THE NEVER-ENDING BATTLE AGAINST OUR COGNITIVE BIASES

Published at: http://www.archania.org

August 19, 2017

Unfortunately, it seems like our species is genetically predisposed for a variety of cognitive biases. In order to prosper as a species, we need fight a constant and never-ending battle against these cognitive biases.

1 Confirmation bias

When people search for information on the Internet, they are likely to search for information that confirms their beliefs, rather than for information that might be opposed to their beliefs. Even when people are confronted with information that contradicts their beliefs, they are likely to ignore it. This causes different political and religious groups to grow further apart, which again creates more conflicts in the world.

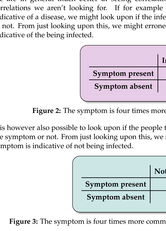

Figure 1: How I am much more interested in finding information that confirms my beliefs

We are in general much better at seeing correlations that we are looking for, than seeing correlations we aren't looking for. If for example we want to figure out if a symptom is indicative of a disease, we might look upon if the infected are more likely to have the symptom or not. From just looking upon this, we might erroneously start to believe that the symptom is indicative of the being infected.

	Infected
Symptom present	40
Symptom absent	10

Figure 2: The symptom is four times more common among the infected

It is however also possible to look upon if the people that aren't infected are more likely to have the symptom or not. From just looking upon this, we might erroneously start to believe that the symptom is indicative of not being infected.

	Not infected
Symptom present	800
Symptom absent	200

Figure 3: The symptom is four times more common among people that aren't infected

If we compare all of these things, we might see that there is absolutely no correlation between the symptom and the disease. The symptom is simply more prevalent among people in general; both people that are infected and people that aren't infected. The probability of being infected if you have the symptom, is the same as the probability to have the infection in general.

$$P(S) = \frac{|S|}{|A|} = \frac{1{,}280}{1050} = 0.8 \qquad P(I) = \frac{|I|}{|A|} = \frac{50}{1050} = 0.0476 \qquad P(S|I) = \frac{|S|}{|A|} = \frac{40}{1050} = 0.0381$$

$$P(I|S) = \frac{P(S|I)}{P(S)} = \frac{0.0381}{0.8} = 0.0476 = P(I) = \mathbf{4.76\%}$$

This can also be related to political and religious convictions. We might selectively choose to look only upon the prevalence of favorable things in our own religions and/or political affiliations, without comparing it to the prevalence of these same favorable things in other religions and/or political affiliations. Similarly, we might look upon the absence of adverse things in our own religions and/or political affiliations, without comparing it to the absence of these same adverse things in other religions and/or political affiliations.

2 The fallacy of rosy retrospection

We derive more pleasure from thinking about nice things that happened to us in the past, than from thinking about boring and distasteful things that happened to us in the past. So we have a tendency to think more about nice things that happened to us in the past, and every time we remember something, we strengthen the memory. We also modify it a little, to make it appear even more agreeable, so that we can derive even more pleasure from thinking about it in the future.

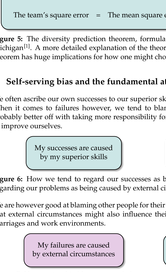

Figure 4: How we are inclined to remember the past as more colorful and beautiful than it really was, since we tend to focus more upon nice memories than upon boring and distasteful memories.

Over time this tends to make us get an overly positive image of the past. It also tends to make us think that things are getting worse, or that society as a whole is in a state of decline. This way of thinking also tends to lead civilizations to stagnation, since there is much more focus upon reestablishing the past, than upon incorporating new ideas.

3 The illusion of homogeneous perfection

People tend to associate perfection with one ethnicity, culture and/or personality type. Often their own ethnicity, culture and/or personality type. This way of thinking fails to recognize the benefits of diversity, as stated in the diversity prediction theorem.

$$(C - X)^2 \quad = \quad \frac{1}{n}\left[\sum_{i=1}^{n}(x_i - X)^2\right] \quad - \quad \frac{1}{n}\left[\sum_{i=1}^{n}(x_i - C)^2\right]$$

The team's square error = The mean square error - The diversity of the team

Figure 5: The diversity prediction theorem, formulated by Scott E. Page at the University of Michigan[11]. A more detailed explanation of the theorem can be found here (**PDF**, **HTML**). The theorem has huge implications for how one might choose to put together a team.

4 Self-serving bias and the fundamental attribution error

We often ascribe our own successes to our superior skills, rather than to external circumstances. When it comes to failures however, we tend to blame it on external circumstances. We are probably better off with taking more responsibility for our failures, since it gives us motivation to improve ourselves.

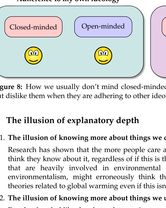

Figure 6: How we tend to regard our successes as being related to our superior skills, while regarding our problems as being caused by external circumstances.

We are however good at blaming other people for their failures, without taking into consideration that external circumstances might also influence their failures. This can lead to hostilities in marriages and work environments.

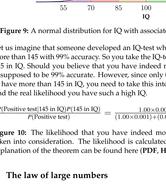

Figure 7: How we tend to blame external circumstances for our own problems, while neglecting that other people might also fail due to external circumstances.

5 We only dislike closed-minded people if they adhere to other ideologies

We usually don't mind closed-minded people that adhere to the same ideologies as us, while we usually dislike closed-minded people that adhere to other ideologies[21]. On the other hand, if people adhering to different ideologies are open-minded, we tend to like them much more. So we should probably be a bit less tolerant of closed-minded people adhering to our own ideologies, since we dislike so much closed-minded people that are adhering to other ideologies.

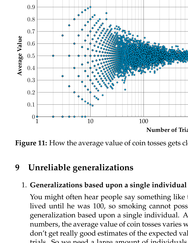

Figure 8: How we usually don't mind closed-minded people adhering to our own ideologies, but dislike them when they are adhering to other ideologies.

6 The illusion of explanatory depth

1. **The illusion of knowing more about things we care about**
   Research has shown that the more people care about something, the more they tend think they know about it, regardless of if this is the case or not[15]. For example, people that are heavily involved in environmental organizations or care a lot about environmentalism, might erroneously think they know a lot about the scientific theories related to global warming even if this isn't necessarily the case.
2. **The illusion of knowing more about things we use a lot**
   People often feel like they know how an item works, if they know how to use it[16]. For example, people that drive a lot might think they have a better understanding of how their car works than what is actually the case. Similarly, people that use computers and cellphones a lot, might think they have a better understanding of how these devices work, than what is actually the case.

7 Neglect of base rate

Most tests have false positives, since there usually is a bit of luck and/or randomness involved. For extremely rare conditions, these false positives can actually be far more common than the true positives. However, people often tend to neglect the background probabilities for rare conditions[24]. Such a rare condition might for example be to have more than 145 in IQ.

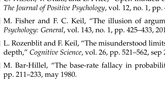

Figure 9: A normal distribution for IQ with associated percentages of the world population.

Let us imagine that someone developed an IQ-test which would predict if a person has an IQ of more than 145 with 99% accuracy. So you take the IQ-test, and you score positively for more than 145 in IQ. Should you believe that you have indeed more than 145 in IQ? After all, the IQ-test is supposed to be 99% accurate. However, since only 0.1% of the world population is supposed to have more than 145 in IQ, you need to take this into consideration and use Bayes' theorem to find the real likelihood you have such a high IQ.

$$\frac{P(\text{Positive test}|145 \text{ in IQ})P(145 \text{ in IQ})}{P(\text{Positive test})} = \frac{1.00 \times 0.001}{(1.00 \times 0.001) + (0.01 \times 0.999)} = \frac{0.001}{0.01099} = 0{,}09099 \approx \mathbf{9\%}$$

Figure 10: The likelihood that you have indeed more than 145 in IQ, when the base rate is taken into consideration. The likelihood is calculated using Bayes' theorem. A more detailed explanation of the theorem can be found here (**PDF**, **HTML**).

8 The law of large numbers

If you throw a fair coin, and assign the value 1 for heads, and the value 0 for tails, the average value gets closer to the expected value (0.5) with more trails. For coin tosses, the average value doesn't seem to always get really close to the expected value before around 100 000 tosses. With medicinal, nutritional and behavioral studies, there is always a bit of randomness for each participant. This can be minimized by using a large number of participants.

Figure 11: How the average value of coin tosses gets closer to the expected value with more trials

9 Unreliable generalizations

1. **Generalizations based upon a single individual**
   You might often hear people say something like this: "I know a guy that smoked and lived until he was 100, so smoking cannot possibly be that bad for you". This is a generalization based upon a single individual. As we have seen from the law of large numbers, the average value of coin tosses varies widely until around 1000 trials, and we don't get really good estimates of the expected value before between 10 000 and 100 000 trials. So we need a large amount of individuals (preferably around 100 000) to make reliable generalizations.
2. **Generalizations based upon our friends**
   In order to make reliable generalizations, we also need to have a random selection of people, and your friends are not a random selection of people. You might for example work for a construction company, and most of your friends could be colleges from work. If you generalized based upon your friends, you might erroneously start to believe that people in general know a lot about construction.

10 Bibliography

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