UCSD

DSC 96

Spring 2019

Class 2

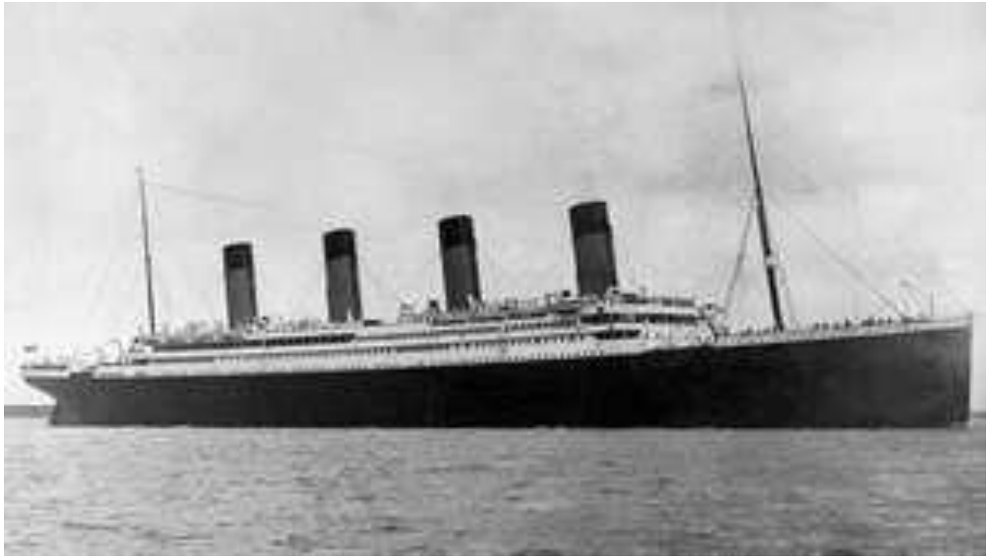
Data Exploration

Announcements

- Readings (Week 1 due Friday, week 2 due Tuesday)
- Professor versus Lecturer

Titanic Data

- How many people were on the ship?
- What was the total of all fares paid?



Tableau

- Dimensions and Measures
- Chart Types
- Aggregations
- Filters
- Calculated Values

Titanic data

- Pclass:
  - It represent the class for each passenger (first, second, third)
  - 1,2,3
- Tableau
  - It guesses it is a number (like the amount paid): it is in **Measures**
  - It makes sense for Tableau to sum them up or to average them
  - What is the meaning of: average class is 1.85 ?
- Solution
  - Drag pclass it to **Dimensions** !
  - Change the data type to **string**
- What about age?
  - Age in bins (drag to Dimensions, Create, Bins)
  - Fix reasonable intervals (10 years?)

- **Titanic!**

  - Titanic dataset and cool things you can do with it: https://www.kaggle.com/c/titanic

  - Tableau official training: https://www.tableau.com/learn

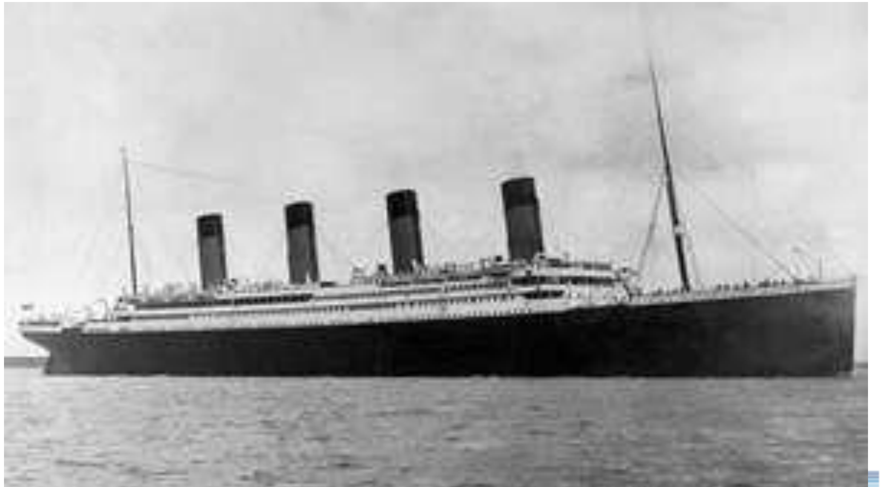
  - Tableau examples with Titanic data: https://public.tableau.com/search/all/titanic

Titanic Questions

- Can you attribute survival to a single primary trait?
- In other words, can you attempt to tease apart the confounding effects of pclass/age/sex, when assessing one?

- Can you explain why the distribution of fares by pclass seems off? why are some 3rd class tickets more expensive than first class?

- Does group size have an effect on survival rate?



Data is Messy

Colin Jemmott
and
Giorgio Quer
DSC 96

Much of this is adapted from the outstanding “Quartz Bad Data Guide”
https://github.com/Quartz/bad-data-guide

Data Types

Many different data types exist. Common types include:

- Integers : 5, 2790, 342, 1200124
- Floating-point numbers: 13.540394542 , 3.14159… , 22.7421341321514
- Strings: ‘Hello’ , ‘This data is a mess!’, ‘92122’
- Booleans: True, False

Even with these simple types, data can often be “messy” or bad”.

What might go wrong?

Missing Values

- Null
- NaN
- 0, -1 or “” instead of null
- 1900 and 1970
- “Null Island” at 0°00'00.0"N+0°00'00.0"E

Related: missing data that you know should be there

- how many states should be listed in national data?

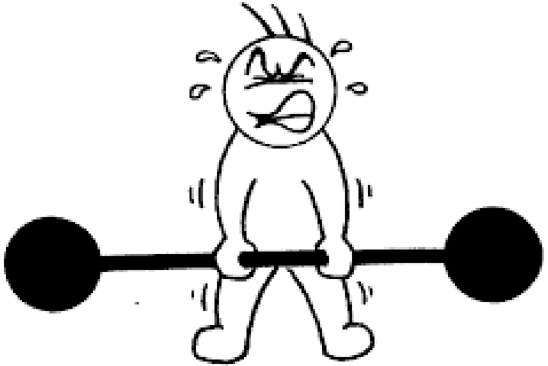
Null Island is one of the most popular jogging locations according to the Strava fitness tracking app. https://en.wikipedia.org/wiki/Null_Island

Dates and Units

Which date is in September?

- 9/10/18
- 10/9/18

Object A is listed as “weight=87”. Can you lift it?



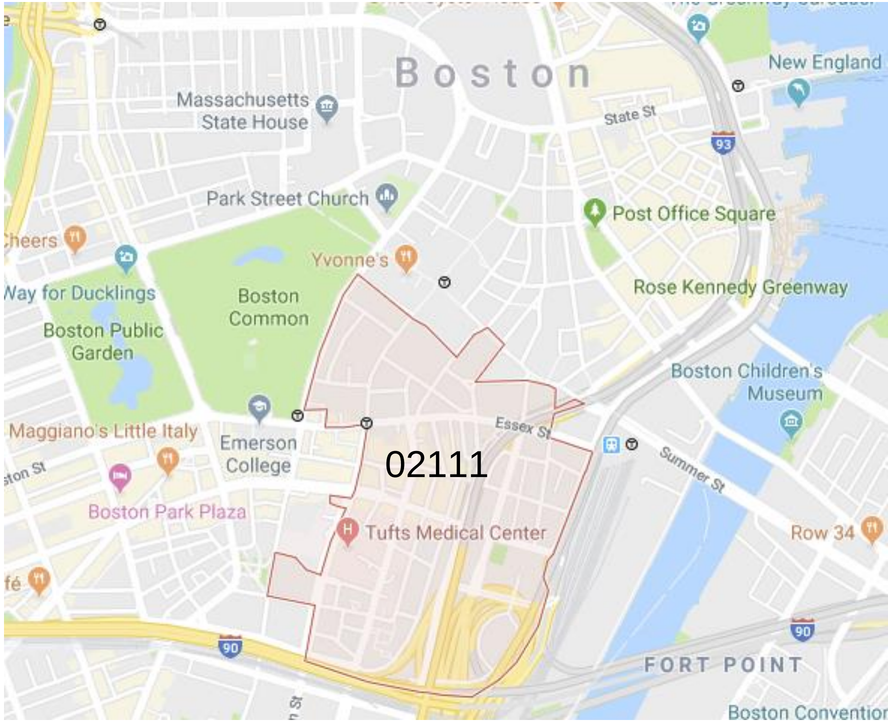
Does “Los Angelos” == “Los Angeles”?

Numbers and “Numbers”

1537660383 looks like a number, but is probably a date (Unix timestamp)

“**USD 1,000,000**” looks like a string, but is actually a number and a unit.

02111 looks like a number, but is really a zip code (and isn’t equal to 2,111)



Strings

- **Encoding problems**
    - Presence of weird characters in the middle of a word
- **Solution**
    - Ask the source
    - Best guess

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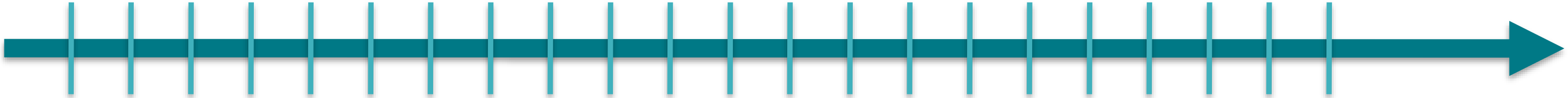
Data definition

- Data is too coarse:
  - You needs months, but you only have years
- Data is too granular:
  - You have daily “number of steps”, but you need monthly steps for your statistical analysis



Data collection problems

- We have a great dataset:
  - Physical activity for 1 year from 10M people in US with an activity tracker!
  - We want to describe the physical activity of US citizens !
  - Can we?

Data collection problems

- We have a great dataset:
  - Physical activity for 1 year from 10M people in US who bought an activity tracker!
  - We want to describe the physical activity of US citizens !
  - Can we?
- Ok, let’s collect the data properly:
  - 1000 people randomly selected (any age or physical status or income) in San Diego county
  - 3 months of data (May, June, July)
  - Are we ok now?

Data collection problems

- Sample is not random
  - You have the number of steps, but the population is composed of very active people

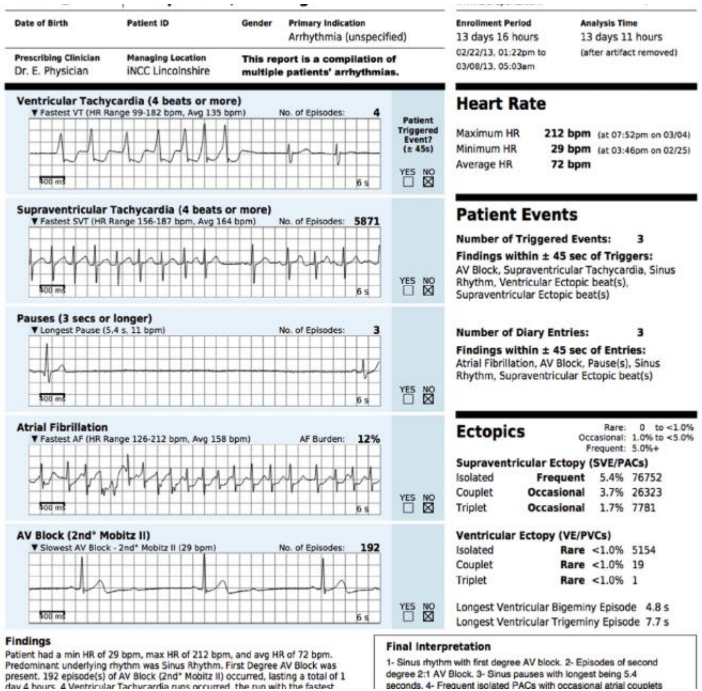
- Seasonal variation
  - You have number of steps from a good population, but only in summer time

- Results are p-hacked
  - The data collection stopped once a significant result

Other data types

Data doesn’t always come in in nicely formatted packages.

- CSV, escaping, and the lack of standards
- Data are in a PDF - what now?
- Images and sound recordings as data



Date of Birth	**Patient ID**	**Gender**	**Primary Indication** Arrhythmia (unspecified)
Prescribing Clinician Dr. E. Physician	**Managing Location** iNCC Lincolnshire	**This report is a compilation of multiple patients' arrhythmias.**	

Enrollment Period
13 days 16 hours
02/22/13, 01:22pm to
03/08/13, 05:03am

Analysis Time
13 days 11 hours
(after artifact removed)

Ventricular Tachycardia (4 beats or more)
▼ Fastest VT (HR Range 99-182 bpm, Avg 135 bpm) No. of Episodes: **4**

Patient Triggered Event? (± 45s)
YES □ NO ☒

Supraventricular Tachycardia (4 beats or more)
▼ Fastest SVT (HR Range 156-187 bpm, Avg 164 bpm) No. of Episodes: **5871**
YES □ NO ☒

Pauses (3 secs or longer)
▼ Longest Pause (5.4 s, 11 bpm) No. of Episodes: **3**
YES □ NO ☒

Atrial Fibrillation
▼ Fastest AF (HR Range 126-212 bpm, Avg 158 bpm) AF Burden: **12%**
YES □ NO ☒

AV Block (2nd° Mobitz II)
▼ Slowest AV Block - 2nd° Mobitz II (29 bpm) No. of Episodes: **192**
YES □ NO ☒

Heart Rate

Maximum HR	**212 bpm**	(at 07:52pm on 03/04)
Minimum HR	**29 bpm**	(at 03:46pm on 02/25)
Average HR	**72 bpm**	

Patient Events

Number of Triggered Events: **3**

Findings within ± 45 sec of Triggers:
AV Block, Supraventricular Tachycardia, Sinus Rhythm, Ventricular Ectopic beat(s), Supraventricular Ectopic beat(s)

Number of Diary Entries: **3**

Findings within ± 45 sec of Entries:
Atrial Fibrillation, AV Block, Pause(s), Sinus Rhythm, Supraventricular Ectopic beat(s)

Ectopics

Rare:	0 to <1.0%
Occasional:	1.0% to <5.0%
Frequent:	5.0%+

Supraventricular Ectopy (SVE/PACs)

Isolated	**Frequent**	5.4%	76752
Couplet	**Occasional**	3.7%	26323
Triplet	**Occasional**	1.7%	7781

Ventricular Ectopy (VE/PVCs)

Isolated	**Rare**	<1.0%	5154
Couplet	**Rare**	<1.0%	19
Triplet	**Rare**	<1.0%	1

Longest Ventricular Bigeminy Episode	4.8 s
Longest Ventricular Trigeminy Episode	7.7 s

Findings
Patient had a min HR of 29 bpm, max HR of 212 bpm, and avg HR of 72 bpm. Predominant underlying rhythm was Sinus Rhythm. First Degree AV Block was present. 192 episode(s) of AV Block (2nd° Mobitz II) occurred, lasting a total of 1 day 4 hours. 4 Ventricular Tachycardia runs occurred, the run with the fastest

Final Interpretation
1- Sinus rhythm with first degree AV block. 2- Episodes of second degree 2:1 AV Block. 3- Sinus pauses with longest being 5.4 seconds. 4- Frequent isolated PACs with occasional atrial couplets

from: Barrett et al, "Comparison of 24-hour Holter Monitoring with 14-dayNovel Adhesive Patch Electrocardiographic Monitoring"