DATA SCIENCE, STATISTICS, AND PUBLIC ADMINISTRATION

MPA 630: Data Science for Public Management

September 6, 2018

PLAN FOR TODAY

What is all this stuff?
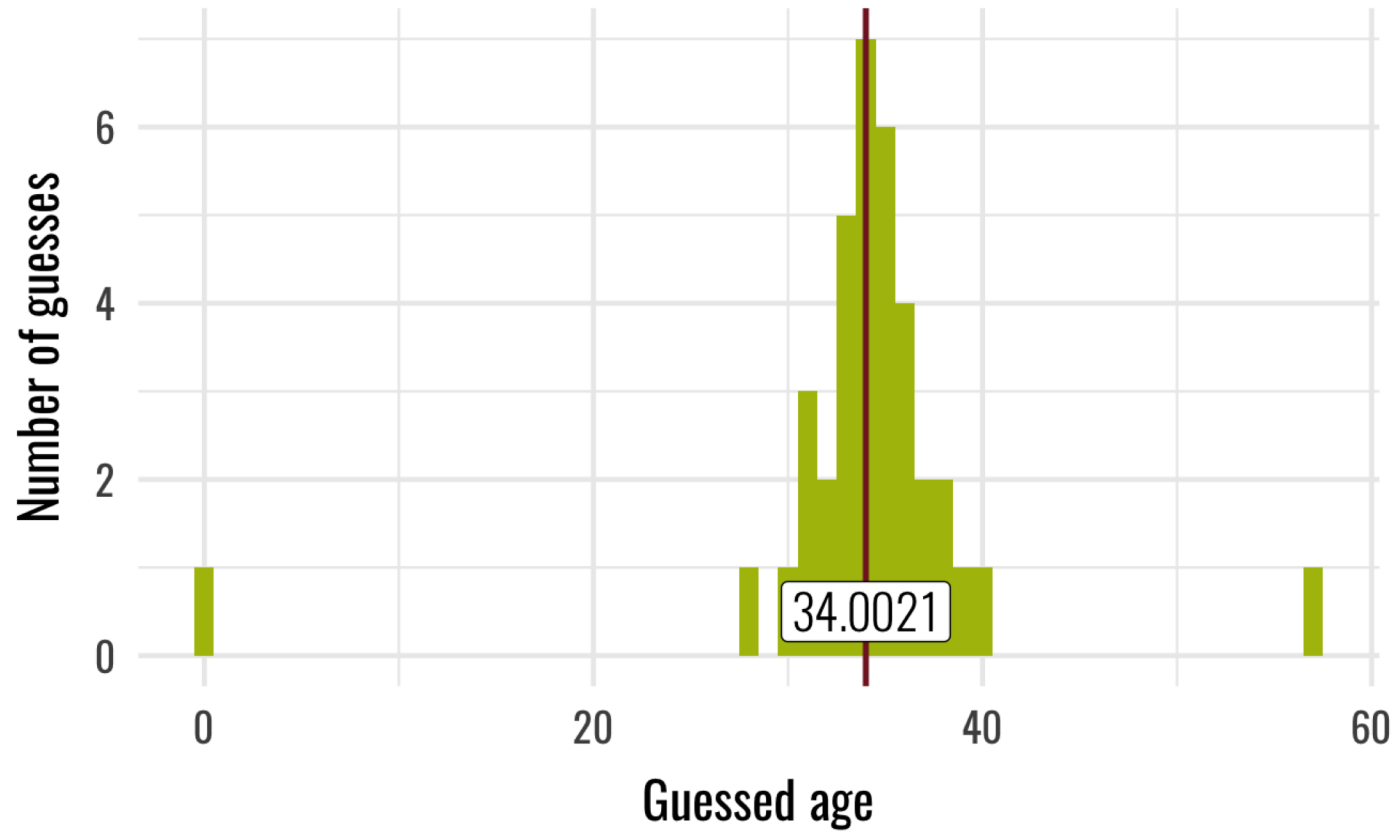
Why should we care about data?

Class philosophy

Class details

Birds and airports

WHAT IS
ALL THIS STUFF?

WISDOM OF THE CROWD

	guess
1	35.000
2	35.476
3	36.600
4	35.000
5	34.000
6	36.000
7	32.000
8	38.000
9	36.000
10	34.000
11	35.000
12	38.000
13	31.000

$$\frac{12,405}{365.25} = 33.963$$

WHO AM I?

§11   Now that we know the quiddity of truth through our knowledge of its definitions, let us learn the quality of truth, or how truth exists, and how it occurs and comes to be. We say that truth is a proposition with which the speaker's soul is tranquil,[26] knowing that what he said is indeed <as he said it> and that what he described is indeed as he described it. We also say that the truth is a proposition that the tongue articulates, whereby the soul informs another soul regarding something of which [the latter] is ignorant or of which it is content in knowing.[27] We also say that the truth is various modes that recount the form of beings and the existence of the intelligibles. We also say that truth is the ultimate verbal achievement of the soul // in its inquiry into whatever it did not know, as demonstrated in the following schema:

§12   **❖ The quality of truth is one of four: ❖**

The first: Truth is a proposition with which the speaker's soul is content, knowing that what he said is indeed as he said it and what he described is indeed how he described it. The second: Truth is a proposition that the tongue articulates, whereby the soul informs another soul regarding something of which it is ignorant or which it is content in knowing. The third: Truth recounts the form of beings and the existence of intelligibles. The fourth: Truth is the ultimate verbal achievement of the soul in its inquiry into whatever it did not know.

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26. *Sukūn al-nafs*, meaning the state of "rest" that is a result of unwavering certainty (as opposed to the frantic searching "movement" that accompanies uncertainty), and hence, "tranquility" of the mind. Below (*IM* 2.11) al-Muqammaṣ contrasts this content state with ignorance rather than with falsehood. For many *mutakallimūn*, for instance, Abū ʿAlī al-Jubbāʾī, *sukūn al-nafs* describes knowl-[edge]; see ʿAbd al-Jabbār, *Mughnī*, 12:13. Al-Muqammaṣ's use of [...] to the antiquity of the term, and there is, therefore, no [...] al-Jabbār of forcing it on Abū ʿAlī, as suggested by Vajda, [...] 151 and n. 10. See also Vajda, "Autour de la théorie," 139; [...], 12:43, lines 9–10; and compare al-Qirqisānī in Hirschfeld, [...] lines 8–13. On this concept, which has Stoic origins, see [...]*peech*, 43 and n. 21, as well as 47–49; and Vajda "Saadya,"

[...]ted here as "informing," is the silencing of the opponent [...]ogical dead end (see Pines, "A Note on an Early Use of the [...] and n. 77; see also al-Qirqisānī, *Kitāb al-anwār*, 484–86; and

<div dir="rtl">

(١١)   فإذ عرفنا ماهية الحقّ بمعرفتنا[43] حدوده،[44] فلنعرف الآن كيفية الحقّ، أو كيف يكون الحقّ ويقع ويجب. ونقول إنَّ الحقَّ مقالٌ تسكن إليه النَّفس بعلمها[45] بأنَّ ما قال <كما قال>[46] وما وصف كما وصف. ونقول أيضًا، إنَّ الحقَّ مقالٌ ينطق به اللسان مخبر،[47] أعني النَّفس لانقطاع نفس أخرى في ما جهلت أو سكنت.[48] وقول أيضًا إنَّ الحقَّ ضروب تحكي[49] صورة الموجودات ووجود المعقولات، ونقول أيضًا إنَّ

[7] الحقَّ غاية ما إليه تصير النَّفس من // [القول عن فحصها ع]من ماكانت به جاهلة، وذلك على هذا [المثال]:

(١٢)   ❖ كيفية الحقّ على أربعة أوجه ❖

[أ]حدها، أنَّ الحقَّ مقال تسكن إليه النَّفس بعلمها بأنَّ ما[50] قال كما قال وما وصف كما وصف. والثاني، أنَّ الحقَّ مقال أن[51] ينطق به اللسان مخبر، أعني النَّفس لانقطاع نفس أخرى في ما جهلت أو سكنت.[52] والثالث، أنَّ الحقَّ يحكي صورة الموجودات ووجود المعقولات. والرابع، أنَّ الحقَّ غاية ما إليه تصير النَّفس من القول عن فحصها عن ماكانت به جاهلة.

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[43]ف: بمعرفنا.   [44]ف: حدورها   [45]ف: بعدها   [46]للمقايسة، يُنظر لاحقًا الفقرة ١٢.   [47]ف: موجود (للمقايسة، يُنظر لاحقًا الفقرة ١٢).   [48]ربما يجدر التصويب: سكنت.   [49]ف: تحي.   [50]ف: بأنا (للمقايسة، يُنظر، بلاو، النحو، المادة ٤٦)   [51]يُنظر، بلاو، النحو، المادة ٣٥٩.   [52]ربما يجدر التصويب: سكنت.

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al-Maqdisī, *Kitāb al-badʾ*, 1:51, line 11ff.). It seems, therefore, that this definition is intended to explain in what sense one can speak of truth in a disputation. The last part of the definition—which includes *juhūl* and *sukūn*—is somewhat awkward. With a minor correction (see n. 48 to the text) this sentence would read ". . . in order to help another soul out of a state of being either ignorant or silent (*sakatat*) about something." On "silence" in disputation, see, for instance, al-Qirqisānī, *Kitāb al-anwār*, 485, line 19.

Lehi₁'s Commission

⁴For it came to pass in the commencement of the first year of the reign of Zedekiah,ᵃ king of Judah, (my father, Lehi, having dwelt at Jerusalem in all his days); and in that same year there came many prophets, prophesying unto the people that they must repent, or the great city Jerusalem must be destroyed. ⁵Wherefore it came to pass that my father, Lehi, as he went forth prayed unto the Lord, yea, even with all his heart, in behalf of his people. ⁶And it came to pass as he prayed unto the Lord, there came a pillar of fire and dwelt upon a rock before him; and he saw and heard much; and because of the things which he saw and heard he did quake and tremble exceedingly.

⁷And it came to pass that he returned to his own house at Jerusalem; and he cast himself upon his bed, being overcome with the Spirit and the things which he had seen. ⁸And being thus overcome with the Spirit, he was carried away in a vision, even that he saw the heavens open, and he thought he saw God sitting upon his throne, surrounded with numberless concourses of angels in the attitude of singing and praising their God.ᵇ

⁹And it came to pass that he saw One descending out of the midst of heaven, and he beheld that his luster was above that of the sun at noon-day. ¹⁰And he also saw twelve others following him, and their brightness did exceed that of the stars in the firmament. ¹¹And they came down and went forth upon the face of the earth; and the first came and stood before my father, and gave unto him a book, and bade him that he should read. ¹²And it came to pass that as he read, he was filled with the Spirit of the Lord. ¹³And he read, saying, "Wo,ᶜ wo, unto Jerusalem, for I have seen thine abominations!" Yea, and many things did my father read concerning Jerusalem—that it should be destroyed, and the inhabitants thereof; many shouldᵈ perish by the sword, and many should be carried away captive into Babylon.

¹⁴And it came to pass that when my father had read and seen many great and marvelous things, he did exclaim many things unto the Lord, such as:

> "Great and marvelous are thy works, O Lord God Almighty!
> Thy throne is high in the heavens,
>   and thy power, and goodness, and mercy
>   are over all the inhabitants of the earth.
> And because thou art merciful,
>   thou wilt not suffer those who come unto thee
>   that they shall perish!"

¹⁵And after this manner was the language of my father in the praising of his God; for his soul did rejoice, and his whole heart was filled, because of the things which he had seen, yea, which the Lord had shown unto him.

ᵃ4 597 BC   ᵇ8 The twenty-one words "saw God . . . praising their God" are quoted exactly at Alma 36.22.
ᶜ13 Both *wo* and the standard spelling *woe* occur in the Book of Mormon.   ᵈ13 Or *concerning Jerusalem: that it should be destroyed; and the inhabitants thereof—many should*

¹⁶And now I, Nephi, do not make a full account of the things which my father hath written, for he hath written many things which he saw in visions and in dreams; and he also hath written many things which he prophesied and spake unto his children, of which I shall not make a full account. ¹⁷But I shall make an account of my proceedings in my days. Behold, I make an abridgment of the record of my father, upon plates which I have made with mine own hands; wherefore, after I have abridged the record of my father then will I make an account of mine own life.

Lehi₁ Prophesies to the Jews

¹⁸Therefore, I would that ye should know, that after the Lord had shown so many marvelous things unto my father, Lehi, yea, concerning the destruction of Jerusalem, behold he went forth among the people, and began to prophesy and to declare unto them concerning the things which he had both seen and heard. ¹⁹And it came to pass that the Jews did mock him because of the things which he testified of them; for he truly testified of their wickedness and their abominations; and he testified that the things which he saw and heard, and also the things which he read in the book, manifested plainly of the coming of a Messiah,ᵃ and also the redemption of the world. ²⁰And when the Jews heard these things they were angry with him; yea, even as with the prophets of old, whom they had cast out, and stoned, and slain; and they also sought his life, that they might take it away.

But behold, I, Nephi, will show unto you that the tender mercies of the Lord are over all those whom he hath chosen, because of their faith, to make them mighty even unto the power of deliverance.ᵇ

Into the Wilderness

2 For behold, it came to pass that the Lord spake unto my father, yea, even in a dream, and said unto him, "Blessed art thou Lehi, because of the things which thou hast done; and because thou hast been faithful and declared unto this people the things which I commanded thee, behold, they seek to take away thy life." ²And it came to pass that the Lord commanded my father, even in a dream, that he should take his family and depart into the wilderness. ³And it came to pass that he was obedient unto the word of the Lord, wherefore he did as the Lord commanded him.

⁴And it came to pass that he departed into the wilderness. And he left his house, and the land of his inheritance, and his gold, and his silver, and his precious things, and took nothing with him, save it were his family, and provisions, and tents, and departed into the wilderness. ⁵And he came down by the borders near the shore of the Red Sea; and he traveled in the wilderness in the borders which are nearer the Red Sea; and he did travel in the wilderness with his family, which consisted of my mother, Sariah, and my elder brothers, who were Laman, Lemuel, and Sam.

ᵃ19 Hebrew "anointed one"; *Christ* is the Greek translation of *messiah*.   ᵇ20 The Lord's mercies are a major theme in the Book of Mormon, from the first chapter to the last; see Moro 10.3.

Mother's Milk

Poems in search of Heavenly Mother

By **Rachel Hunt Steenblik**
with **Ashley Mae Hoiland**,
Illustrator

What Søren Aabye Taught Me
When the child needed to be weaned,
the Mother cried.

How She Broke Her Own Heart
The Mother held me tightly
and said, *I'm sorry,*
Mama's milk is all gone,
as I sobbed and sobbed.

The Very Hungry Girl
One Monday evening, the
cool moon came up, and out
of the womb came a tiny and
very hungry girl. She started to
look for her Mother.

Questions
I asked my daughter two questions
the day that she was born.
1) Did she remember me—
   my voice, my smell,
   my beating heart?
2) Did she remember the one
   we both call Mother—
   Her voice, Her Smell, Her heart?
I can't remember anything.

ALL HUMANITIES UNTIL...

romney institute
BRIGHAM YOUNG UNIVERSITY

Economics   Statistics   Accounting

180°
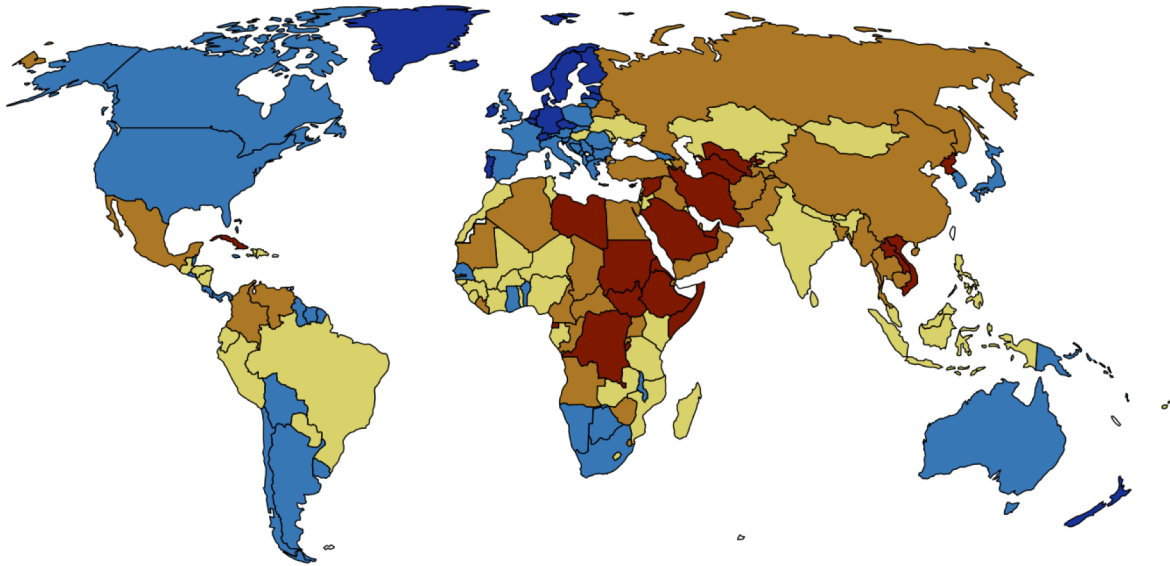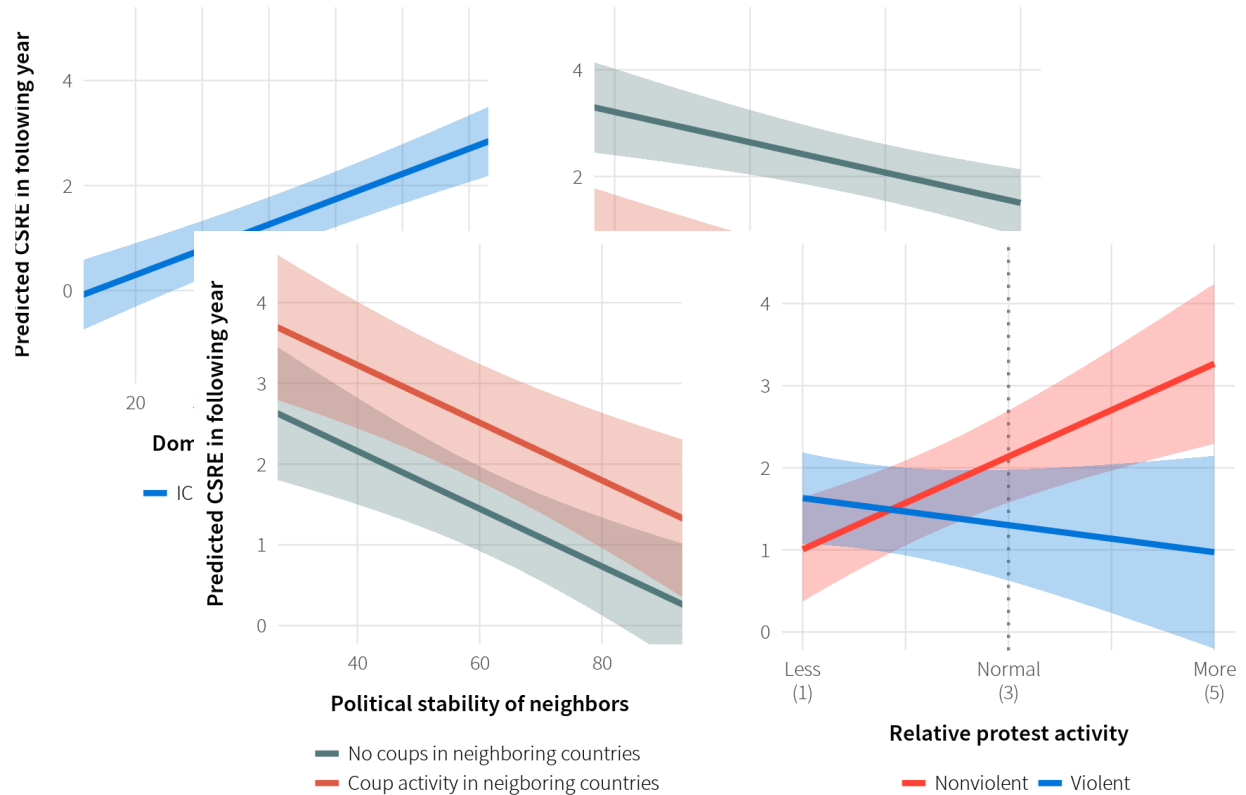
NGOS AND REPRESSION

Differences in donation likelihood in control and crackdown groups, conditioned by other experimental groups

90% credible intervals shown in black. Solid vertical line = median; dotted vertical line = 0
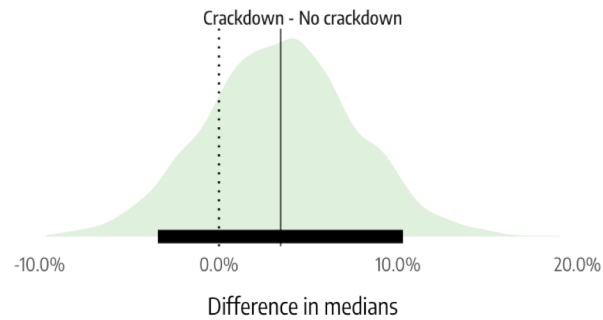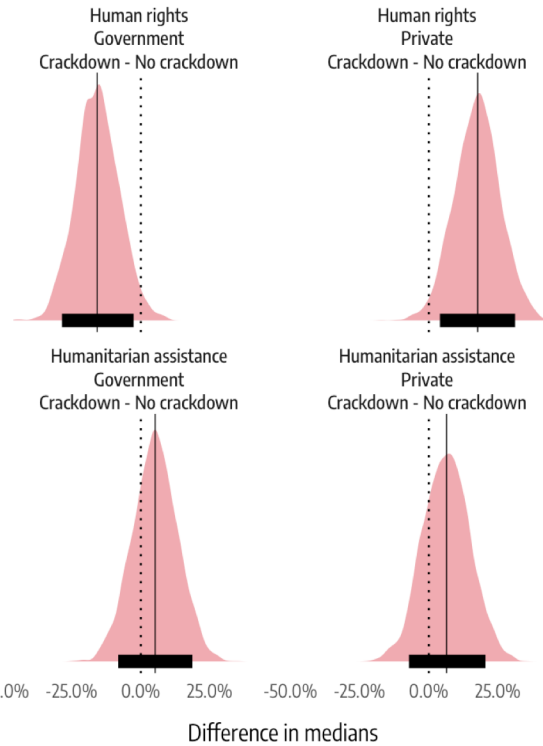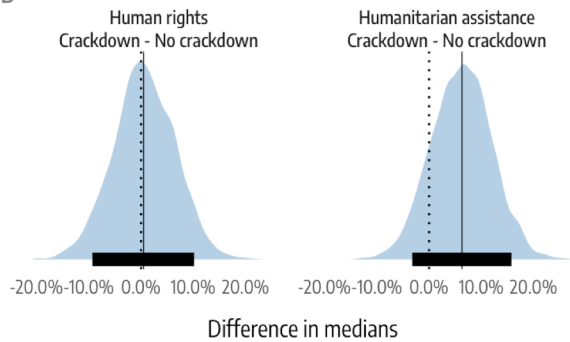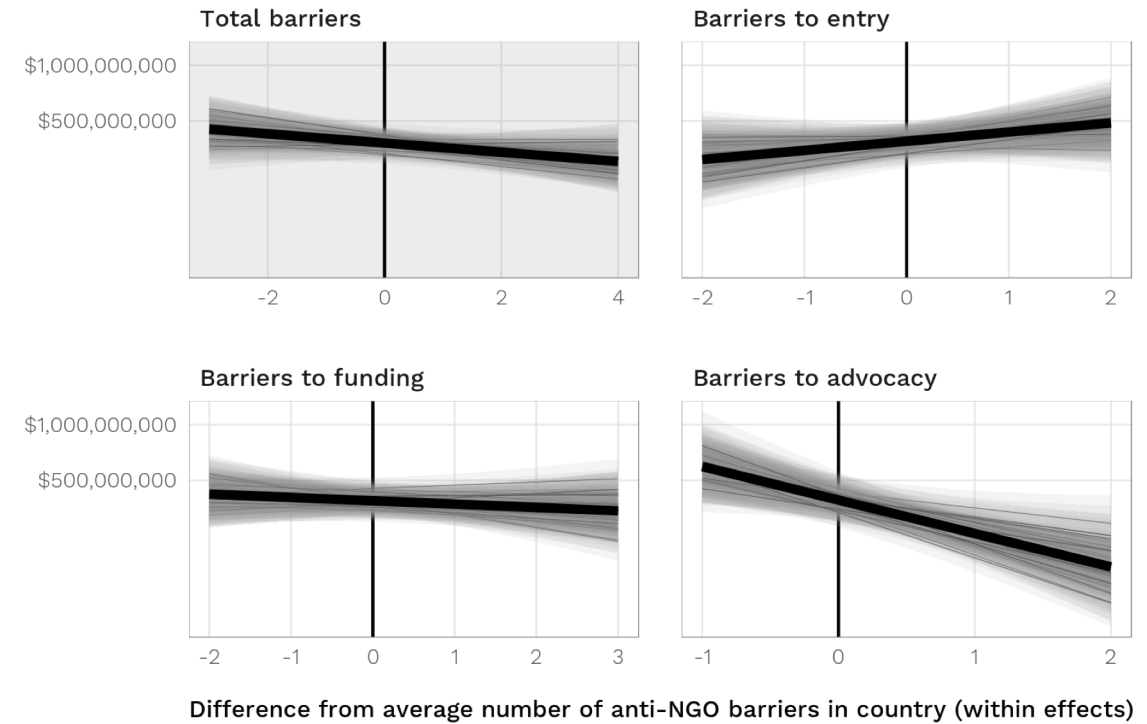
LOLZ

romney institute

BRIGHAM YOUNG UNIVERSITY

Economics   Statistics   Accounting

WHAT IS "STATISTICS"?

Collecting and analyzing data from a representative sample in order to make inferences about a whole population

WHAT IS "DATA SCIENCE"?

Big data

Algorithms

Machine learning

Data mining

Cloud computing

Neural networks

Artificial intelligence

PR-speak for "statistics"

WHAT IS "DATA SCIENCE"?

Turning raw data into understanding, insight, and knowledge

Collect   Analyze   Communicate

WHAT'S THE DIFFERENCE?

Source: Palmer, Shelly. Data Science for the C-Suite.
New York: Digital Living Press, 2015. Print.
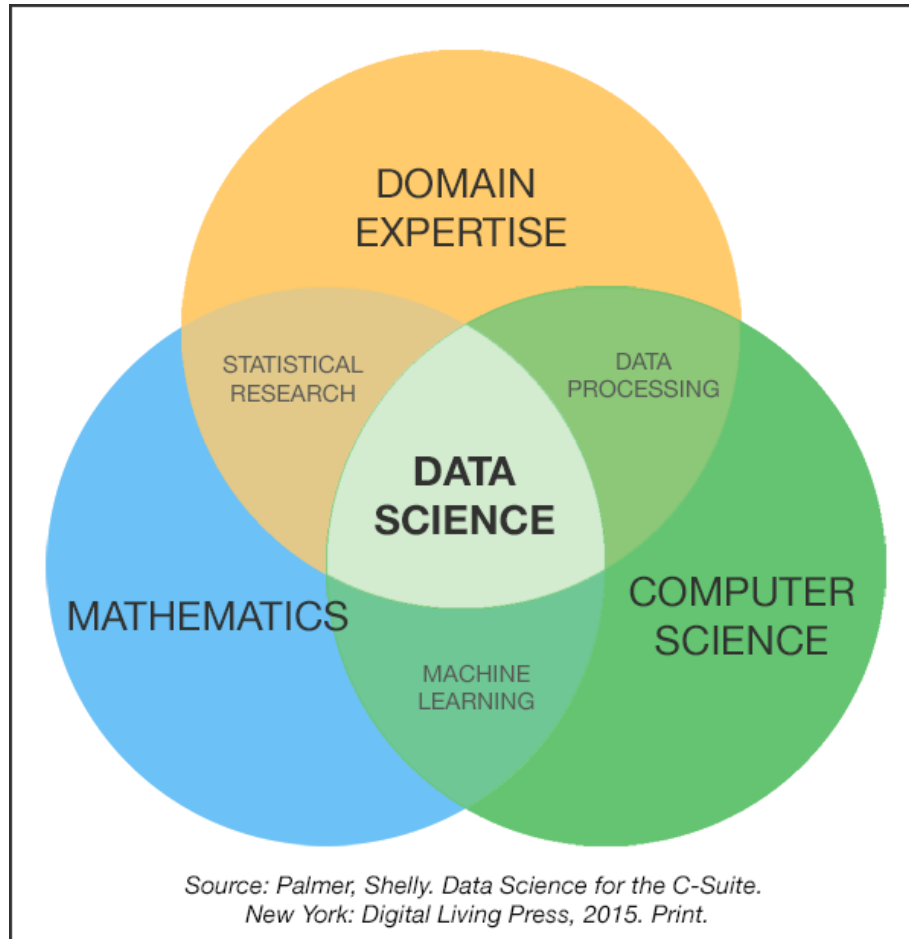
Statistics

Collect

Analyze

Communicate

WHY SHOULD WE CARE ABOUT DATA?

Just hire a bunch of quant nerds to do it for you!

WHY DO WE MAKE YOU TAKE THIS ~~AWFUL PAINFUL~~ CLASS?

EXCITING AND FUN

1. Data is everywhere. We have to understand its limits, uses, and ethics.

2. Data can improve public services and public policy.

WHY UNIVERSITIES NEED 'PUBLIC INTEREST TECHNOLOGY' COURSES

POLICYMAKERS AT ALL levels of government are struggling to thoughtfully harness data in the service of public values. Many public servants grew up in an era of firmly separate disciplines: You were either an engineer or an economist, either a programmer or a social worker, but never both. In an era in which data is everything, the risks to core democratic principles—equity, fairness, support for the most vulnerable, delivery of effective government services—caused by technological illiteracy in policymakers, and policy illiteracy in computer scientists, are staggering.

field aimed at addressing precisely this gap in interdisciplinary opportunities. This new area, "public interest technology," is still being defined; it encompasses designing public policy and laws with an awareness of how technology actually works, as well as ensuring that technology is being used to serve public values of fairness and equity. It means consciously thinking about the welfare of society in general, rather than the incentives of a single company.

DATA AND GOVERNMENT

"To responsibly unleash the power of data to benefit all Americans"

FACT SHEET: Launching the Data-Driven Justice Initiative: Disrupting the Cycle of Incarceration

"[O]ur criminal justice system isn't as smart as it should be. It's not keeping us as safe as it should be. It is not as fair as it should be.
Mass incarceration makes our country worse off, and we need to do something about it." –
President Barack Obama, July 14, 2015

U.S. CITY OPEN DATA CENSUS
POWERED BY OPEN DATA CENSUS

SUNLIGHT FOUNDATION

OPEN KNOWLEDGE INTERNATIONAL

Rank	Place	Budget	Crime Reports	Parcels	Construction Pe...	Zoning	Service Request	Code Violations	Employee Salaries	Business Listings	Spending	Restaurant Inspections	Public Facilities	Traffic Crashes	Property Assessment	Procurement Contracts	Emergency Calls	Lobbyist Activity	Police Use-of-Force	Website Analytics	Property Transfers	Score
1	Cincinnati, OH									+ Add												94%
2	Las Vegas, NV						+ Add													+ Add		89%
3	San Francisco, CA															+ Add						85%
4	Virginia Beach, VA						+ Add									+ Add						79%
5	Baton Rouge/E.B.R Parish, LA						+ Add			+ Add								+ Add			+ Add	78%

Salt Lake City, UT

53% Open	83% Score
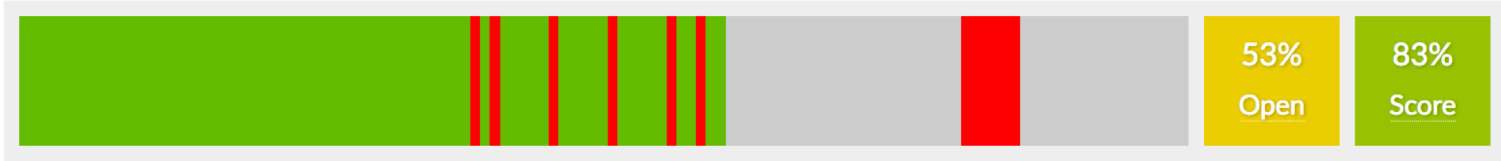
Breakdown

Dataset	Breakdown	Year	Score	
Budget	🔒 👁 $ ⧉ ⏱ ⌨	2018	100%	✎
Business Listings	🔒 👁 $ ⧉ ⏱ ⌨	2018	100%	✎
Construction Permits	🔒 👁 $ ⧉ ⏱ ⌨	2018	100%	✎
Crime Reports	🔒 👁 $ ⧉ ⏱ ⌨	2018	100%	✎
Parcels	🔒 👁 $ ⧉ ⏱ ⌨	2018	100%	✎
Police Use-of-Force	🔒 👁 $ ⧉ ⏱ ⌨	2018	100%	✎
Spending	🔒 👁 $ ⧉ ⏱ ⌨	2018	100%	✎
Service Requests	🔒 👁 $ ⧉ ⏱ ⌨	2018	83%	✎
Emergency Calls	🔒 👁 $ ⧉ ⏱ ⌨	2018	78%	✎
Traffic Crashes	🔒 👁 $ ⧉ ⏱ ⌨	2018	78%	✎
Zoning	🔒 👁 $ ⧉ ⏱ ⌨	2018	78%	✎
Restaurant Inspections	🔒 👁 $ ⧉ ⏱ ⌨	2018	61%	✎
Code Violations	🔒 👁 $ ⧉ ⏱ ⌨			✎
Employee Salaries	🔒 👁 $ ⧉ ⏱ ⌨			✎
Lobbyist Activity	🔒 👁 $ ⧉ ⏱ ⌨			✎
Procurement Contracts	🔒 👁 $ ⧉ ⏱ ⌨			✎
Property Assessment	🔒 👁 $ ⧉ ⏱ ⌨	2018	0%	✎

Google Dataset Search Beta

Search for Datasets 🔍

Try **boston education data** or **weather site:noaa.gov**

Google Dataset Search

🔍 salt lake city

S Salt Lake City Police Department
moto.data.socrata.com
Updated Aug 26, 2018

Salt Lake City Police Department

🌐 moto.data.socrata.com

254 scholarly articles cite this dataset (View in Google Scholar)

H Precipitation Depth Table from Salt Lake City Zoo Station
www.hydroshare.org

Dataset created Dec 2, 2015
Dataset updated Aug 26, 2018
Dataset published Dec 2, 2015

U Data from: Case Outcomes Following Investigative Interviews of Suspected...
www.icpsr.umich.edu
datamed.org

Available download formats from providers
CSV , RSSXML , RDFXML , XML

Description

Salt Lake City Police Department incident dataset

HOW DO YOU START USING ALL THIS DATA?

Take this class

WHAT IS YOUR BIGGEST FEAR ABOUT THIS CLASS?
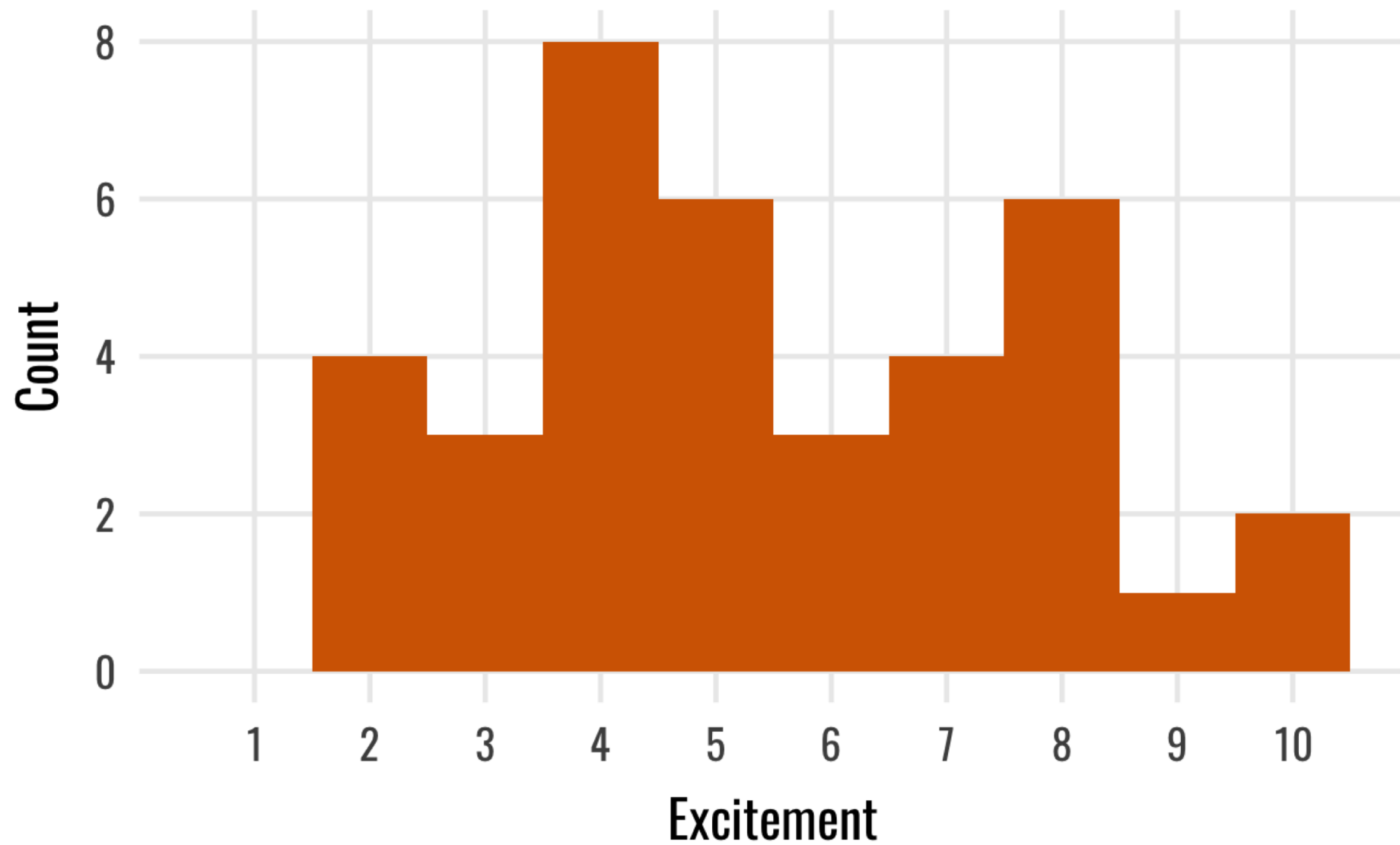
YOU CAN DO THIS.

CLASS PHILOSOPHY

CLASSICAL STATISTICS CLASSES

Mean

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$

Standard deviation

$$\sigma = \sqrt{\frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n}}$$

Correlation

$$r_{xy} = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2 \sum_{i=1}^{n}(y_i - \bar{y})^2}}$$

CLASSICAL STATISTICS CLASSES

- Research design
- Probability
- Random variables
- Central limit theorem
- One/two sample mean and proportion hypothesis tests

- Chi-square tests
- ANOVA
- Simple linear regression
- Multiple linear regression
- Logistic regression
- **All with pre-cleaned data**

MODERN SUPER COOL STATISTICS CLASSES

```
mean(employee_salaries)
```

```
sd(employee_salaries)
```

```
cor(employee_salaries,
employee_experience)
```

MODERN SUPER COOL STATISTICS CLASSES

Getting started with R

Working with data

Tidy data

Data visualization

Data wrangling

DATA SCIENCE FOR PUBLIC MANAGEMENT
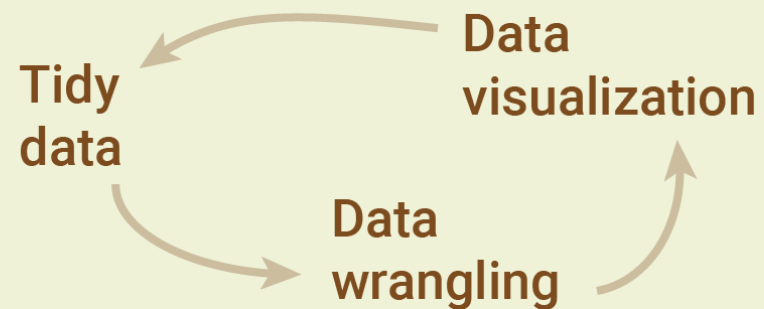
Communication & beyond

Modeling

Regression

Inference & regression

Inference

Sampling

Confidence intervals

Hypothesis testing

MODERN SUPER COOL STATISTICS CLASSES

Modern and practical

Centered on data and tools

Quantitative, but not too mathy

Challenging, but not intimidating

CLASS TECHNOLOGY

THE TIDYVERSE

MODERN SUPER COOL STATISTICS CLASSES

```r
strike_damages_month <- bird_strikes %>%
   group_by(Month) %>%
   summarize(total_damages = sum(Cost, na.rm = TRUE),
             average_damages = mean(Cost, na.rm = TRUE))

ggplot(data = strike_damages_month,
       mapping = aes(x = Month, y = total_damages)) +
   geom_col() +
   scale_y_continuous(labels = dollar) +
   labs(x = "Month",
        y = "Total damages",
        title = "Really expensive collisions happen in the fall?",
        subtitle = "Don't fly in August or October?",
        source = "Source: FAA Wildlife Strike Database")
```
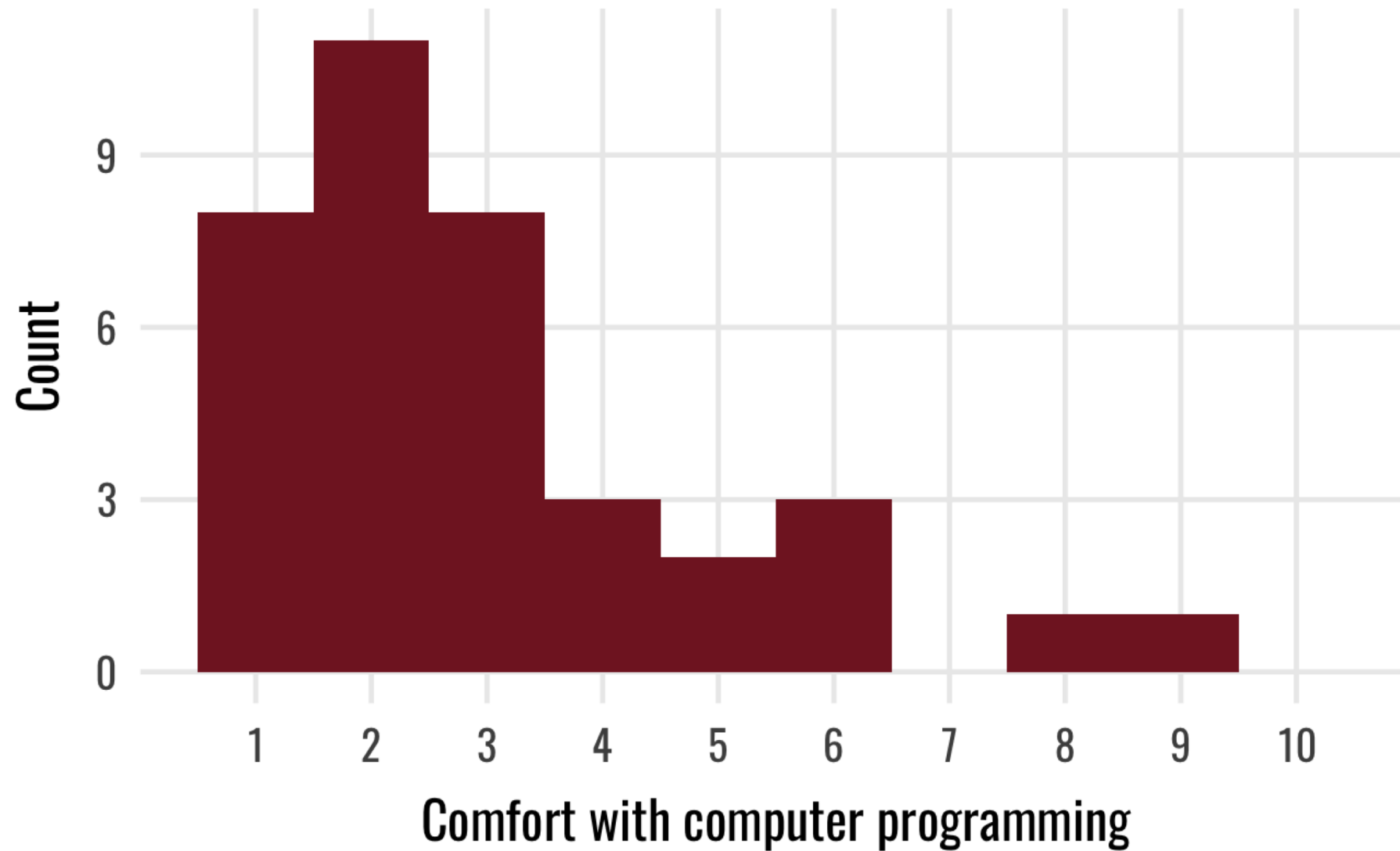
S U C K I N G

There is no way to go from knowing nothing about a subject to knowing something about a subject without going through a period of much frustration and suckiness

Push through. You'll suck less.

Hadley Wickham, author of ggplot2 and the tidyverse

SUCKING

Dude, sucking at something is the first step towards being sort of good at something

Opinion

SPORTING

(It's Great to) Suck at Something

By Karen Rinaldi

April 28, 2017

225

LEARNING R

Jesse Maegan
@kierisi

Following

My #rstats learning path:

1. Install R
2. Install RStudio
3. Google "How do I [THING I WANT TO DO] in R?"

Repeat step 3 ad infinitum.

7:19 AM - 18 Aug 2017

CLASS DETAILS

GOAL FOR THE CLASS

Provide a gateway experience to doing impactful work with data

Answer your own questions with real world data

Change the world with data

PREREQUISITES

Math skills

None

Computer science skills

None

MISCELLANEA

MISCELLANEA

Class representative

Class expectations

Late work   Technology   Participation   Other?

BREAK

BIRDS AND AIRPORTS

https://andhs.co/630rstudio