IS 6489: Statistics and Predictive Analytics

Class 2

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Tonight's agenda

- Details
- Questions about the course or the material?
- Live poll review
- Review: tidy data
- Review: Why EDA?
- EDA workflow
- .Rmd script on tidy data and EDA workflow; mini-project.
- Note: My assumption tonight is that you've studied the lecture and tutorial videos for week 2 and are ready to practice the concepts and techniques covered there.

Details

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- My office hours: 9:30 AM - 10:30 AM Tuesday or by appointment.
- TA Ali Samanazari: ali.samanazari at utah.edu. Ali will conduct weekly tutorial sessions on Mondays, 5 - 6 PM in SFEBB 5163. Please also feel free to email him with any questions about R programming or other course content.
- Homework coming up is *Introduction to the Tidyverse* at Datacamp. If you want more to do I would suggest additional courses in dplyr, ggplot2 or tidyverse.

Questions

Questions

- Any questions on the course or the material so far that I can address?

Live poll review

live poll review

Go to PollEv.com/jeffwebb768

Tidy data

Messy data

- As noted: all messy datasets are messy in their own way, which makes it hard to generalize about how to fix them.
- Nevertheless, here are some guidelines for tidy data:

  1. Each variable must have its own column.
  2. Each observation must have its own row (meaning that each value must have its own cell).
  3. A table should be dedicated to same observational unit.

- Adapted from *R for Data Science* by Wickham and Grolemund.

Messy data

Tuberculosis cases and population by country and year. What's messy here?

```
## # A tibble: 12 x 4
##    country      year type            count
##    <chr>       <int> <chr>           <int>
##  1 Afghanistan  1999 cases             745
##  2 Afghanistan  1999 population   19987071
##  3 Afghanistan  2000 cases            2666
##  4 Afghanistan  2000 population   20595360
##  5 Brazil       1999 cases           37737
##  6 Brazil       1999 population  172006362
##  7 Brazil       2000 cases           80488
##  8 Brazil       2000 population  174504898
##  9 China        1999 cases          212258
## 10 China        1999 population 1272915272
## 11 China        2000 cases          213766
## 12 China        2000 population 1280428583
```

Messy data

What's messy here?

```
## # A tibble: 6 x 3
##   country      year rate
## * <chr>       <int> <chr>
## 1 Afghanistan  1999 745/19987071
## 2 Afghanistan  2000 2666/20595360
## 3 Brazil       1999 37737/172006362
## 4 Brazil       2000 80488/174504898
## 5 China        1999 212258/1272915272
## 6 China        2000 213766/1280428583
```

Messy data

What's messy here?

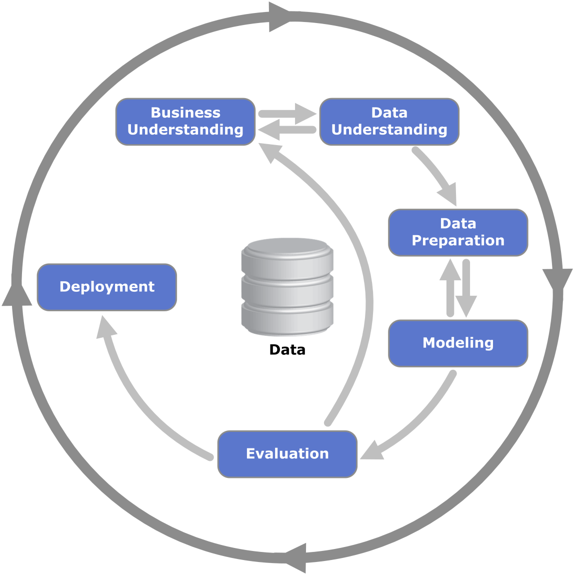
```
## # A tibble: 3 x 3
##   country     `1999` `2000`
## * <chr>        <int>  <int>
## 1 Afghanistan    745   2666
## 2 Brazil       37737  80488
## 3 China       212258 213766
```

Tidy data

```
## # A tibble: 6 x 4
##   country      year  cases population
##   <chr>       <int>  <int>      <int>
## 1 Afghanistan  1999    745   19987071
## 2 Afghanistan  2000   2666   20595360
## 3 Brazil       1999  37737  172006362
## 4 Brazil       2000  80488  174504898
## 5 China        1999 212258 1272915272
## 6 China        2000 213766 1280428583
```

Why EDA?

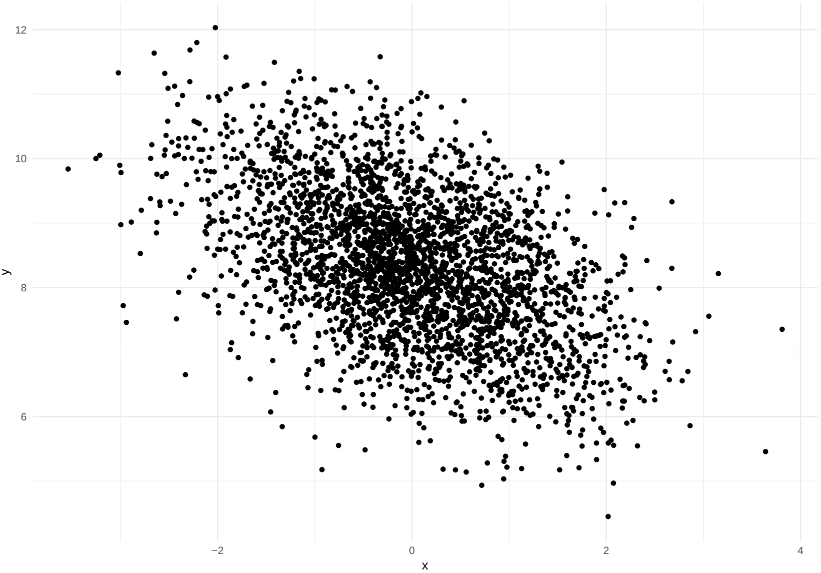
Reminder: Cross Industry Standard Process for Data Mining (CRISP-DM)



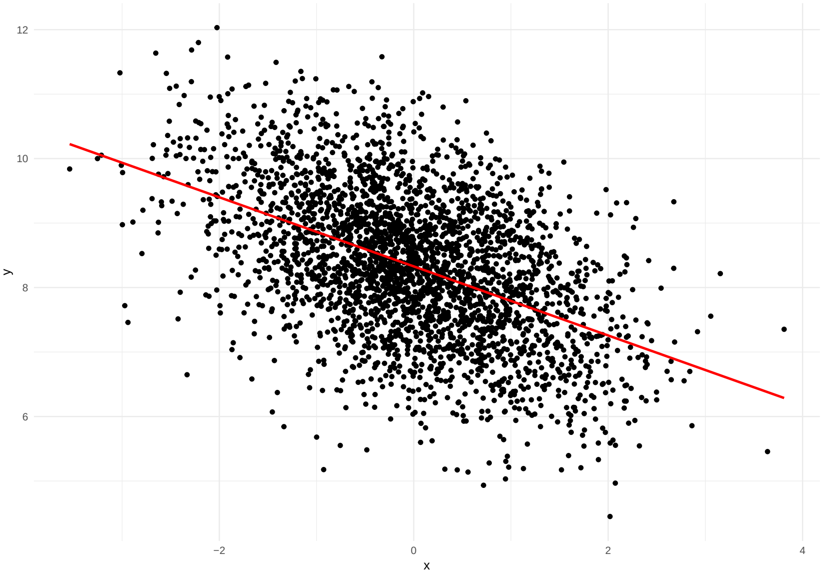
Simpson's paradox

x	y	group
-0.6264538	9.420478	grp07
0.1836433	8.617918	grp06
-0.8356286	10.093969	grp08
1.5952808	6.643508	grp03
0.3295078	6.547648	grp04
-0.8204684	9.722400	grp07
0.4874291	9.868629	grp07
0.7383247	7.866649	grp05
0.5757814	9.899366	grp06
-0.3053884	10.081377	grp07
1.5117812	7.995739	grp04
0.3898432	8.546668	grp06
-0.6212406	7.412821	grp05
-2.2146999	11.799955	grp10
1.1249309	8.040340	grp05

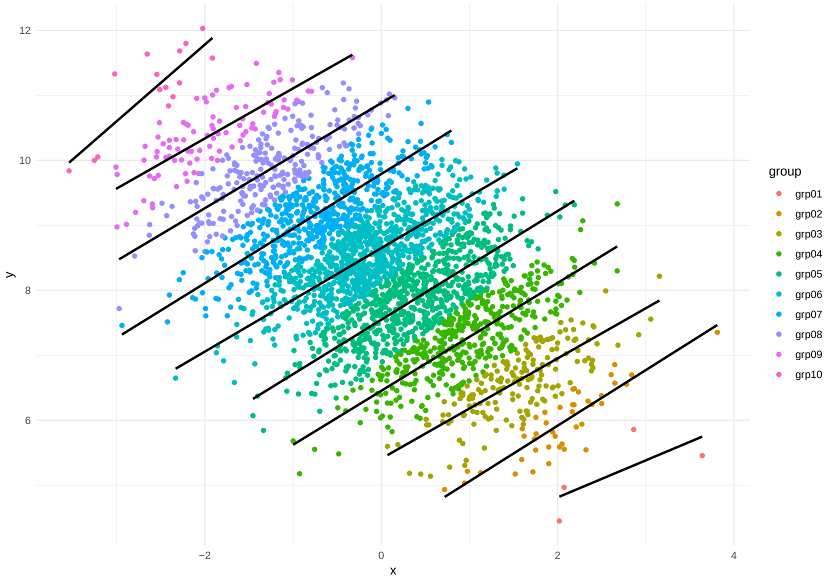
Simpson's paradox



Simpson's paradox



Simpson’s paradox



Why EDA?

- We explore the data prior to fitting a model so that we understand the idiosyncrasies of the data and can make informed modelling decisions.
- In the case of Simpson's paradox data we may be interested in the relationship between x and y, but through EDA we (hopefully) learn that we need to examine the relationship between x and y *within* each group.

EDA workflow

After understanding the business context and the motivating business problem for the analysis:

1. Formulate a question
2. Read in your data
3. Check the packaging
4. Inspect dataset: str(), glimpse(), View()
5. Look at the top and the bottom of your data
6. Summarize the data
7. Try the easy solution first
8. Challenge your solution
9. Follow up questions

- Adapted from *Exploratory Data Analysis* by Roger Peng.