

Computational Social Systems

Week 2

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Recap of week 1

- Brief history of quantitative (social) sciences
- Different types of data collection in the past and present times
- Questions:
 - What is a complex system?
 - What is its property?
 - Is society a complex system?

Part 1

SOCIAL IMPACT

Social Impact Theory

Definition: changes in behaviour that occur in an individual as a result of the presence or actions of other individuals.

Examples of behavior:

subjective feelings, motives, emotions, thoughts, customs, decisions...

The presence or actions of others can be:

- *real*: the physical presence of others
- *implied*: expected or manipulated presence, e.g. a cardboard policeman
- *imagined*: mental representation of others,
e.g. supporters of your team when watching TV sports

Asch's conformity experiments

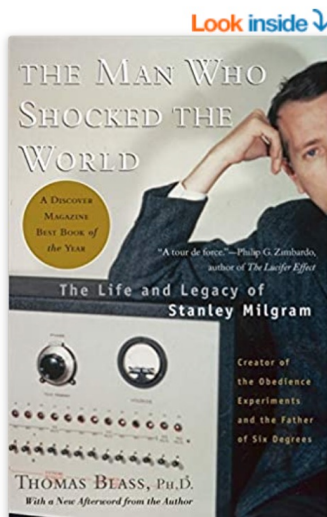


Stanley Milgram

- A social psychologist
- Yale and Harvard University
- For which studies is he famous?



1933-1984



The Man Who Shocked The World: The Life and Legacy of Stanley Milgram Paperback – 24 Feb. 2009

by [Thomas Blass](#) (Author)

★★★★★ 35 ratings

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Creator of the famous Obedience Experiments and originator of the 'six degrees of separation' theory, Stanley transformed our understanding of human nature and continues to be one of the most important figures in psychology and beyond. In this sparkling biography, Thomas Blass captures the colorful personality and pioneering work of a visionary scientist who revealed the hidden workings of our social world. In this new paperback edition, he includes an afterword connecting Milgram's torture, war crimes, and Abu Ghraib.

Milgram imitation experiments

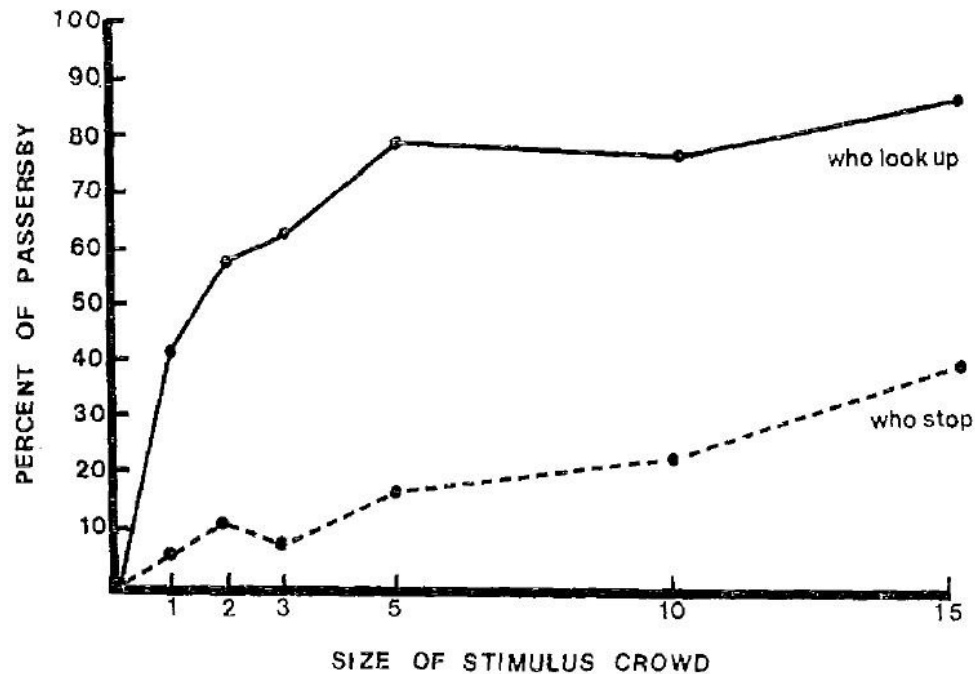
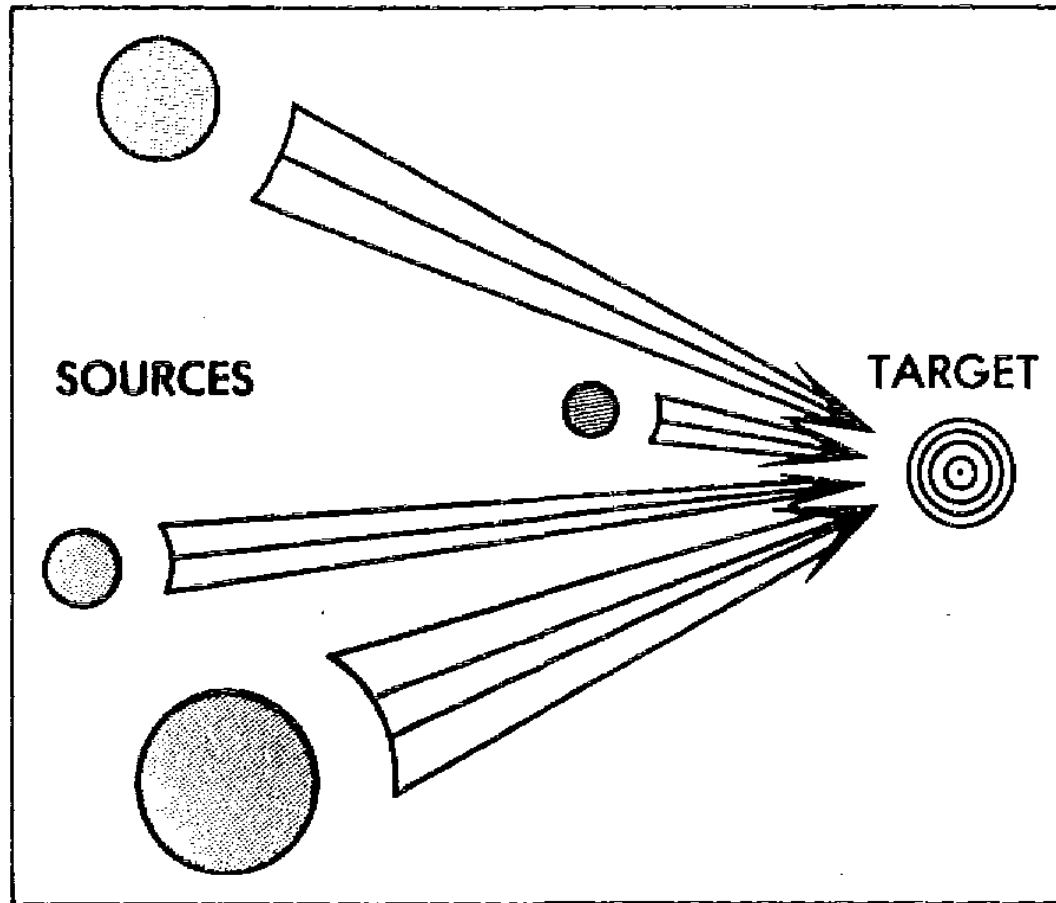


FIG. 1. Mean percentage of passersby who look up and who stop, as a function of the size of the stimulus crowd.



What are the factors (in sources) that impact the target person?



Social Impact Theory (Bibb Latane)

In Social Impact Theory (SIT), social impact is driven by three forces:

$$I = f(S \times i \times N)$$

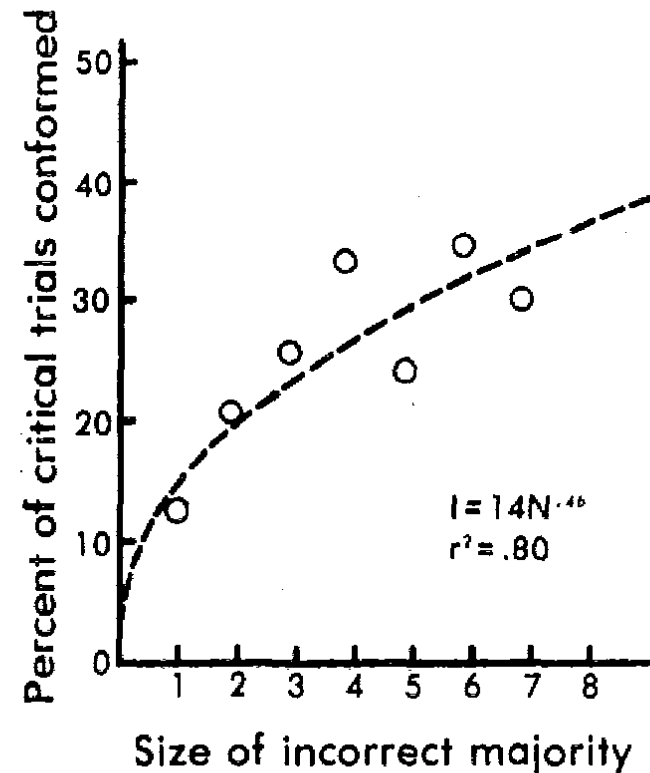
- I is the magnitude of social impact
- $f()$ is a multiplicative function of three conditions of the impact:
 1. Strength S or power of the source(s)
 2. Immediacy I or proximity of the source(s)
 3. Number of sources N or number of people

N: Number of sources

SIT predicts that impact should grow with N. Asch's conformity experiments test this hypothesis where:

- I: increase in the percentage of wrong answers given by students that were experiment subjects
- N: controlled number of confederates

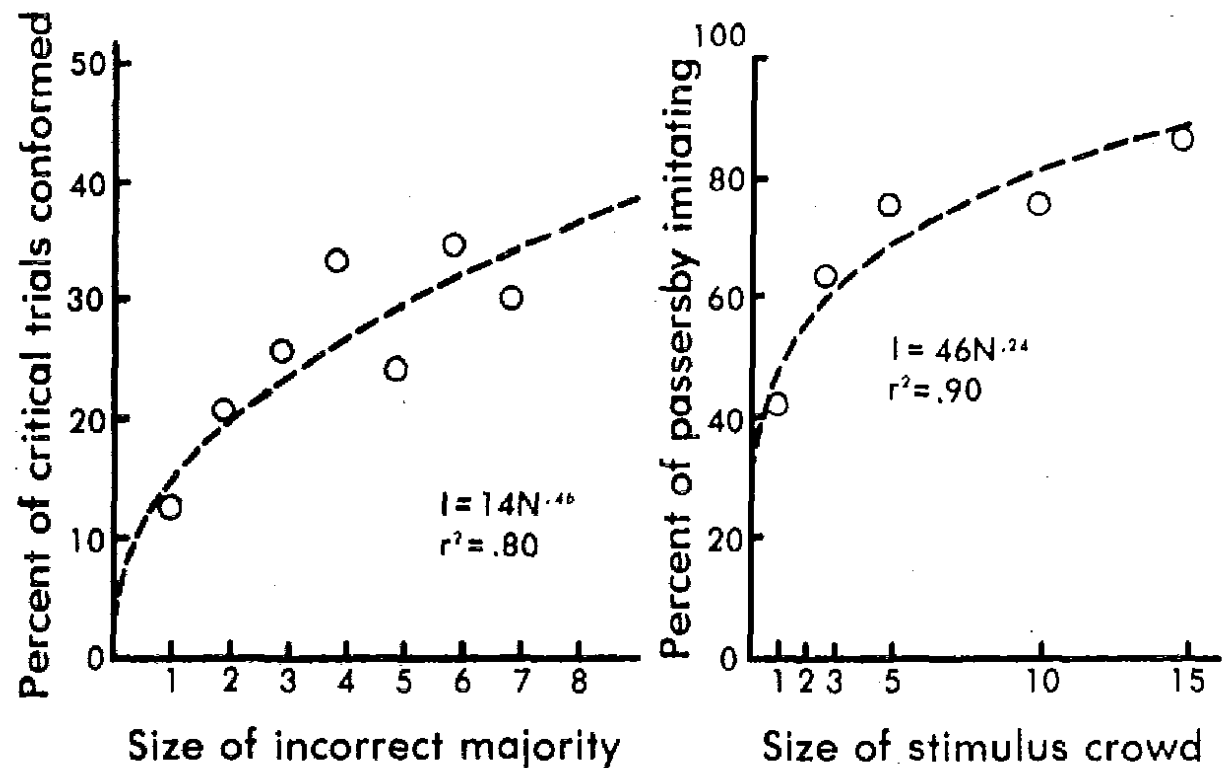
The result: the percentage of wrong answers grows with the amount of sources.



The Psychosocial Law

The Psychosocial Law:

The extent of social impact grows ??? with the number of sources.



The Psychosocial Law

The Psychosocial Law:

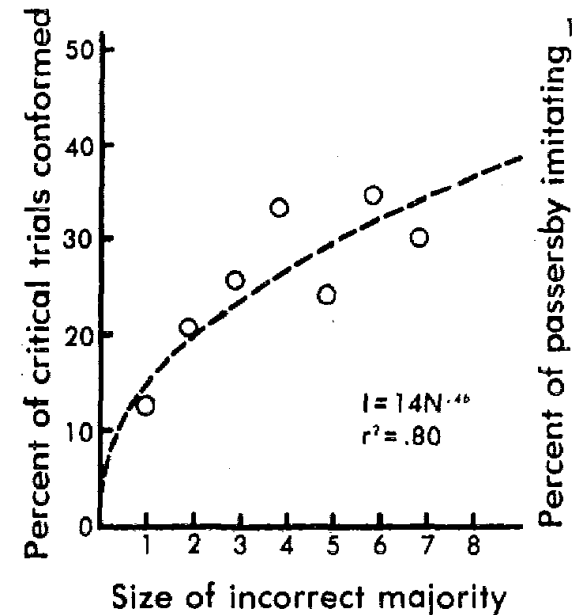
The extent of social impact grows sublinearly with the number of sources.

This can be translated to the equation:

$$I \propto N^t, t < 1$$

This means that the hundredth source has less additional effect than the first (*diminishing returns*).

The equation is what is called a power-law with exponent t . In the case of conformity among high school students, t was estimated to be 0.48.

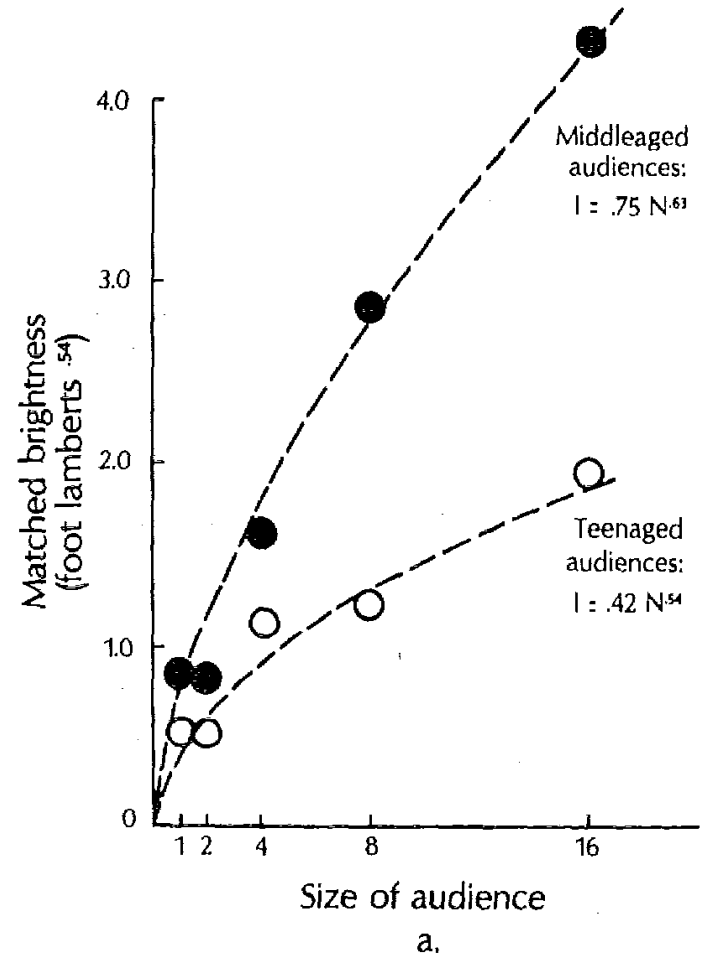


S: Strength of sources

The strength in SIT is the perceived social status, power, wealth, importance, or intensity of the sources. Poem experiment example:

- I: anxiety of the students recorded with a dial they use to measure their own anxiety
- N: number of people in the audience
- S: audience is middle-aged (strong) or teenagers (weak)

Multiplicative effect: The impact of the number of sources grows faster when they are strong than when they are weak



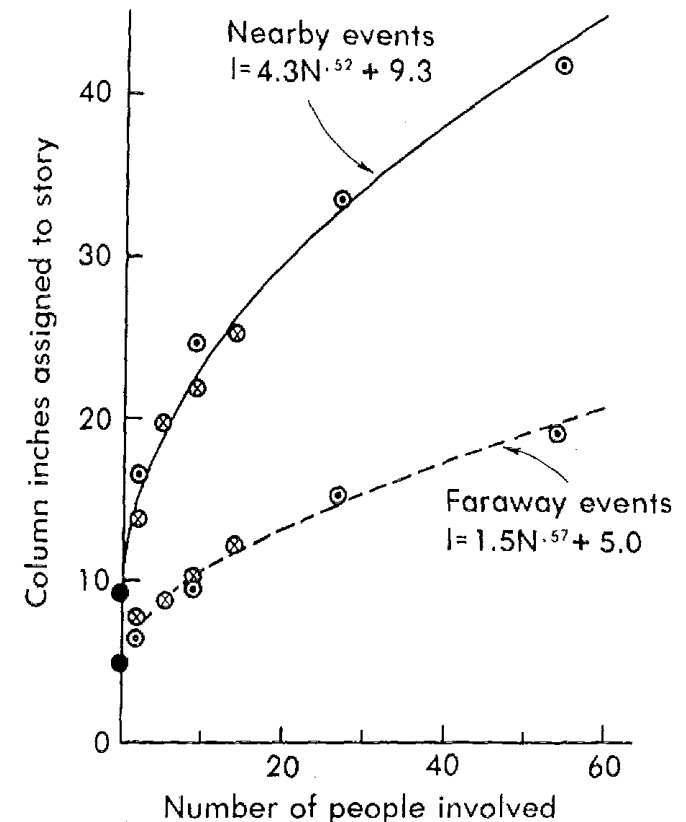
Social tension as a function of audience size.

i: immediacy of sources

Immediacy is defined as the proximity between the sources and the target of social impact. Immediacy can be spatial, temporal, or social. The effect of immediacy in media bias experiments:

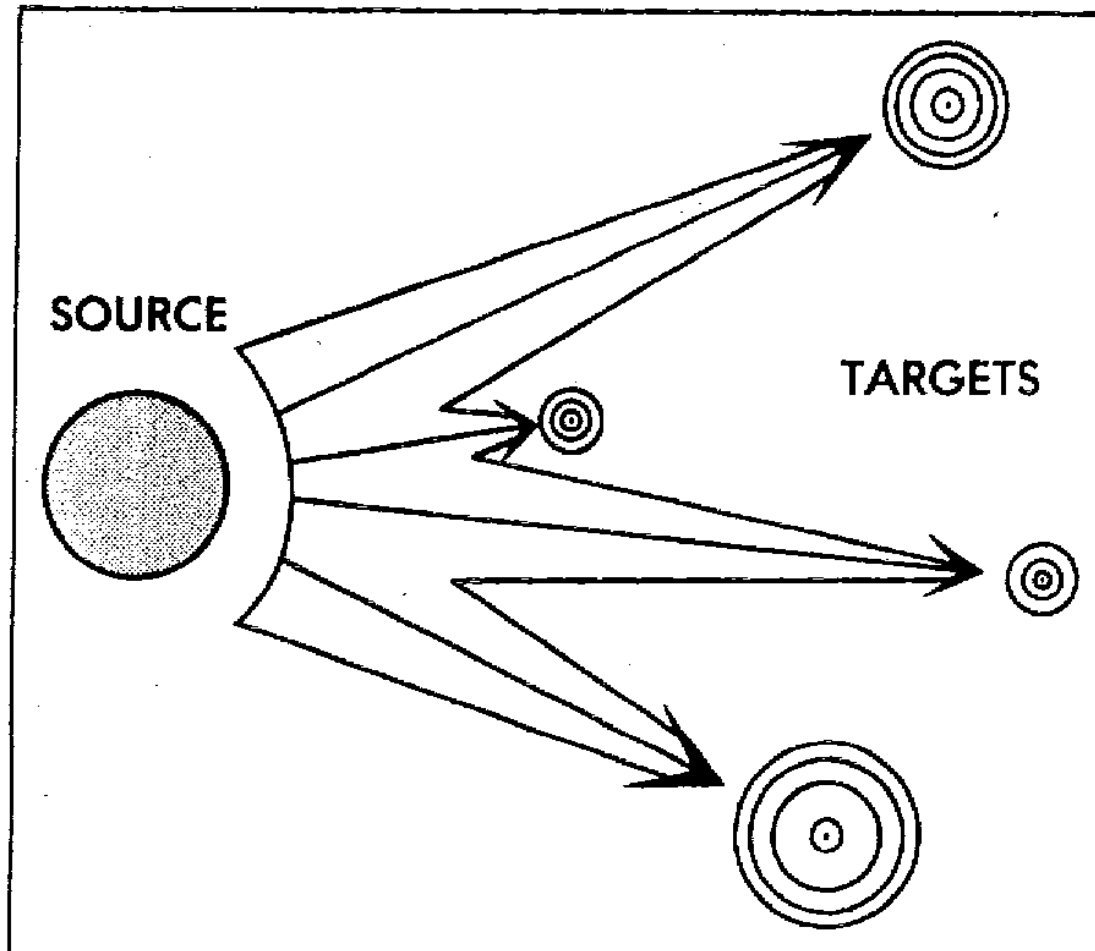
- I: number of lines used to report the news by the students
- N: number of people reported dead in the accident
- i: is the distance to the place of the accident (close vs far conditions)

Results: The growth of impact with N was steeper for the close condition



Interest value of news events as a function of number of people involved. (source:)

Division of impact



Division of impact

Social Impact Theory also covers situations with one source but when targets are not alone. It formulates the impact I on **each** target as:

$$I = f\left(\frac{1}{S \times i \times N}\right)$$

Where the terms are:

- S strength of the targets: the stronger the targets, the harder to impact each one.
- i immediacy between the targets: the closer or more connected the targets, the harder to impact each one.
- N the more the targets in the group, the harder to impact each one.
- $f()$ is a multiplicative function with negative exponents for the terms.

Division of impact

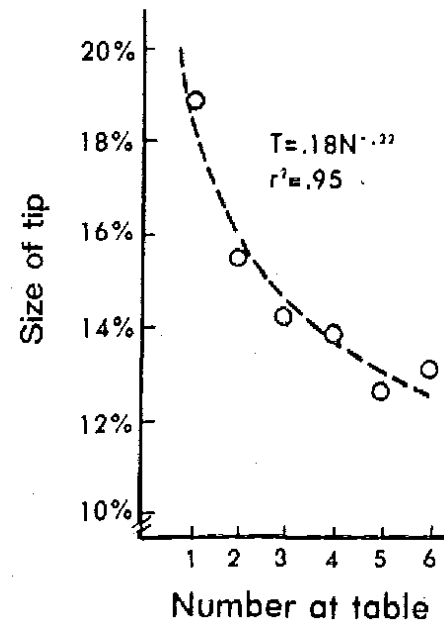
The most widely studied divisor of impact is group size (N). An observational study finds the effect for the case of restaurant tips:

- I: Percentage of tip (assumed evenly shared among customers)
- N: number of customers at the table

Result: I decreases as N increases.

The more people sitting at the same table, the less obliged each one feels to leave a tip.

The resulting shape of I as a function of N is well-fitted by a negative power of N.



bystander effect

“38 Who Saw Murder Didn’t Call the Police”.

bystander effect: division of impact in case of intervening or helping.

In this case the individual change of behavior (calling the police) decreases with the number of people impacted (number of neighbors watching).

If impact per observer becomes too low, nobody might intervene, producing a paradoxical situation like the one reported by the New York Times.

The bystander effect has been widely replicated in experiments and observed in many other situations.

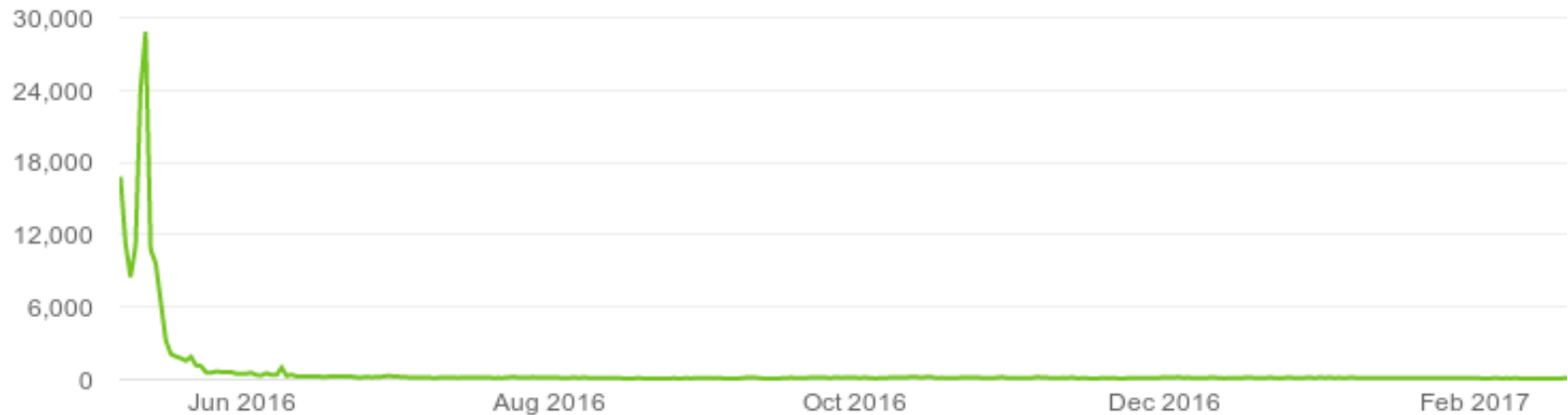
Closely related to the **tragedy of the commons**.

Part 2

SOCIAL IMPACT IN MODERN TIMES

Time series of the number of views of a video.

Question: what has sparked such a pattern in the number of views?



Social impact

Justine Bieber effect!



Justin Bieber  @justinbieber · 11 Jul 2013

so many activities it is making my **head spin!** haha



Step Brothers- 'Activities'

My favoruite clip from the movie Step Brothers. Credit in video to Columbia Pictures. Copyright Columbia Pictures [2009]

[youtube.com](#)

Step Brothers- 'Activities'

 Worble

 **Subscribe** 192



1:09 / 2:19

RETWEETS

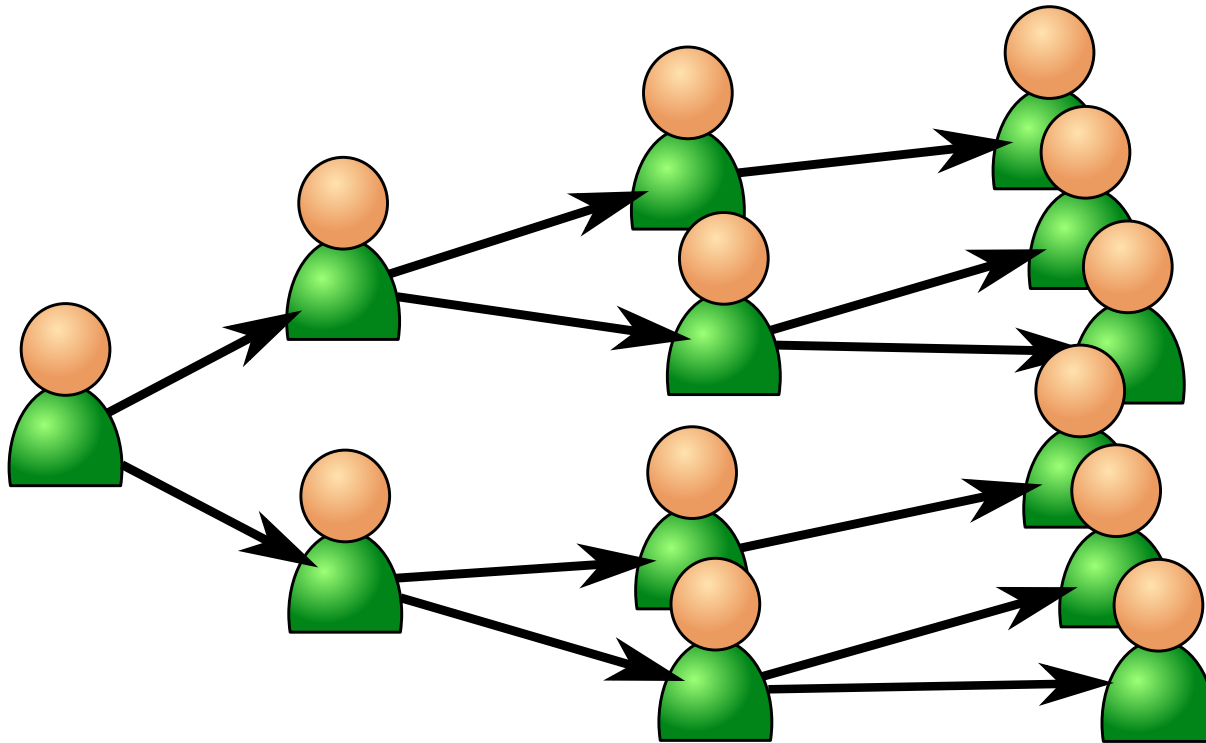
58,887

LIKES

47,530

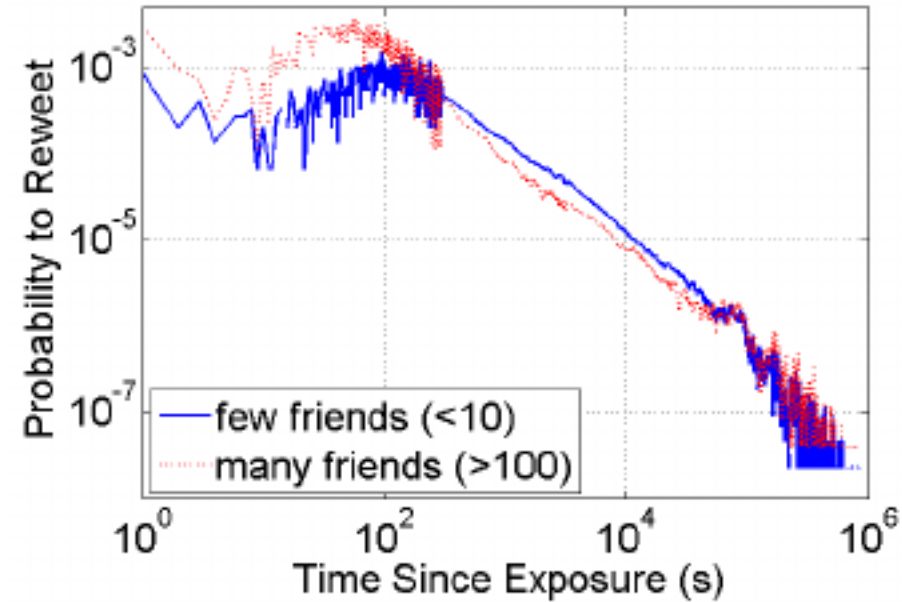
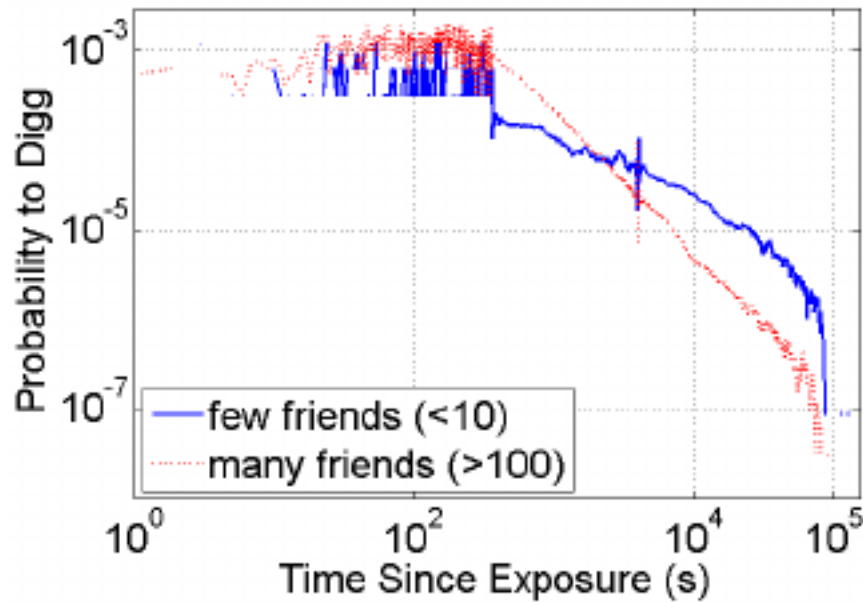
235,460 views

(Supercritical spreading: viral marketing)



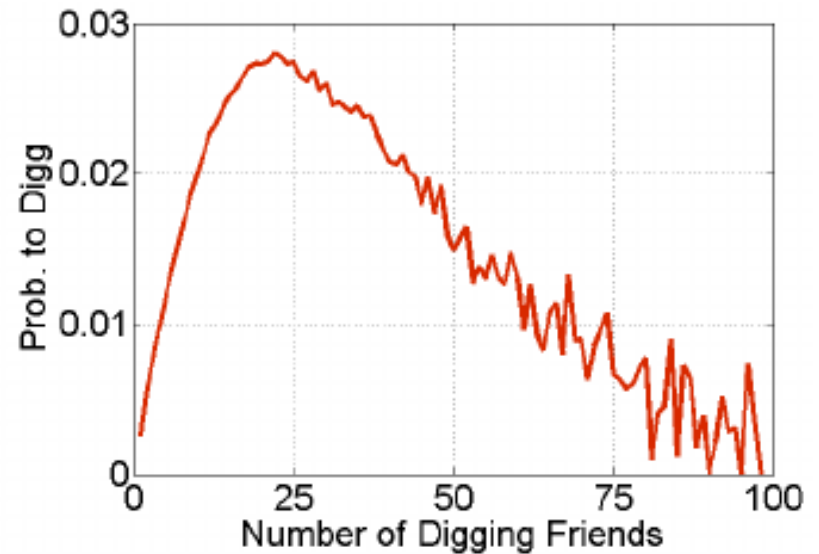
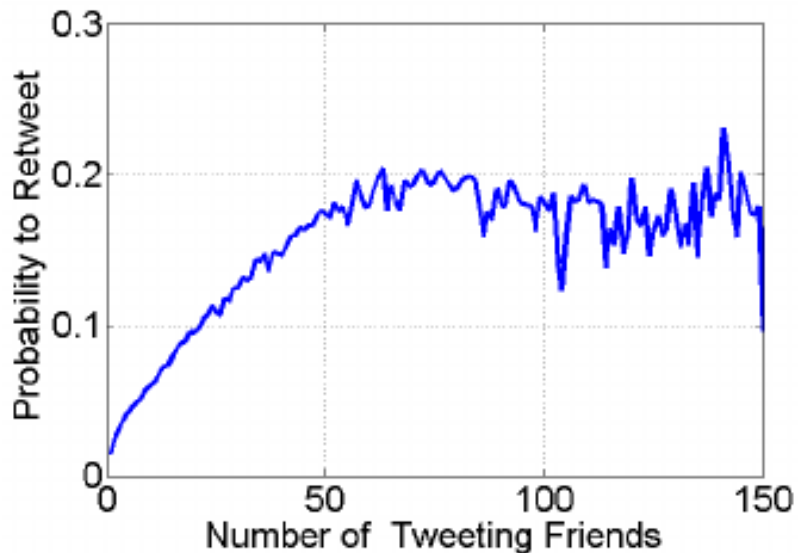
Kristina Lerman's review ["Information Is Not a Virus, and Other Consequences of Human Cognitive Limits"](#).

Online Social Impact: immediacy

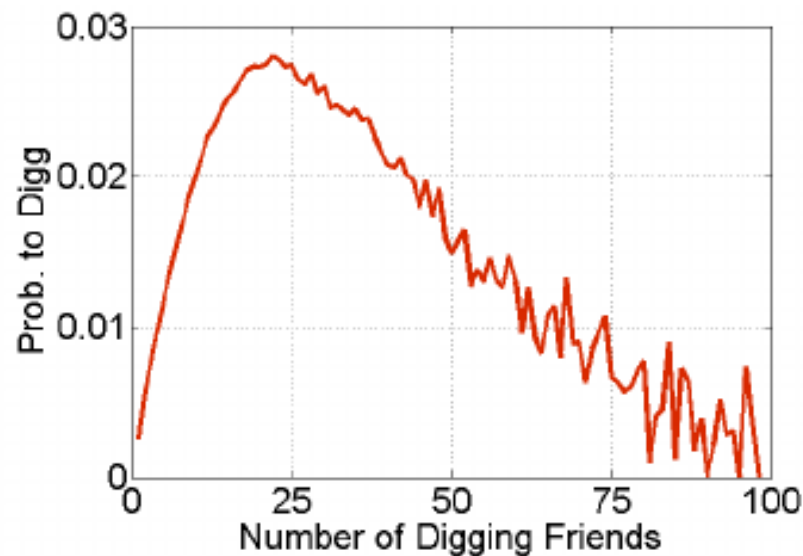
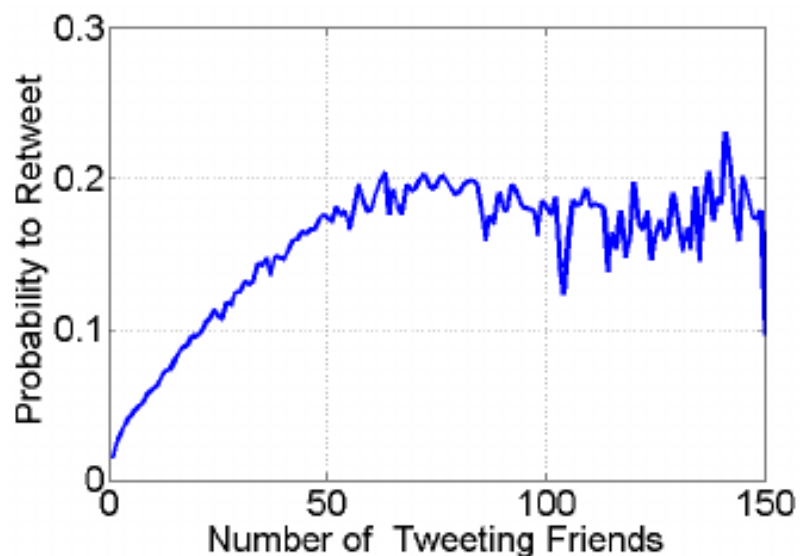


Limits to the psychosocial law

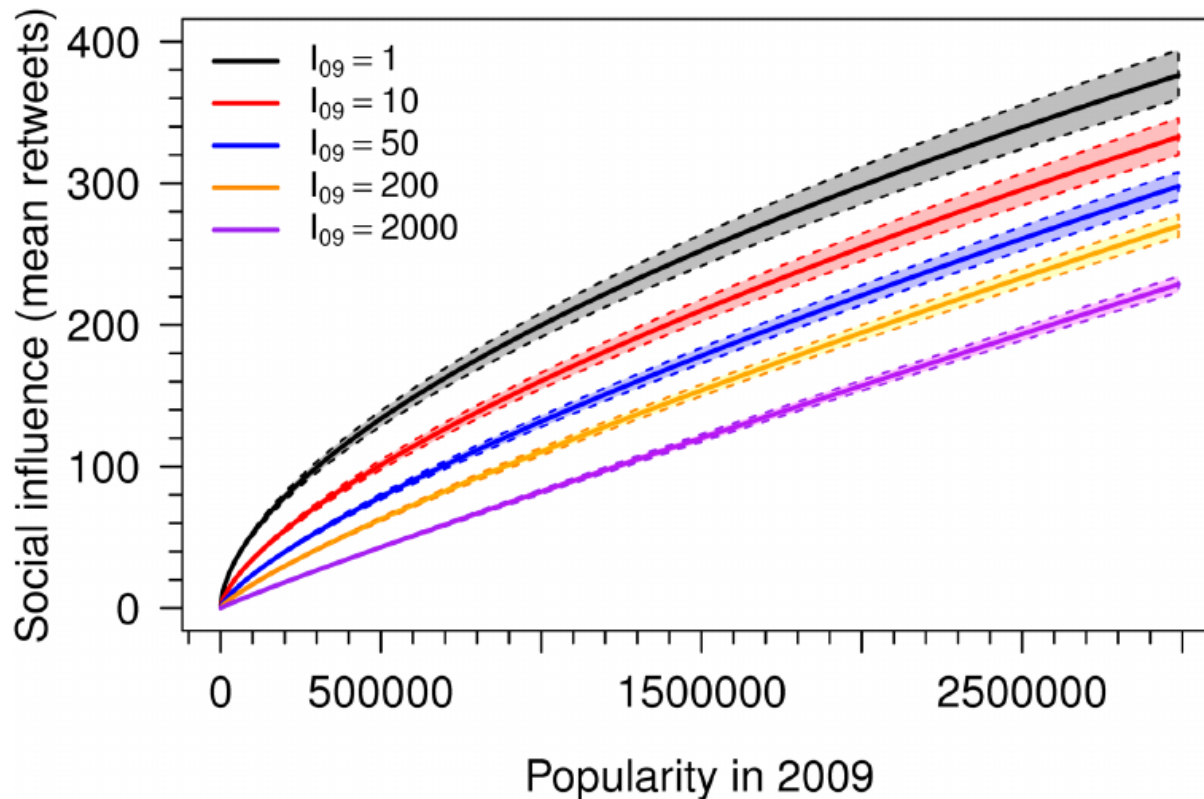
The extent of impact grows monotonically with the number of exposures and shows diminishing returns.



Online information spreading is different
from a virus spreading!
(simple contagion vs. complex contagion)



Division of impact in online social networks



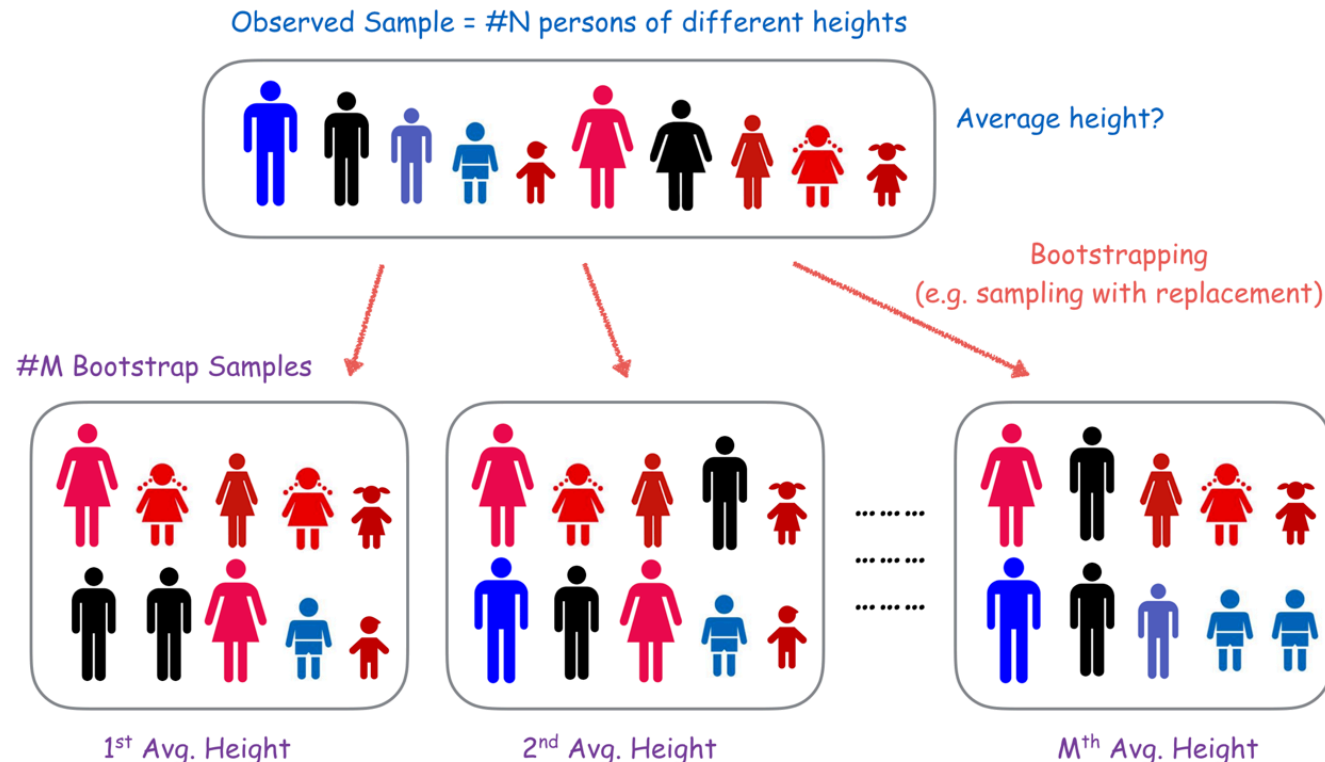
Garcia, David, et al. "Understanding popularity, reputation, and social influence in the Twitter society." *Policy & Internet* 9.3 (2017): 343-364.

Part 3

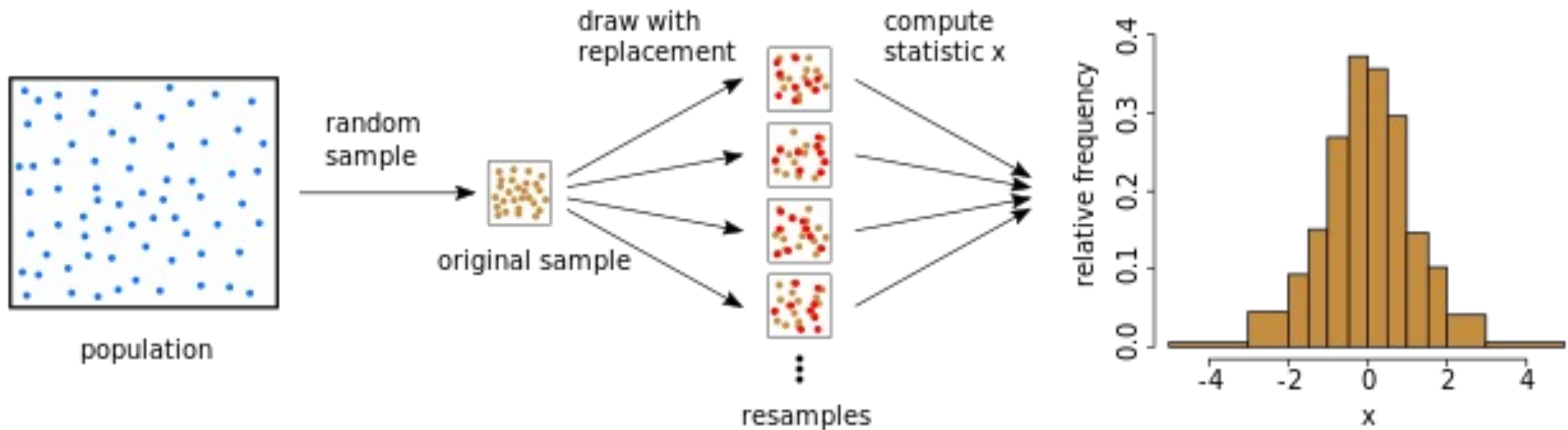
METHOD: BOOTSTRAPPING

Assessing uncertainty via bootstrapping

Bootstrap simulates the sampling of our original data.
To bootstrap, we resample from our sample by generating new samples of the same size as our original sample **with replacement**



Bootstrapping logic



Source: Wikipedia

Example: the mean of a variable

First, we load the data and measure the mean over our sample. We will use the height Data from **National Health Interview Survey (NHIS) 2007**.

The first few heights in the dataset look like this (inches):

74 70 61 68 66 98

With the mean height over the sample being **69.5782654 inches**.

To generate a bootstrap sample we should resample once with replacement and compute the mean over the resulting sample. An example of a bootstrap mean is 69.5423197 inches.

Running the resampling

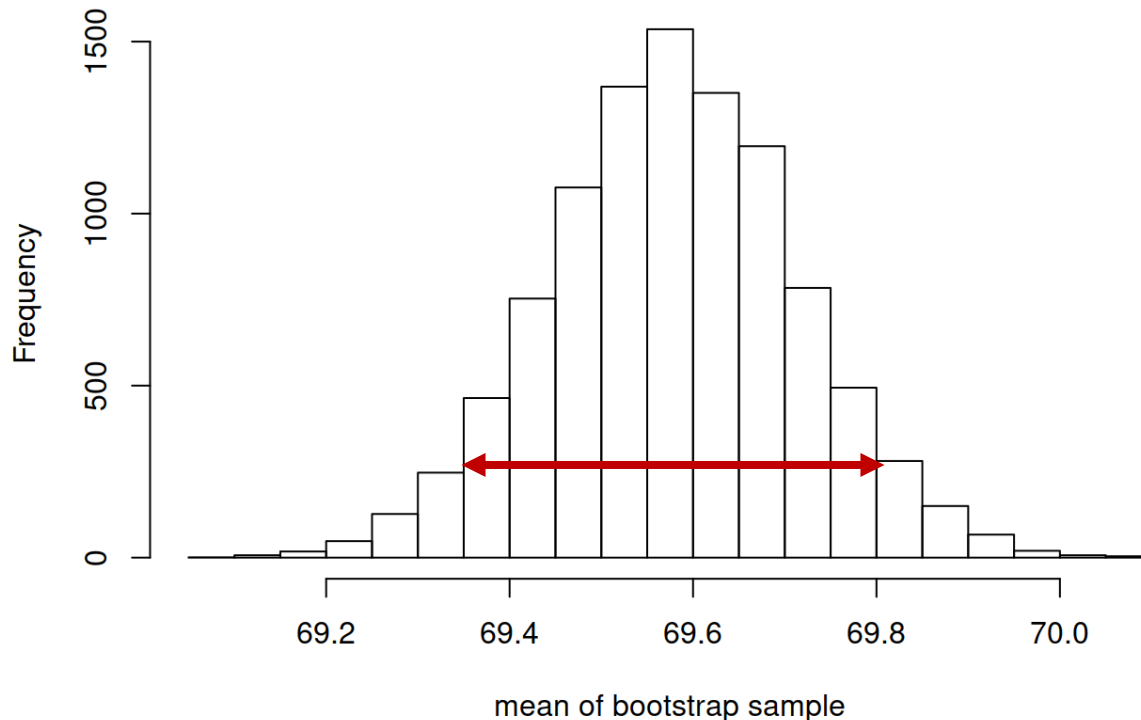
Now we can repeat the bootstrap sample and measurement a lot of times, here we do it 10000 with a loop, saving the results in a vector. The vector will look like this:

69.85601 69.59352 69.62717 69.5302 69.62717 69.59415

Over the results, we can now see the **median**, which is the point that separates 50% of the results on one side and 50% on the other. In this case the median is **69.5760711** inches.

Uncertainty in the measure

Histogram of means measured over each bootstrap sample



95% of the examples fell between 69.3166092 and 69.8453553, this is called the **95% confidence interval**.

We can be confident that the mean we calculated 69.5782654 inches is reliable measure.

References and further reads

Slides are based on David Garcia's lecture and material on Github

Latané, B. (1981). The psychology of social impact. *American psychologist*, 36(4), 343.

Latané, Bibb, and Sharon Wolf. "The social impact of majorities and minorities." *Psychological Review* 88.5 (1981): 438.