LSU E. J. OURSO COLLEGE OF BUSINESS

Dr. Chun's Numb3rs & L∅gic

Berkson's Paradox

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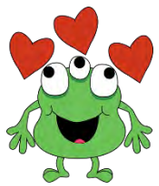
Are You Looking for Someone to Love?

*Top seven criteria considered by LSU students when they are looking for…

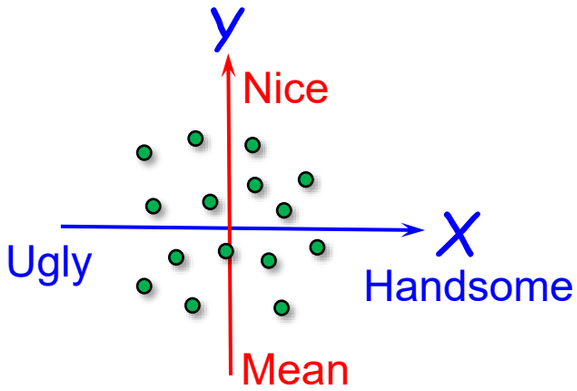
Rank	Boyfriend	Girlfriend
1	Physical attractiveness	Body
2	Personality	Personality
3	Good general attitude	Money
4	Trustworthiness	Intelligence
5	Wit	Lack of #4
6	Intelligence	Wit
7	Money	Maturity

** Reproduced from the 2006 LSU yearbook without permission*

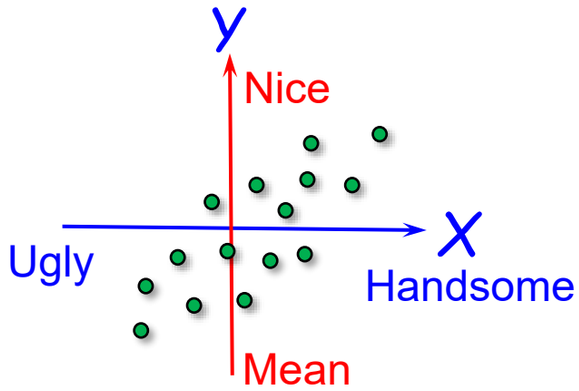
1. Physical attractiveness: Handsome or Ugly
2. Personality: Nice or Mean



* Positive or Negative Relationship?



(a) Corr[X, Y] = 0



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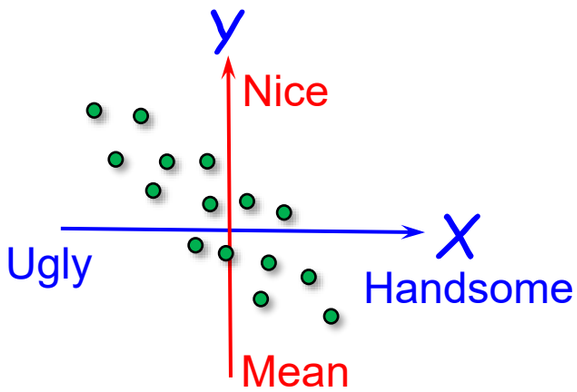
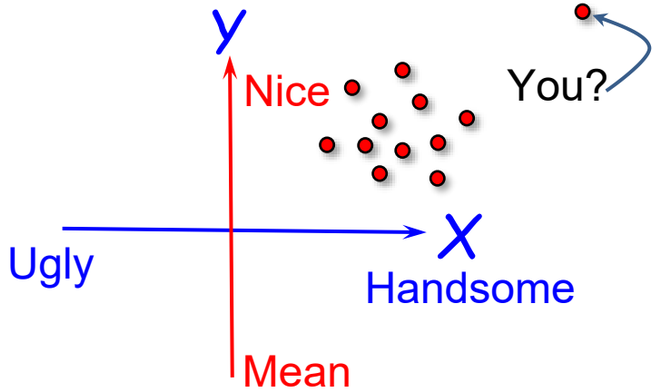
(b) Corr[X, Y] > 0



(c) Corr[X, Y] < 0



(d) LSU MBA Students!

Why Are Handsome Men Such Jerks?

Jordan Ellenberg, *Slate*, June 3, 2014

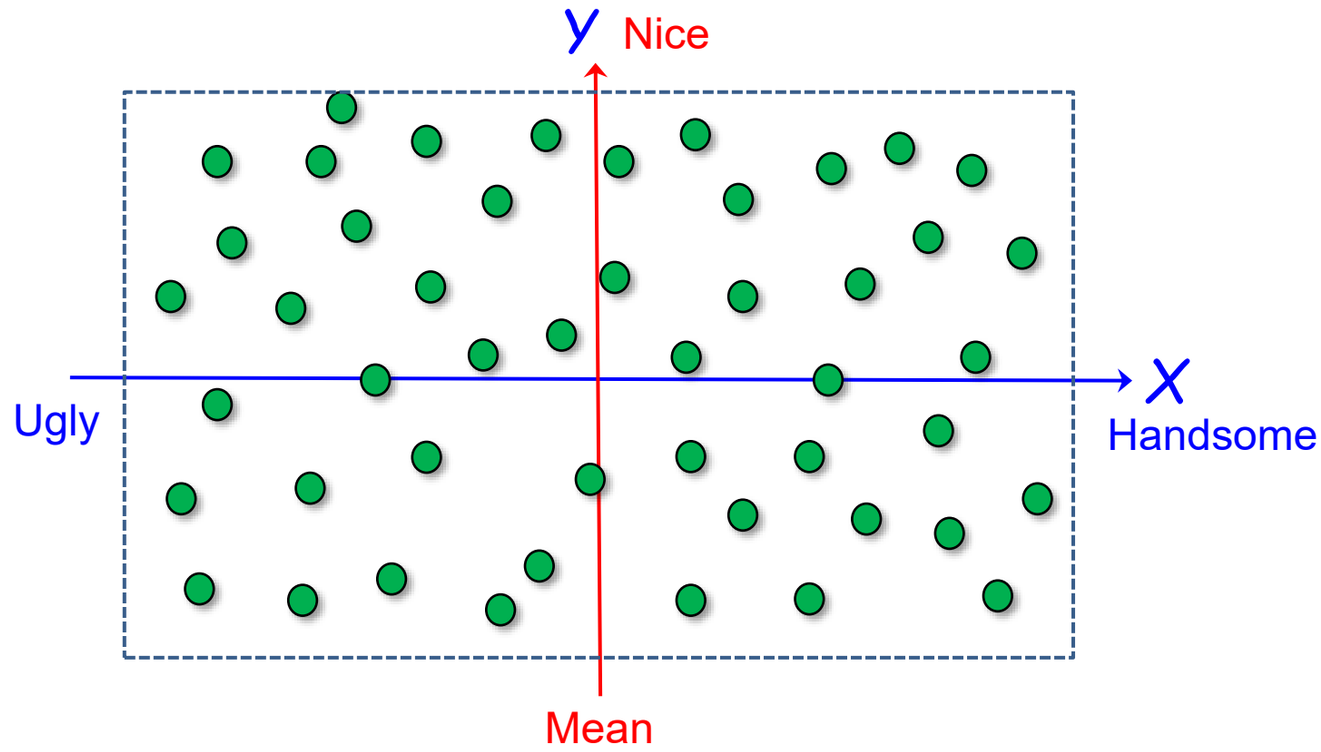
Suppose you're looking for someone to love. You may have noticed that, among the men in your dating pool, the handsome ones tend not to be nice, and the nice ones tend not to be handsome.

Is that because having a symmetrical face makes him cruel? Does it mean that being nice to people makes him ugly? Well, it could be. But it doesn't have to be?

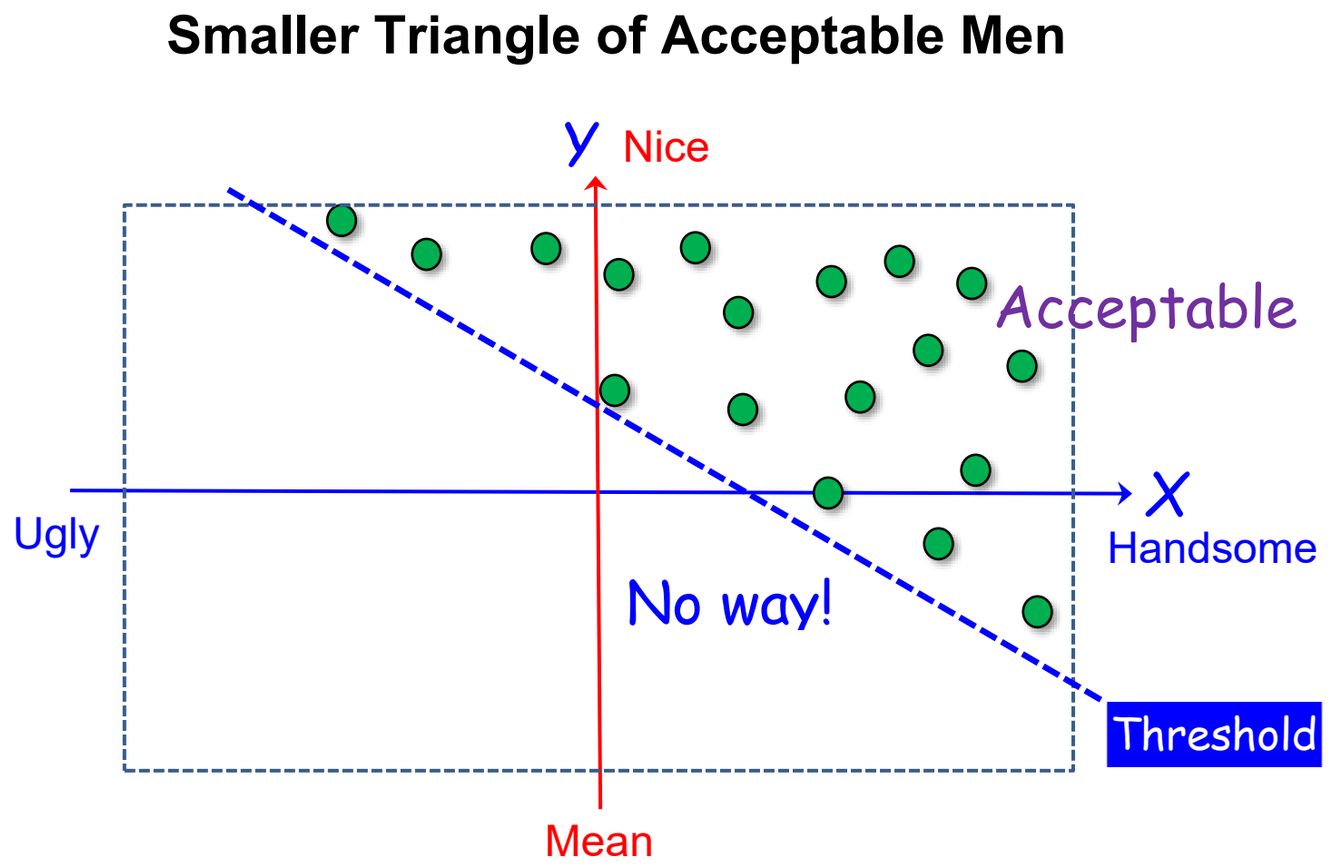
In the dating example, evaluating the relationship between handsomeness and niceness in your individual optimum dating pool gives a false impression of the spurious negative relationship between handsomeness and niceness in the entire potential dating pool. Why?

Suppose that men are equi-distributed all over this square. In particular, there are nice handsome ones, nice ugly ones, mean handsome ones, and mean ugly ones, in roughly equal numbers. (Thus, the correlation coefficient between X and Y is zero.)

Great Square of Men

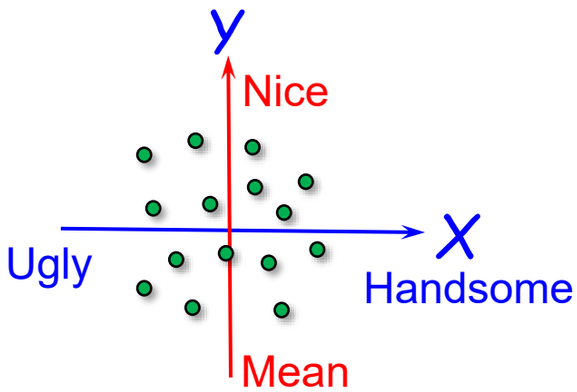


Niceness and handsomeness have a common effect: They put these men in the group of people that you notice. Be honest! You will only date a man if his niceness plus his handsomeness exceeds some threshold!



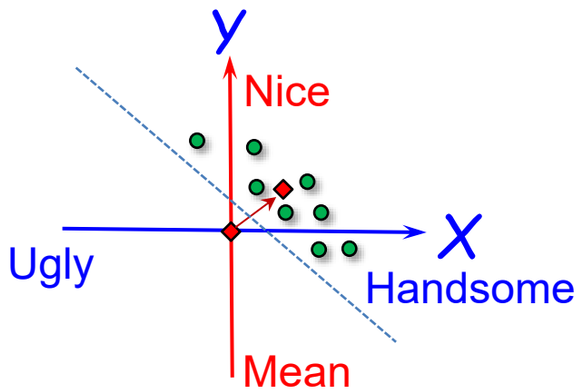
Note that this does not mean that men in your dating pool compare unfavorably with men in the population. On the contrary, the average nice man that you date is actually more handsome than the average guy in the population.

(a) **General population**



$E[X] = 0,\ E[Y] = 0,\ Corr[X, Y] = 0$

(b) **Your dating pool**



$E[X] > 0,\ E[Y] > 0,\ Corr[X, Y] < 0$

The negative correlation between looks and personality in your dating pool is absolutely real. But the relation isn't causal. If you try to improve your boyfriend's complexion by training him to act mean, you've fallen victim to Berkson's paradox.

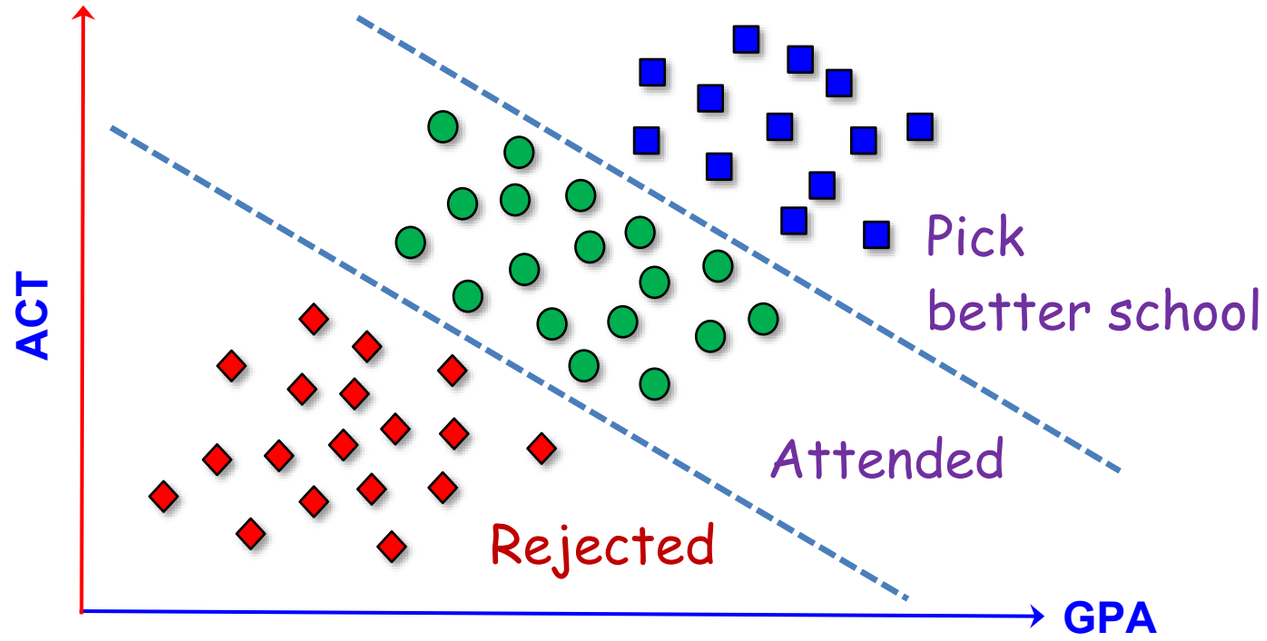
Berkson's Paradox

Berkson's paradox is a particular kind of selection bias caused by systematically observing some events more than others. In this paradox, observations are restricted to those where two variables sum together. If you know that A+B must be within a certain range, then having a high A results in a lower B, and vice versa.

For example, universities pick students based on a number of attributes. In the US, two commonly considered attributes are high school GPA and ACT scores. These are positively correlated, so one would expect that within a given school they would also be positively correlated.

However, this need not be so.

The admissions committee accepts students who have either a sufficiently high GPA, a sufficiently high ACT score, or some combination of the two.



The range of students that actually attend the school is given by the green dots in the plot. These dots show a downward trend, even though the overall population (red and blue dots) show an upward trend. This trend reversal is the "paradox," though there is nothing truly paradoxical about it. It is the result of a trade-off between GPA and ACT scores in the applicants reviewed.

Berkson's Restaurants

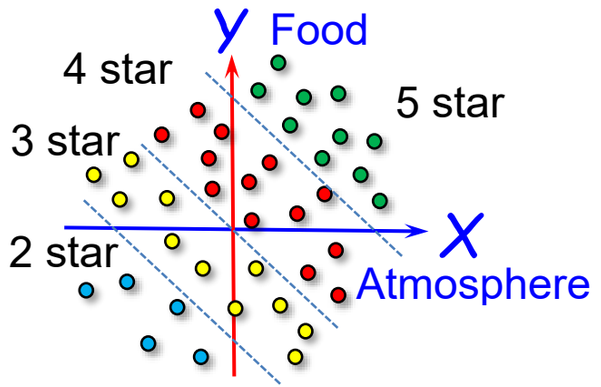
Patrons rate restaurants based on a number of features, including (i) the quality of the food and (ii) the quality of the "atmosphere" (what it looks like, what music they play, etc). They combine these ratings into an overall rating from one to five stars.

You come across two restaurants that you know have five star ratings. You can see inside, but you haven't tasted the food yet. Which restaurant is more likely to have the best tasting food?

(a) Equally likely

(b) Worse-looking restaurant

(c) Better-looking restaurant



Movie Trivia

A rat who can cook makes an unusual alliance
with a young kitchen worker at a famous restaurant.

Ratatouille (2007)

A rat who can cook makes an unusual alliance
with a young kitchen worker at a famous restaurant.