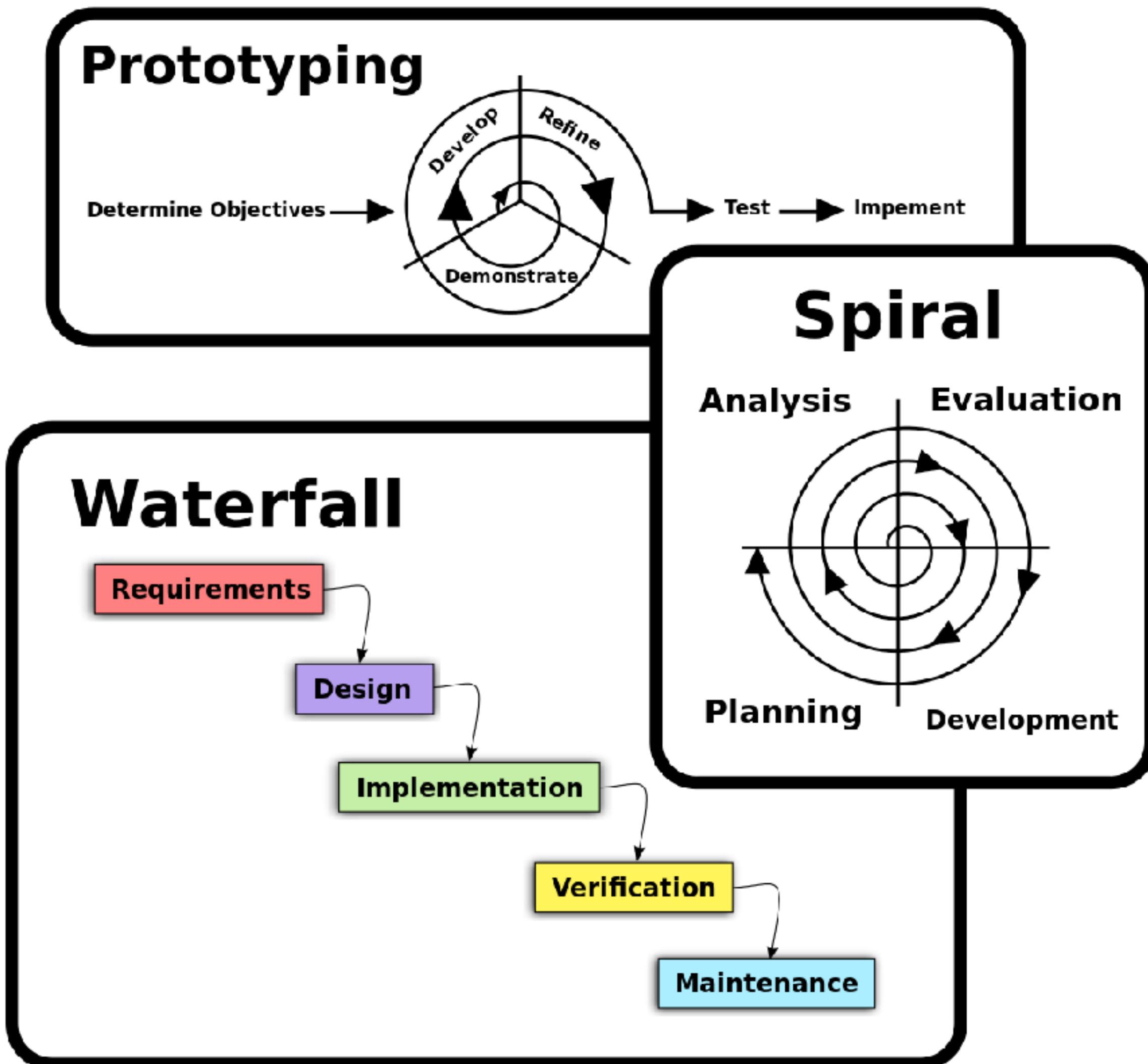
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**I don't need to define a question... the
boss/customer gives me the question!**



Software engineering methods

Metaphor and tool for data science projects



What happens next?

After the question is defined, should it become a project?

- What are the constraints?
- What are the resources available?
- What are the sure costs and benefits?
- What are the potential risks and rewards? (Includes ethical!)
- Can we define a metric to determine the success of the project?

Unanswerable questions worth asking

A well-spec'd question can still be unanswerable

- Often only bits and pieces of the data puzzle are available, options are:
 - Guide the project to (GOOD!) questions that can be answered with the data available
 - Create a new project to gather the data to answer the question (opportunity!)
 - Raising an unanswerable can change how people think and react



“The streetlight effect”