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RESEARCH ARTICLES

The Camouflage That Grapples Our Perception

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During World War 2, airplanes designers and engineers were researching on how to best strengthen their warplanes so that it won't doom easily as a result of enduring the multitude hits from the enemy's planes. The data they analysed were populated from those returning but heavily shot warplanes, as shown in the figure. A quick glimpse into the data intuitively leads them to fortify areas where the plane had suffered the most shots (indicated by the red dots). Their belief, by doing so, the objective to reinforce the fuselage's skin, thus enhancing chances of the warplane surviving further ammunitions from the enemy would be attained.

However, a statistician by the name of Abraham Wald simply disputed the strategy. He argued that data that was being analysed were tabulated from the planes that flew back to the base safely – the survived samples.

Safely made it back, despite suffering shots from the enemy which translates to the fact that, albeit being bombarded by the trains of bullets, those regions scattered by red dots weren't the weakest spots on the fuselage. On the contrary, the regions actually needed strengthening are those clean ones – locations without the bullet traces! Why so? Because the airplanes that were hit at those spots simply did not make it back to the base, i.e., did not survive the attack – the failed samples. Therefore, those areas are in fact the most weakest ones and must precede the list of spots needed reinforcement!

Such a flawed perception in data interpretation that engineers had initially is called Survivorship Bias. As human beings, we inherently have the psychological tendency to arrive at conclusions based only on information clearly visible to us (survival data) and often overlook the condition that is missing from the event, but forms an ever important narrative to the entire process of data interpretation (other side of the story). While it may seem as strange a phenomenon, in reality it is quite common than we may think that we bump into one. Below are two daily life examples and how we can explain it through the lens of survivorship bias:

1. "They don't make it like they use to!". Have you ever heard such statements before? Some people say it while comparing car models or mechanical machines. We have the perception that older car models are more robust and reliable.

As proof, our uncle or someone we know has a 30 years-old Toyota Camry that has hit 500,000 km on the odometer but is still running fine! But automotive engineering has been progressing exponentially that modern cars should be much sturdier and of better quality. So how to inject logic to the above argument? We can probably explain how your uncle has a workable 30 years-old Camry in two ways:
a) He has been meticulously taking care of the car since day one, changing and maintenance parts well before the recommended time, etc. No wonder it would last for

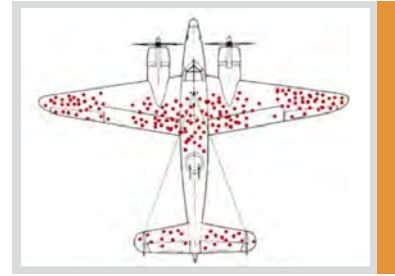


Figure 1. Red dots on airplane indicating the most common area found to be shot.

that long. So, among all the Camry models of that year, that particular car is probably the only one percent that still in good order. b) Genuinely a coincidence that, that year's Camry model has been regarded as one of the most robust and sturdy models ever manufactured. Then, how about the other Camrys of the same year? Chances are, a whopping majority have already been scrapped and forgotten down the years. Here lies the blind spot in our cognitive conversancy as depicted by the survivorship bias. The scrapped, rusty cars in the scrapyards are not readily visible, but one working old car is easily recognised by us. To add more opacity to our perception, this occurs by some remote probability that we recently bought a car and it's broken down just after two days. Unfortunately, it further amplifies the flawed notion that 'old cars are built tough, but new ones are not as good'.

2. You tune in to a classic frequency on the car radio and by some miracles that all the classic songs on the playlist that day are pleasing to the ears. Similarly, the whispers, "Ah, why don't they make good music like they used to?"

Again, this might be a fallacy in inference originating from the survivorship bias. It cannot be denied that during the classic era of those yesteryears, there were equally amazing and also awful songs being composed. However, due to them being 'awful', such songs might as well succumbed to the future-proof test across different eras and music genres, explicating that they are no longer favoured by the radio stations anymore. As a result, only those wonderful, evergreen and sought-after songs are getting the airtime, establishing themselves as a trademark of classic music.

On a similar premise, current songs are going to pass through the same 'filtering' process as well. There will always be good and bad songs, but bad songs won't make that far along the future years, creating a vacuum in our dataset thus unequivocally, skewing our perception that only classic songs are the real music to the ears whilst modern ones are not. By extension, this can be said true for other situations as well such as when it comes to books and movies preference.

As a conclusion, survivorship bias can be a psychological mindset that we inherently carry along our life where its presence often renders us as oblivious in the decision making process. As future engineers, it is therefore pertinent that we take into account these biases and the need to be more critical in assessing all situations around us, even more so by those 'non-survivors dataset'. Ostensibly, those missing dots paint a broader insight to the overall picture. Only when we consider these unforeseen aspects that sound, informed and holistic judgements can be attained.