Murat Durmus

COGNITIVE BIASES

A Brief Overview of Over 160 Cognitive Biases

Bonus Chapter:
Algorithmic Bias

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+

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"Bias here, Bias there;

Watch out, Bias everywhere!"

~ Murat Durmus

For You

You know why

PREFACE

Cognitive biases are systematic patterns of deviation from the norm and rationality in judgment. They are often studied in psychology and behavioral economics.

Although the reality of most of these biases is confirmed by reproducible research, there is often controversy about how to classify these biases or how to explain them. For example, Gerd Gigerenzer has criticized the classification of cognitive biases as errors of judgment and argues that they should be interpreted as the result of rational deviations from logical reasoning.

Explanations include information-processing rules (i.e., mental shortcuts), called heuristics, that the brain uses to produce decisions or judgments. Biases take a variety of forms and occur as cognitive ("cold") biases, such as mental noise, or motivational ("hot") biases, such as when beliefs are distorted by wishful thinking. Both effects can be present simultaneously.

There is also controversy about some of these biases, whether they are considered useless or irrational or lead to good attitudes or behavior. For example, when getting to know other people, people tend to ask suggestive questions to confirm their assumptions about the person. However, this type of confirmation bias has also been cited as an example of social skills to connect with others.

Although most of this research was conducted with human subjects, there are also findings showing bias in nonhuman animals. For example, loss aversion has been demonstrated in monkeys, and hyperbolic discounting has been observed in rats, pigeons, and monkeys.

You will find 169 cognitive biases in this book. Some of them are already well researched, and we have only vague ideas for some. Nevertheless, this book should give you a comprehensive overview and introduction to cognitive biases. I have provided the links to the respective biases in the references for those who need more detailed information. In addition, I have added a chapter on "Algorithmic Biases" because the more artificial intelligence systems are used in decision-making, the more significant the topic of algorithmic biases becomes.

Let's learn more about our human biases to make less biased conclusions in the future.

A world with less bias is a better world.

Murat Durmus

Frankfurt am Main (Germany), 18 April 2022

TOO MUCH INFORMATION

We notice things already primed in memory or repeated often.

Availability Heuristic

Availability bias

The tendency to overestimate the likelihood of events having greater "availability" in memory may be influenced by how recent the memories are or how unusual or emotionally charged they may be.

The availability heuristic, also known as availability bias, is a mental shortcut that relies on immediate examples that come to a person's mind when evaluating a particular topic, concept, method, or decision. The availability heuristic is based on the notion that something that can be remembered must be necessary or more important than alternative solutions that cannot be easily recognized. As a result, because of the availability heuristic, people tend to bias their judgments heavily toward recent information so that new opinions are biased toward the latest news.[1]

Attentional Bias

Availability bias

The tendency of perception to be affected by recurring thoughts.

Attentional bias refers to how a person's perception is affected by selective factors in their attention. Attentional biases can explain why a person cannot consider alternative possibilities when engaged in an existing train of thought. For example, cigarette smokers have been shown to exhibit an attentional bias for smoking-related cues in their environment due to the altered reward sensitivity of their brain. Attentional biases have also been associated with clinically relevant symptoms such as anxiety and depression.[2]

Illusory Truth Effect

Truthiness

The tendency to believe a statement to be valid if it is easier to process or if it has already been said several times, regardless of its actual truth content; These are exceptional cases of truthfulness.

The first condition is logical because people compare new information with what they already know to be true. Repetition makes statements more straightforward than recent statements that have not been repeated, so people believe that the repeated conclusion is more accurate. The illusory truth effect has also been linked to hindsight bias, in which the memory of the confidence is distorted after learning the truth.[3]

Mere-Exposure Effect

Familiarity principle

The tendency to express undue liking for things merely because of familiarity with them.

The mere-exposure effect is a psychological phenomenon in which people tend to develop a preference for things simply because they are familiar with them. In social psychology, this effect is sometimes called the familiarity principle. The effect has been demonstrated with many things, including words, Chinese characters, paintings, pictures of faces, geometric figures, and sounds. In studies of interpersonal attraction, it has been found that the more often a person is seen, the more likable they are.[4]

Context Effect

Memory

That cognition and memory are dependent on context, such that out-of-context memories are more difficult to retrieve than in-context memories (e.g., recall time and accuracy for a work-related memory will be lower at home, and vice versa).

Context effects are considered as part of the top-down design. The theoretical approach of constructive cognition supports the concept. Context effects can affect our daily lives in many ways, such as word recognition, learning ability, memory, and object recognition. They can have a significant impact on marketing and consumer decisions. For example, research has shown the comfort level of the floor that shoppers are standing on. At the same time, reviewing products can affect their assessments of the product's quality, leading to higher estimates if the floor is comfortable and lower ratings if it is uncomfortable. Because of such effects, context effects are currently studied predominantly in marketing.[5]

Cue-Dependent Forgetting

Memory

Cue-dependent forgetting or retrieval failure refers to the loss of retrieving information without memory support. The term refers to either semantic, state, or context-dependent cues.

When searching for files in a computer, its memory is searched for words. Relevant files containing that word or phrase are displayed. However, this is not how human memory works. Instead, information stored in memory is retrieved by association with other memories. Some memories cannot be retrieved simply by thinking about them. Rather, you have to think of something that is associated with them.[6]

Mood Congruence

Memory

The improved recall of information is congruent with one's current mood.

Mood congruence is the correspondence between a person's emotional state and the general situations and circumstances the person is experiencing at the time. On the other hand, Mood incongruence is when the person's reactions or emotional state appear to be at odds with the situation. For example, in psychosis, hallucinations and delusions may be considered mood-congruent (e.g., feelings of personal inadequacy, guilt, or worthlessness during a depressive episode with bipolar disorder) or incongruent.[7]

Frequency Illusion

Availability bias

The frequency illusion consists of the fact that something is noticed once again and again, leading to the assumption that it occurs very frequently (a form of selection bias). The Baader-Meinhof phenomenon is an illusion in which something recently noticed suddenly seems to happen with improbable frequency. It was named after a case of frequency illusion in which the Baader-Meinhof group was mentioned.

The name "Baader-Meinhof Phenomenon" was derived from a particular case of frequency deception in which the Baader-Meinhof Group was mentioned. In this case, it was noticed by a man named Terry Mullen, who wrote a letter to a newspaper column in 1994 in which he said that he had first heard of the Baader-Meinhof group and shortly after that happened to come across the term through another source. After the article was published, several readers sent letters describing their own experiences with similar events; the name "Baader-Meinhof phenomenon" was coined.[8]

Empathy Gap

Empathy bias

The tendency to underestimate the influence or strength of feelings in either oneself or others.

Empathy gaps can be interpersonal (toward others) or intrapersonal (toward oneself, e.g., in predicting one's future preferences). Much social psychological research has focused on intergroup empathy gaps, their underlying psychological and neural mechanisms, and their effects on downstream behavior (e.g., prejudice against outgroup members).[9]

Omission Bias

(No assignment)

The tendency to judge harmful actions (commissions) as worse or less moral than equally dangerous inactions (omissions).

It can arise from several processes, including psychological inertia, the perception of transaction costs, and the tendency to evaluate harmful actions as worse or less moral than equally dangerous omissions (inaction). It is debatable whether the tendency to refrain is a cognitive bias or whether it is often rational. The trolley problem often illustrates the prejudice and has also been described as explaining the endowment effect and the status quo bias.[10]

Base Rate Fallacy

Extension neglect

The tendency is to ignore general information and focus on information only about the specific case, even when the available information is more important.

Base rate fallacy, also called base rate neglect or bias is a form of fallacy. When base rate information (i.e., general information about prevalence) is juxtaposed with specific information (i.e., information that relates only to a particular case), people tend to ignore the base rate in favor of the individual information rather than correctly integrating the two.[11]

Bizarre, funny, visually striking, or anthropomorphic things stick out more than non-bizarre/unfunny things.

Bizarreness Effect

Memory

Bizarre material is better remembered than common material.

The bizarreness effect is the tendency for bizarre material to be better remembered than ordinary material. The scientific evidence for its existence is controversial. Some research suggests that it exists, some that it does not, and some that it causes people to remember worse.

McDaniel and Einstein argue in their 1986 paper that bizarreness per se does not improve memory. They claim that bizarre information becomes distinctive. It is distinctiveness that, according to them, facilitates encoding. From an intuitive point of view, this makes perfect sense since the human brain neglects to take in information with which it is already familiar and is particularly attuned to taking in new information as an adaptation technique.[12]

Humor Effect

Memory

That humorous items are more easily remembered than non-humorous items, which could be explained by the specificity of humor, the longer cognitive processing time to understand humor, or the emotional arousal triggered by humor.[13]

Von Restorff Effect

Memory

The Von Restorff effect, also known as the "isolation effect," states that when several homogeneous stimuli are presented, the motivation that is different from the others is more likely to be remembered. The theory was developed by German psychiatrist and pediatrician Hedwig von Restorff (1906-1962). They found in her 1933 study that participants remembered the item better when presented with a list of categorically similar items that was distinguished by a single, isolated thing.

The study used the isolation paradigm, which refers to a particular feature of an item in a list distinguished from the others by its dimension. Such a unique feature, leading to the von Restorff effect, can be produced by a change in the meaning or physical nature of the stimulus, e.g., size, shape, color, spacing, or underlining.[14]

Picture Superiority Effect

Memory

The idea is that concepts learned by looking at pictures are more easily and frequently recalled than concepts learned by looking at their written counterparts in word form.

The image superiority effect refers to the phenomenon that images and pictures are more likely to be remembered than words. This effect has been demonstrated in numerous experiments using various methods. It is based on the idea that "human memory is susceptible to the symbolic representation form of event information." However, the explanations for the picture superiority effect are not concrete and are still being discussed.[15]

Self-Reference Effect

Memory

The self-reference effect is a tendency of people to encode information differently depending on whether they are involved in the information. Therefore, asking people to remember information related to themselves in some way can improve recall rates.

In 1955, George Kelly published his theory about how people create personal constructs. This was a more general cognitive theory based on the idea that each individual's psychological processes are influenced by how they anticipate events. This forms the basis for the concept of personal constructs.[16]

Negativity Bias

Memory

A psychological phenomenon in which people recall unpleasant memories more strongly than positive memories.

Negativity bias, also called the negativity effect, states that things of a negative nature (e.g., unpleasant thoughts, emotions, or social interactions; harmful/traumatic events) have a greater impact on a person's psychological state and processes than neutral or positive things, even when they are of equal intensity. In other words, something very positive generally has less influence on a person's behavior and perceptions than something equally emotional but negative. Negativity bias has been studied in many different areas, including the formation of impressions and general evaluations, attention, learning, and memory, and decision making and risk considerations.[17]

We notice when something has changed.

Anchoring or Focalism

Anchoring Bias

The tendency to rely too heavily on a feature or information (usually the first piece of information one receives on the subject) or to "anchor" when making a decision.

An anchor is a device, usually made of metal, used to secure a ship to the bottom of a body of water to prevent the vessel from drifting due to wind or current. The word is derived from the Latin Ancora, which in turn comes from the Greek ἄγκυρα (ankȳra).

Anchors can be either temporary or permanent. Permanent anchors are used to moor a berth and are rarely moved; their movement or maintenance usually requires a specialized company. In addition, ships carry one or more temporary anchors, which may be of different construction and weight.[18]

Conservatism (belief revision)

Anchoring Bias

The tendency to insufficiently revise one's beliefs when presented with new evidence.

In cognitive psychology and decision science, conservatism or conservatism bias refers to the tendency to revise one's beliefs when presented with new evidence insufficiently. This bias describes human belief revision, in which people overweight the prior distribution (base rate) and underweight new sample evidence compared to Bayesian belief revision.

The theory states that "opinion changes are highly ordered and generally proportional to Bayesian theorem numbers-but insufficiently so." In other words, people update their prior beliefs when new evidence becomes available, but they do so more slowly than if they were using Bayes' theorem.[19]

Contrast Effect

Framing effect

A contrast effect is the improvement or deterioration of perception, cognition, or related performance relative to normal due to successive (immediately preceding) or simultaneous exposure to a stimulus of lower or higher value in the same dimension. (In this case, the standard perception, cognition, or performance is that which would be obtained in the absence of the comparison stimulus, i.e., based on all prior experience.)[20]

Example of perception: A neutral gray target appears lighter or darker than when viewed in isolation if a dark gray or light gray target immediately precedes it or is compared with it.

Example of cognition: A person appears more or less attractive if a less attractive or a more attractive person immediately precedes it or is compared with it simultaneously than if it is viewed in isolation.

Distinction Bias

Framing effect

The tendency to view two options as more dissimilar when they are evaluated simultaneously than when they are considered separately.

One author presented a "simplified view" of discrimination bias: When someone is asked if he wants an apple, he might say "yes." So you put an apple in front of him, and he starts eating it and is happy. But what if two apples were put on the table - one would be the one they would have liked to eat, and the other would be the one that looks a little fresher. The person will choose the newer apple, eat it, and be happy, but if you ask them if they would have liked to eat the other apple, they would probably say "no." Even though they were pleased with the apple in the alternate reality where they had no choice;[21]

Framing Effect

Framing effect

Drawing different conclusions from the same information depends on how that information is presented.

The framing effect is a cognitive bias in which people decide on options depending on whether the options are presented positively or negatively, e.g., as a loss or a gain. People tend to avoid risks when a negative frame is presented and seek risks when a positive frame is presented. Gain and loss are defined in the scenario as descriptions of outcomes (e.g., lives lost or saved, sick people treated or not treated, etc.).[22]

Money Illusion

Money illusion

The tendency to focus on the nominal value (face value) of money rather than its value in terms of purchasing power.

In economics, money illusion or price illusion refers to the cognitive tendency of people to think of money in nominal rather than absolute terms. In other words, the nominal value (face value) of money is confused with its purchasing power (actual value) at an earlier point in time. However, purchasing power in terms of nominal value is wrong because modern fiat currencies have no intrinsic value, and their real value depends solely on the price level. Irving Fisher coined the term in Stabilizing the Dollar. John Maynard Keynes popularized it in the late nineteenth century, and Irving Fisher wrote an essential book on the subject, The Money Illusion, in 1928.[23]

Weber-Fechner Law

Weber-Fechner law

Difficulty in comparing minor differences in large quantities.

The Weber-Fechner laws are two related hypotheses in psychophysics, known as Weber's law and Fechner's law. Both directions relate to human perception, specifically to the relationship between the actual change in a physical stimulus and the perceived change. This includes stimuli for all senses: sight, hearing, taste, touch, and smell.

Weber states that "the minimum increase in the stimulus that produces a perceptual increase in sensation is proportional to the present stimulus." At the same time, Fechner's Law derives from Weber's Law (with additional assumptions) that states that the intensity of our sensation increases with the logarithm of an increase in energy and not as fast as the increase in power.[24]

We are drawn to details that confirm our own existing beliefs.

Confirmation Bias

Confirmation bias

Confirmation bias is the tendency to seek, interpret, prefer, and retrieve information in ways that confirm or support one's prior beliefs or values. People exhibit this bias when they select the information that supports their views and ignore contrary information or when they interpret ambiguous evidence in ways that confirm their existing attitudes. This effect is vital for desired outcomes, emotionally charged issues, and deeply held beliefs. Confirmation bias cannot be eliminated, but it can be managed, for example, through education and training in critical thinking.[25]

Congruence Bias

Confirmation bias

Congruence bias is the tendency of people to rely too much on testing their original hypothesis (the most harmonious one) while neglecting to test alternative ideas. People rarely conduct experiments that might disprove their initial beliefs but rather try to replicate their original results. This is a particular case of confirmation bias.

Suppose that a subject is presented with two buttons and is told that pressing one of these buttons, but not the other, will open a door. The issue hypothesizes that the button on the left will open the door in question. A direct test of this hypothesis would be pressing the left button; an indirect test would be pushing the right button. The latter is still a valid test because if the result that the door remains closed is found, it is proven that the left button is the desired button.[26]

Choice-Supportive Bias

Confirmation bias

Choice-supportive bias or post-purchase rationalization tends to retroactively attribute favorable properties to a chosen option and/or devalue the omitted options. It is part of cognitive science and is a distinct cognitive bias that occurs once a decision has been made. For example, suppose a person chooses option A instead of option B. In that case, they are likely to ignore or downplay option A's failures while reinforcing option B's dangerous failures or attributing new shortcomings to it.

The memory of a decision can be as important as the decision itself, especially regarding how much one regrets or is satisfied with one's decision. But unfortunately, research shows that making and remembering decisions leads to memories that are biased in predictable ways.[27]

Selective Perception

Confirmation bias

Selective perception is the tendency not to notice and more quickly forget stimuli that cause emotional discomfort and contradict our prior beliefs. For example, a teacher may have a favorite student because they are biased by in-group favoritism. As a result, the teacher ignores the student's poor performance. Conversely, he may not notice the progress of his least favorite student.

Selective perception is how individuals perceive what they want in media messages while ignoring opposing viewpoints. It is a broad term that describes the behavior of all people who tend to "see" things based on their particular frame of reference. It also explains how we categorize and interpret sensory information in ways that favor one category or interpretation over another. In other words, selective perception is a form of bias because we analyze information to match our existing values and beliefs. Psychologists believe that this process is automatic.[28]

Observer-Expectancy Effect

Confirmation bias

The observer expectancy effect (also called experimenter expectancy effect, expectancy bias, observer effect, or experimenter effect) is a form of reactivity. A researcher's cognitive bias causes them to influence participants in an experiment unconsciously. Confirmation bias can cause the experimenter to misinterpret results because they tend to look for information consistent with their hypothesis and overlook information contrary to it. It poses a significant threat to the internal validity and is therefore usually controlled by a double-blind experimental design.

It may involve conscious or unconscious influences on subject behavior, including creating challenging characteristics that influence subjects and the altered or selective recording of the experimental results themselves.[29]

Ostrich Effect

Ostrich effect

The ostrich effect refers to investors' attempts to avoid negative financial information in behavioral finance. The name comes from the common (but false) legend that ostriches bury their heads in the sand to avoid danger.

Initially coined by Galai & Sade (2006), the term was defined as "avoiding seemingly risky financial situations by pretending they do not exist." Still, since Karlsson, Loewenstein & Seppi (2009), it has taken on the somewhat broader meaning of "avoiding exposure to [financial] information that one fears may cause psychological discomfort." For example, in a market downturn, people might choose not to monitor their investments or not to seek further financial news.[30]

Subjective Validation

Truthiness

The perception that something is true when a person's belief presumes true. It also assigns perceived correlations between coincidences.

Sometimes called the personal validation effect, subjective validation is a cognitive bias. People believe a statement or other information to be valid if it has personal meaning or importance to them. People whose opinions are influenced by the subjective validation effect perceive two unrelated events (e.g., a coincidence) as related because their personal beliefs require them to be told. Closely related to the Forer effect, subjective validation is essential in cold reading. It is considered the main reason for most reports of paranormal phenomena. According to Bob Carroll, psychologist Ray Hyman is regarded as the leading expert on subjective validation and cold reading.[31]

Semmelweis Reflex

Confirmation bias

The Semmelweis reflex or "Semmelweis effect" is a metaphor for the reflexive tendency to reject new evidence or knowledge because it contradicts established norms, beliefs, or paradigms.

The term derives from the Hungarian physician Ignaz Semmelweis, who discovered in 1847 that the mortality rate from puerperal fever decreased tenfold when physicians disinfected their hands with a chlorine solution before moving from one patient to another, or especially after an autopsy. (In one of the two maternity wards at the university hospital where Semmelweis worked, doctors performed an autopsy on every patient who died.) Semmelweis' procedure saved many lives by stopping the constant contamination of patients (primarily pregnant women) with what he called "cadaver particles" twenty years before germ theory was discovered. Nevertheless, his medical colleagues rejected his hand-washing suggestions despite overwhelming empirical evidence, often for non-medical reasons. For example, some physicians refused to believe that a man's hands could transmit disease.[32]

We notice flaws in others more easily than we notice flaws in ourselves.

Bias Blind Spot

Egocentric bias

The tendency to think of oneself as less biased than other people or to be able to recognize more cognitive biases in others than in oneself;

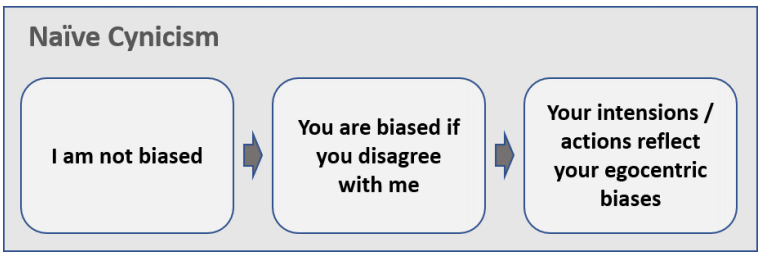
The blind spot of bias is the cognitive bias of recognizing the effects of bias on the judgment of others while not seeing the impact of bias on one's decision. The term was developed by Emily Pronin, a social psychologist in the Department of Psychology at Princeton University, and her colleagues Daniel Lin and Lee Ross. The blind spot is named after the visual blind spot. Most people appear to have a biased blind spot. In a sample of more than 600 United States residents, more than 85% believed they were less biased than the average American. Only one participant thought they were more biased than the average American. People differ in the extent to which they exhibit the blind spot of bias. This appears to be a stable individual difference that can be measured (for a scale, see Scopelliti et al. 2015). [33]

Naïve Cynicism

Egocentric bias

To expect more egocentric bias in others than in oneself.

Naïve cynicism is a state of mind, a cognitive bias, and a form of psychological selfishness that occurs when people naïvely expect more egocentric bias in others than is actually the case.



The term was formally proposed by Justin Kruger and Thomas Gilovich and has been studied in a variety of contexts, including negotiation, group membership, marriage, economics, government policy, and more. [34]

Naïve Realism

Egocentric bias

In social psychology, naive realism refers to the human tendency to believe that we see the world objectively and that people who disagree with us must be uninformed, irrational, or biased.

Naïve realism provides a theoretical basis for several other cognitive biases: systematic errors in thinking and making decisions. These include the false consensus effect, the actor-observer bias, the blind spot, and the fundamental attribution error.[35]

NOT ENOUGH MEANING

We tend to find stories and patterns even when looking at sparse data.

Confabulation

Memory bias

In psychology, confabulation is a memory defect defined as producing fabricated, distorted, or misinterpreted memories about oneself or the world. It is generally associated with certain types of brain damage (especially aneurysm of the anterior communicating artery) or a specific subset of dementias. The basal forebrain has been implicated in the phenomenon of confabulation, although research is ongoing. People who confabulate exhibit false memories ranging from subtle inaccuracies to surreal inventions and may also confuse or distort memories' temporal classification (timing, sequence, or duration). They are very confident about their memories, even when confronted with conflicting evidence.[36]

Clustering Illusion

Apophenia

The clustering illusion is the tendency to mistakenly view the inevitable "streaks" or "clusters" that occur in small samples of random distributions as non-random. The illusion is caused by the human tendency to underestimate the variability that can happen in a small selection of random or pseudorandom data.

Thomas Gilovich, an early author on the subject, argued that the effect occurs in various types of random distributions, including two-dimensional data, such as clusters in the impact locations of World War II V-1 bombs on maps of London or in observing patterns in stock market price fluctuations over time. Although Londoners have developed specific theories about the way of impacts on London, a statistical analysis by R. D. Clarke, initially published in 1946, showed that V-2 missile impacts on London conform to a random distribution.[37]

Insensitivity to Sample Size

Extension neglect

The tendency to expect too slight variation in small samples.

Insensitivity to sample size is a cognitive bias that occurs when people judge the probability of obtaining a statistical sample without regard to sample size. For example, in one study, subjects assigned the same possibility to the likelihood of achieving an average height of over six feet [183 cm] in samples of 10, 100, and 1,000 men. In other words, variation might be more likely in smaller pieces, but people might not expect it.[38]

Neglect of Probability

Extension neglect

Probability neglect, a type of cognitive bias, is the tendency to neglect probability when deciding under uncertainty and is a simple way in which people regularly violate the normative rules for decision making. As a result, small risks are usually wholly neglected or vastly overstated. The continuum between the two extremes is ignored. Cass Sunstein coined the term probability neglect.

There are many related ways in which people violate the normative rules of decision-making concerning probability, including hindsight bias, neglecting the effect of prior base rates, and gambler's trick. However, this bias is different because the actor does not misapply probability but disregards it.[39]

Anecdotal Evidence

Anecdotal evidence

Anecdotal evidence is a statement of fact based only on personal observations collected casually or unsystematically. The term is sometimes used in a legal context to describe certain types of testimony that are not corroborated by objective, independent evidence, such as notarized documents, photographs, audiovisual recordings, etc.

When used in advertising a product, service, or idea, anecdotal reports are often referred to as testimonials, which are strictly regulated in some jurisdictions.[40]

Illusion of Validity

Egocentric bias

The illusion of validity is a cognitive bias in which a person overestimates their ability to correctly interpret and predict the outcome of analyzing a data set, especially when the data analyzed show a highly consistent pattern, i.e., when the data "tell" a coherent story.

This effect persists even when the person is aware of all the factors that limit the accuracy of their predictions, i.e., when the data/or and the methods used to assess the lead to highly flawed predictions.[41]

Masked-Man Fallacy

Masked-man fallacy

In philosophical logic, masked fallacy (also known as intensional fallacy or epistemic fallacy) is committed when one improperly uses Leibniz's law in an argument. For example, Leibniz's law states that if A and B are the same object, then A and B are indistinguishable (i.e., they all have the same properties). Regarding modus tollens, if one entity has a particular property while another object does not have the same property, the two things cannot be identical. The fallacy is "epistemic" because it presupposes an immediate identity between a subject's knowledge of an object and the object itself and fails to recognize that Leibniz's law cannot account for intensional contexts.[42]

Recency Illusion

Recency bias

The topicality illusion is the belief or impression that a word or usage is recent, even though it has been established for a long time. The term was coined by Arnold Zwicky, a Stanford University linguist primarily interested in examples of words, meanings, sentences, and grammatical constructions. However, the use of the term is not limited to linguistic phenomena: Zwicky defines it simply as "the conviction that things one has only recently noticed are new."

According to Zwicky, the illusion is caused by selective attention.[43]

Gambler's Fallacy

Logical fallacy

The tendency to believe that future probabilities are modified by past events when they are unchanged.

The gambler's fallacy, also known as the Monte Carlo fallacy or the maturity of odds fallacy, is the false belief that a particular event that occurred more frequently than normal in the past is less likely to occur in the future (or vice versa) when it has otherwise been established that the probability of such events does not depend on past events. Such events that have the property of historical independence are called statistically independent. The fallacy is often associated with games of chance, where, for example, one believes that the next throw of the dice is more likely to result in a six because there have been fewer than the usual number of sixes recently. [44]

Hot Hand

Logical fallacy

The "hot hand" (also known as the "hot hand phenomenon" or "hot hand fallacy") is a phenomenon formerly considered to be a cognitive, social bias, which states that a person who has achieved a successful outcome has a greater chance of success on subsequent attempts. The concept is often applied to sports and skill-based tasks in general and originated in basketball, where a shooter is more likely to score if their previous attempts were successful, i.e., if they have a "hot hand." Although earlier success on a task can indeed alter a player's psychological attitude and subsequent success rate, for many years, researchers found no evidence of a "hot hand" in practice and dismissed it as deceptive. However, later research questioned whether it was indeed a fallacy. Some recent studies using modern statistical analysis have found evidence of the "hot hand" in some athletic activities; however, other recent studies have found no evidence of the "hot hand." In addition, evidence suggests that only a small group of players have a "hot hand," and for those that do, the magnitude (i.e., effect size) of the "hot hand" tends to be small. [45]

Illusory Correlation

Apophenia

In psychology, the term spurious correlation refers to the phenomenon of perceiving a relationship between variables (usually people, events, or behaviors) even though no such relationship exists. A spurious association may arise because rare or novel occasions are more salient and attract people's attention. This phenomenon is one of the reasons for the formation and maintenance of stereotypes. Hamilton & Rose (1980) found that stereotypes can lead people to expect certain groups and characteristics to go together and then overestimate the frequency with which these correlations occur. These stereotypes can be learned and maintained without contact between the bearer of the stereotype and the group at issue.[46]

Pareidolia

Apophenia

Pareidolia is the tendency of perception to impose a meaningful interpretation on a nebulous, usually visual stimulus, so that one sees an object, pattern, or meaning where none exists.

Common examples include perceived images of animals, faces, or objects in cloud formations, seeing faces in inanimate objects, or lunar pareidolia, such as the man on the moon or the moon rabbit. The concept of pareidolia can also extend to hidden messages in musical recordings played backward or at higher or lower speeds than usual and to hearing (usually indistinct) voices or music in random sounds such as those produced by air conditioners or fans.

Scientists have taught computers to "see" faces and other images based on visual cues.[47]

Anthropomorphism

Availability bias

Anthropomorphism is the attribution of human characteristics, feelings, or intentions to non-human beings. It is considered an innate tendency of human psychology.

Personification is the related attribution of human form and characteristics to abstract concepts such as nations, emotions, and natural forces such as seasons and weather.

Both forms have ancient roots as narrative and artistic devices, and most cultures have traditional fables with anthropomorphized animals as characters. Humans have also routinely attributed human emotions and behaviors to wild and domesticated animals.[48]

We fill in characteristics from stereotypes, generalities, and prior histories

Group Attribution Error

Attribution bias

The biased assumption that the characteristics of an individual group member reflect the group as a whole, or the tendency to assume that the outcomes of group decisions reflect the preferences of group members, even when information is available that clearly suggests otherwise

The group attribution error refers to the tendency of people to believe either

- the characteristics of an individual group member reflect the group as a whole, or
- that the outcome of a group decision must reflect the preferences of individual group members, even when external information exists that suggests otherwise.[49]

Ultimate Attribution Error

Attribution bias

The ultimate attribution error is a group-level attribution error that explains how people see different causes of negative and positive behavior in ingroup and outgroup members. The maximum attribution error is the tendency to attribute hostile outgroup and positive ingroup behavior internally and to attribute positive outgroup and negative ingroup behavior externally. In other words, the ultimate attribution error explains an outgroup's negative behavior as a flaw in its personality and an outgroup's positive behavior as the result of chance or circumstance. It is also the belief that positive actions of ingroup members are the result of their personality, while negative behavior of an ingroup member (assumed to be rare) is due to situational factors.[50]

Stereotype

Labelling bias

Social psychology defines a stereotype as a generalized belief about a particular category of people. It is an expectation that people may have about any person in a specific group. The nature of the expectation may vary; for example, it may be an expectation about the group's personality, preferences, appearance, or abilities. Stereotypes are sometimes overgeneralized, inaccurate, and resistant to new information, but they can also be accurate.

While such generalizations about groups of people can help make quick decisions, they can be incorrect when applied to specific individuals and are one of the reasons for prejudiced attitudes.[51]

Essentialism

Essentialism

Essentialism is the view that objects have properties that are necessary for their identity. In early Western thought, Plato's idealism held that all things have such an "essence" - an "idea" or "form." In the Categories, Aristotle likewise proposed that all objects have a substance that, as George Lakoff put it, "makes the thing what it is, and without which it would not be that kind of thing." The opposite view - non-essentialism - denies the need to assume such an "essence."

Essentialism has been controversial from the beginning. In the Parmenides dialogue, Plato depicts Socrates challenging the notion by asserting that if we accept the idea that every beautiful thing or just action contains an essence to be beautiful or just, we must also accept the "existence of separate essences for hair, mud, and dirt." In biology and other natural sciences, essentialism provided the rationale for taxonomy at least until Charles Darwin; the role and significance of essentialism in biology is still the subject of debate.[52]

Functional Fixedness

Anchoring bias

Functional fixation is a cognitive bias that restricts a person from using an object only when it is traditionally used. The concept of helpful fixation comes from Gestalt psychology, a movement in psychology that emphasizes holistic processing. Karl Duncker defined functional fixation as a mental block against using an object in a new way that is needed to solve a problem. This "block" limits a person's ability to use components given to them to complete a task because they cannot go beyond the original purpose of those components. For example, if someone needs a paperweight but only has a hammer, they cannot see how the hammer can be used as a paperweight. Function fixation is the inability to use a hammer for anything other than hammering nails; the person cannot think of using the hammer other than for its conventional function.[53]

Self-Licensing

Self-licensing

Self-licensing (also moral self-licensing, moral licensing, or licensing effect) is a term used in social psychology and marketing to describe the unconscious phenomenon in which increased confidence and certainty in one's own self-image or self-concept causes the person in question to give less thought to the consequences of subsequent immoral behavior and thus is more likely to make immoral decisions and act immorally. Put simply, self-approval occurs when people indulge after having previously done something positive; for example, drinking a diet soda with a greasy hamburger and fries may lead one to unconsciously disregard the negative attributes of the meal's high calorie and cholesterol content.[54]

Just-World Hypothesis

Attribution bias

The just-world hypothesis or just-world fallacy is the cognitive bias that assumes that "people will get what they deserve" - that actions will have morally just and appropriate consequences for the actor. For example, this hypothesis assumes that noble efforts will ultimately be rewarded and evil actions will ultimately be punished. In other words, the justice hypothesis is the tendency to attribute consequences either to a universal force that restores moral balance or to a universal connection between the nature of actions and their outcomes or to expect consequences as a result of them. This belief generally implies the existence of cosmic justice, fate, divine providence, desert, stability, and/or order. It is often associated with several fundamental errors, particularly concerning rationalizing suffering because those who suffer "deserve" it.[55]

Argument from Fallacy

Argument from fallacy

The argument from fallacy is the formal fallacy of analyzing an idea and concluding that the conclusion must be false because it contains a fallacy. It is also called the argument to logic (argumentum ad logicam), the fallacy, the fallacy of the fallacious, and the fallacy of wrong reasons.

It has the general argument form:

> If P, then Q.
>
> P is a fallacious argument.
>
> Therefore, Q is fallacious.

Thus, it is a special case of the denial of the presupposition, where the presupposition is not a false proposition but a whole argument that is false. A fallacious argument, just as with a false antecedent, can still have a consequent that happens to be true. The fallacy is that the consequence of a false statement must be wrong.[56]

Authority Bias

Association fallacy

Authority bias is the tendency to attribute greater correctness to the opinion of an authority figure (regardless of its content) and to be more influenced by that opinion. The idea of that authority figure more influences a person because they consider that the authority figure's views are more credible. Therefore, they value the authority figure's point of view and are more likely to obey it. This concept is considered social-cognitive biases or collective cognitive biases.[57]

Automation Bias

False priors

The tendency to rely too much on automated systems, which can lead to erroneous automatic information overriding correct decisions.

Automation bias is the tendency of humans to give preference to suggestions made by automated decision-making systems and to ignore conflicting information assembled without automation, even if it is correct. Automation bias comes from the social psychology literature, which has identified a bias in human-human interaction that shows that people evaluate human decisions more positively than a neutral object. The same positivity bias has also been found in human-automation interactions, where automated decisions are considered more positively than neutral ones.[58]

Bandwagon Effect

Conformity bias

The follower effect describes the tendency of people to adopt certain behaviors, styles, or attitudes simply because others do so.

More specifically, it is a cognitive bias in which public opinion or behavior can change due to specific actions and beliefs spreading to the public. It is a psychological phenomenon in which the spread of thoughts, ideas, fads, and trends increases as others have done so. When more people believe in something, others also jump on the bandwagon, regardless of the underlying evidence.[59]

Placebo Effect

Placebo

A placebo is a sham substance or treatment that is not intended to have any known therapeutic value. Common placebos include inert tablets (such as sugar pills), inert injections (such as saline), sham operations, and other procedures.

In general, placebos can affect how patients perceive their condition and stimulate the body's chemical processes to relieve pain and other symptoms but have no effect on the disease itself. Patients who experience improvements after treatment with placebo may also be due to unrelated factors, such as regression to the mean (a statistical effect in which an unusually high or low reading is more likely to be followed by a less extreme reading). The use of placebos in clinical medicine raises ethical concerns, mainly when disguised as active treatment, as this renders the doctor-patient relationship dishonest and circumvents informed consent. While it was once assumed that this deception was necessary for placebos to have any effect, there is now evidence that placebos can work even when the patient knows it is a placebo.[60]

We imagine things and people we're familiar with or fond of as better.

Out-Group Homogeneity

Out-group homogeneity

The outgroup homogeneity effect is the perception that outgroup members are more similar than ingroup members, e.g., "they are the same, we are different." Perceivers tend to have impressions about the diversity or variability of group members based on the central tendencies of typical characteristics. Thus, stereotypical judgments about the outgroup are overestimated, supporting the view that outgroup stereotypes are overgeneralizations. The term "outgroup homogeneity effect," "outgroup homogeneity bias," or "relative outgroup homogeneity" has been explicitly contrasted with "outgroup homogeneity" in general, the latter referring to perceived outgroup variability that is unrelated to ingroup perceptions.[61]

Cross-Race Effect

Memory bias

The cross-race effect (sometimes called cross-race bias, other-race bias, own-race bias, or other-race effect) tends to recognize faces that belong to one's racial group more easily. In social psychology, the cross-race product is called "ingroup advantage." At the same time, it can be considered a particular form of "ingroup advantage" in other fields because it only comes into play in interracial or interethnic situations. The cross-race effect is thought to contribute to difficulties in identifying people of different races and implicit racial bias. On the other hand, the cross-race effect is also thought to contribute to identifying people of different races.[62]

In-Group Favoritism

In-group bias

Intra-group favoritism is a pattern of favoring members of one's group over members of the out-group. This can manifest itself in the evaluation of others, the allocation of resources, and many other ways.

Many psychologists have researched this effect, which has been associated with many theories of group conflict and prejudice. However, the phenomenon is primarily viewed from the standpoint of social psychology. Studies have shown that in-group favoritism results from the formation of cultural groups. These cultural groups can be divided based on seemingly trivial, observable characteristics, but populations associate specific characteristics with certain behaviors over time, increasing covariation. It fosters then in-group bias.[63]

Halo Effect

Association fallacy

The halo effect (sometimes called the halo error) is the tendency for positive impressions of a person, company, brand, or product in one area to influence opinions or feelings in other areas positively. The halo effect is "the term used to describe the phenomenon that evaluators tend to be influenced by their past judgments about performance or personality." The halo effect, a cognitive bias, can potentially prevent someone from accepting a person, product, or brand based on an unfounded belief about what is good or bad.

Edward Thorndike coined the term. A simplified example of the halo effect is that a person who notices that the photo is attractive, well-groomed, and appropriately dressed will use a mental heuristic to assume that the person in the picture is a good person based on the rules that person's social concept. This ongoing judgment bias reflects the person's preferences, prejudices, ideology, aspirations, and social perception.[64]

Cheerleader Effect

Association fallacy

The tendency for people to appear more attractive in a group than alone.

The term was coined by the fictional character Barney Stinson (Neil Patrick Harris) in "No Father's Day," an episode of the television series How I Met Your Mother that first aired in November 2008. Barney points out to his friends a group of women who seem attractive at first glance but are all unattractive when viewed individually. Later in the episode, this hint is repeated by two other characters, Ted Mosby (Josh Radnor) and Robin Scherbatsky (Cobie Smulders). They note that some of Barney's friends appear attractive only as a group.[65]

Positivity Effect

Memory bias

The positivity effect is the ability to constructively analyze a situation where the desired results are not achieved but still receive positive feedback that helps us develop further.

It refers to the habits and characteristics of people in evaluating the causes of their behaviors. To attribute positively is to be open to considering a person's innate disposition as the cause of their positive behavior and the situations surrounding them as the possible cause of their negative behavior.[66]

Not Invented Here

Ingroup bias

Not invented here (NIH) is the tendency to avoid using or buying products, research results, standards, or knowledge from external sources. It is usually adopted by social, corporate, or institutional cultures. Research illustrates a strong bias against outside ideas.

The reasons for not wanting to use the work of others are varied but can include a desire to support the local economy rather than pay royalties to a foreign licensee, fear of patent infringement, lack of understanding of others' work, unwillingness to acknowledge or appreciate the work of others, jealousy, persistence in belief, or being part of a larger turf war. As a social phenomenon, this tendency can manifest itself in an unwillingness to adopt an idea or product because it comes from a different culture, in the form of tribalism, and/or in an insufficient effort to take the right approach to business.

The term is usually used in a pejorative sense. The opposite disposition is sometimes referred to as "proudly found elsewhere" (PFE) or "invented elsewhere."[67]

Reactive Devaluation

Reactive devaluation

Reactive devaluation is a cognitive bias in which a suggestion is devalued if it appears to come from an opponent. The bias was proposed by Lee Ross and Constance Stillinger (1988).

Reactive devaluation could be caused by loss aversion, attitude polarization, or naive realism.

In an initial experiment, Stillinger and co-authors asked passersby in the U.S. whether they would support a drastic bilateral nuclear arms reduction program. When they learned that the proposal came from President Ronald Reagan, 90 percent said it would be favorable or balanced for the United States; when they learned that the proposal came from a group of unspecified political analysts, 80 percent thought it was favorable or balanced; however, when respondents learned that it came from Mikhail Gorbachev, only 44 percent thought it was favorable or neutral for the United States.[68]

Well Travelled Road Effect

Availability bias

The well-traveled-road effect is a cognitive bias in which travelers estimate the time it takes to travel a route differently depending on their familiarity with the course. As a result, frequently traveled roads are estimated to be shorter than unfamiliar routes. This effect leads to errors in estimating the most efficient route to an unknown destination when one of the routes contains a familiar path. At the same time, the other road under consideration has no common ways. The effect is most pronounced when subjects drive cars but can also be observed for pedestrians and users of public transportation. The effect has been observed for centuries but was first studied scientifically in the 1980s and 1990s, following earlier work on "heuristics and biases" by Daniel Kahneman and Amos Tversky.[69]

We simplify probabilities and numbers to make them easier to think about.

Mental Accounting

Mental accounting

Mental accounting (or psychological accounting) attempts to describe how people encode, categorize, and evaluate economic outcomes. Richard Thaler first mentioned the concept. Mental accounting is concerned with budgeting and organizing expenditures. People budget money in mental accounts for expenses (e.g., saving for a house) or costs (e.g., gas money, clothing, utilities). Mental accounts are thought to serve as a self-control strategy. People are thought to create mental accounts to manage and keep track of their spending and resources. People are also thought to develop mental accounts to facilitate saving for larger goals (e.g., a house or college tuition). Like many other cognitive processes, this can lead to biases and systematic deviations from rational, value-maximizing behavior, and its effects are pretty robust. Understanding the weaknesses and inefficiencies of mental accounting is critical to making good decisions and reducing human error.[70]

Appeal to Probability

Logical fallacy

An appeal to probability (or appeal to possibility, also known as possibiliter ergo probabiliter, "possibly, therefore probably") is the logical fallacy of taking something as given because it would probably be the case (or could be the case). Therefore, inductive arguments do not have deductive validity and must be asserted or denied in the premises. A mere possibility is not equivalent to a probability. A mere likelihood is not equal to a certainty, nor is the mere probability that something has happened or will happen sufficiently to count as the knowledge that it has happened.[71]

Normalcy Bias

Cognitive dissonance

The normalcy bias is a cognitive bias that causes people to ignore or downplay hazard warnings. As a result, people underestimate the likelihood of a disaster, when they might be affected, and the potential negative impact. The normalcy bias results in many people failing to prepare for natural disasters adequately, market collapses, and disasters caused by human error. Reportedly, about 70% of people exhibit normalcy bias during a disaster.

Normalcy bias can manifest in response to warnings of disasters and actual disasters. Such disasters include market crashes, car accidents, natural disasters such as a tsunami, and war.[72]

Murphy's Law

Murphy's law

Murphy's Law is a proverb or epigram usually phrased as follows: "Anything that can go wrong will go wrong."

The perceived perversity of the universe has long been the subject of commentary, and precursors to the modern version of Murphy's Law are not hard to find. Members of the American Dialect Society have done recent significant research in this area.

Mathematician Augustus De Morgan wrote on June 23, 1866: "The first experiment already illustrates a truth of theory well confirmed by practice: Whatever can happen will happen if we do enough experiments." In later publications, "whatever can happen will happen" is occasionally referred to as "Murphy's law," raising the possibility that "Murphy" - when something has gone wrong - is "De Morgan" (a chance submitted by Goranson, among others, on the American Dialect Society list).[73]

Zero-Sum Thinking

Zero-sum fallacy

Zero-sum bias is a cognitive bias against zero-sum thinking; people tend to intuitively judge that a situation is a zero-sum game even when it is not. This bias promotes zero-sum fallacies, i.e., the false belief that situations are zero-sum games. Such errors can lead to other incorrect judgments and poor decisions. The "zero-sum fallacy" generally refers to the fixed-pie fallacy in economics.

In zero-sum thinking, situations are perceived as zero-sum games in which one person's gain is another's loss. The term originates from game theory. However, unlike the concept of game theory, zero-sum thinking refers to a psychological construct - a person's subjective interpretation of a situation. Zero-sum thought is expressed by the phrase "your gain is my loss" (or conversely, "your loss is my gain"). Rozycka-Tran et al. (2015) defined zero-sum thinking as.[74]

Survivorship Bias

Availability bias

People focus on the people or things that have "survived" a process, inadvertently overlooking those that have not because they are not visible.

Survivorship bias can lead to overly optimistic assumptions because failures are ignored, such as when companies that no longer exist are excluded from financial performance analyses. It can also lead to the false belief that successes in a group have a particular property and are not merely random (correlation "proves" causality). For example, if three of the five students with the highest college grades went to the same high school, this can lead to the assumption that the high school must provide an excellent education when it may just be a much larger school. This can be better understood by looking at the grades of all the other students in that high school, not just those who made it into the top five.[75]

Subadditivity Effect

Logical fallacy

The tendency is to estimate the whole probability as lower than the probabilities of the individual parts.

For example, in one experiment, subjects estimated the probability of dying from cancer in the U.S. at 18%, a heart attack at 22%, and the probability of death from "other natural causes" at 33%. Other participants estimated the likelihood of dying from a natural cause at 58%. Natural causes, strictly speaking, are composed of cancer, heart attack, and "other natural causes," but the sum of the latter three probabilities was 73%, not 58%. According to Tversky and Koehler (1994), this type of outcome is consistently observed.[76]

Denomination Effect

Framing effect

The tendency to spend more money when it is denominated in small amounts (e.g., coins) rather than large amounts (e.g., bills);

A denomination effect is a form of cognitive bias related to money, suggesting that people are less inclined to spend more significant money than the equivalent in smaller denominations. It was proposed by Priya Raghubir, a professor at New York University's Stern School of Business, and Joydeep Srivastava, a professor at the University of Maryland, in their 2009 paper, "Denomination Effect."[77]

The Magical Number 7 ± 2

The magical number 7 ± 2

"The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information" is one of psychology's most frequently cited papers. It was written by cognitive psychologist George A. Miller of the Department of Psychology at Harvard University and published in the journal Psychological Review in 1956. It is often interpreted to mean that the number of objects an average person can store in short-term memory is 7 ± 2; This is sometimes referred to as Miller's Law.[78]

We think we know what other people are thinking.

Illusion of Transparency

Egocentric bias

The illusion of transparency tends to overestimate how much their mental state is known to others. Another manifestation of the illusion of transparency (sometimes referred to as the observer's illusion of clarity) is the tendency of people to overestimate how well they understand the emotional and mental state of others. This cognitive bias is similar to the illusion of asymmetric insight.[79]

Curse of Knowledge

Curse of knowledge

The curse of knowledge is a cognitive bias that occurs when a person communicating with others assumes that they have the necessary background knowledge to understand. Some authors also refer to this bias as the curse of expertise.

For example, in a classroom, teachers struggle because they cannot put themselves in the student's shoes. An experienced professor may not remember the difficulties a young student has in learning a new subject. This curse of knowledge also explains the danger of basing student learning on what teachers think is best rather than what has worked for students.[80]

Spotlight Effect

Memory

The spotlight effect is a phenomenon in which people tend to believe that they are perceived more than they are. Because one is constantly the center of one's world, an accurate assessment of how much one is perceived by others is unusual. The spotlight effect is the innate tendency to forget that although one is the center of one's world, one is not the center of everyone else's. This tendency is especially pronounced when one does something atypical.[81]

Extrinsic Incentives Bias

Attribution bias

The extrinsic incentives bias is an attribution error according to which people attach relatively more importance to "extrinsic incentives" (e.g., a monetary reward) than to "intrinsic incentives" (e.g., learning a new skill) when they weigh the motives of others rather than their own.

This is a counterexample of the fundamental attribution error because others are assumed to be situationally motivated according to the irrelevant bias. At the same time, one's self is considered to be dispositionally motivated. This is the opposite of what the fundamental attribution error would predict. It may also help explain some of the misfirings that can occur when extrinsic incentives are attached to activities for which people are intrinsically motivated. The notion was first proposed by Chip Heath, who drew on earlier research by other management scientists.[82]

Illusion of Asymmetric Insight

Egocentric bias

The illusion of asymmetric insight is a cognitive bias in which people believe their knowledge of others trumps others' knowledge of them. This bias "has been attributed to people's tendency to regard their own spontaneous or off-the-cuff responses to others' questions as relatively uninformative, even though they regard others' similar responses as meaningful."[83]

We project our current mindset and assumptions onto the past and future.

Telescoping Effect

Memory

The tendency to shift recent events backward and distant events forward in time so that current events appear more distant and distant events appear more contemporary.

In cognitive psychology, the telescope effect (or telescope bias) refers to the temporal shift of an event. People perceive recent events as more distant than they are and distant events as more current than they are. The former is known as backward telescoping or time expansion, the latter as forwarding telescoping. Three years is approximately the period in which events change from backward to deliver temporal displacement, with events three years in the past being equally likely to be reported with a bias from forwarding telescoping as from backward telescoping. Although telescoping occurs in both the forward and backward directions, it generally increases the number of events too close in time.[84]

Rosy Retrospection

Rosy retrospection

The rosy retrospect refers to the psychological phenomenon in which people sometimes judge the past more positively than the present. The Romans occasionally referred to this phenomenon by the Latin phrase "memoria praeteritorum bonorum," which can be translated into English roughly as "the past is always well remembered." The rosy retrospect is very closely related to the concept of nostalgia. The difference between the two terms is that rosy retrospection can be understood as a cognitive distortion. In contrast, the broader phenomenon of nostalgia is usually not based on a distorted perspective.[85]

Hindsight Bias

Hindsight bias

Hindsight bias, also known as the "knew-it-all" phenomenon or creeping determinism, is the common tendency of people to view past events as more predictable than they were. People often believe that after an event has occurred, they would have predicted the event's outcome or perhaps even known with a high degree of certainty before the event occurred. Insight biases can lead to a distorted memory of what was known or believed before an event occurred. They are an essential source of overconfidence in a person's ability to predict the outcome of future events. Examples of insight bias can be found in the writings of historians describing the result of battles, in physicians recalling clinical trials, and in the justice system when individuals assign responsibility based on the supposed predictability of accidents.[86]

Outcome Bias

Outcome bias

The tendency to judge a decision by its outcome rather than relying on the quality of the decision at the time it is made.

Outcome bias is an error made in evaluating the quality of a decision when the outcome of that decision is already known. In particular, the outcome effect occurs when the same "behavior elicits more ethical condemnation if it leads to a bad outcome rather than a good outcome, even if the outcome is randomly determined."[87]

Moral Luck

Attribution bias

The tendency of people to assign a higher or lower moral standing depends on the outcome of an event.

Moral luck describes circumstances in which a moral agent is assigned moral blame or moral praise for an action or its consequences, even when it is clear that the agent did not have complete control over it. This concept, introduced by Bernard Williams and its importance for a coherent moral theory, was developed by Williams and Thomas Nagel in their respective essays on the subject.[88]

Declinism

Declinism

Declinism is the belief that a society or institution is prone to decline. Specifically, it is the tendency, possibly caused by cognitive distortions such as rosy hindsight, to see the past more positively and the future more negatively. "The great pinnacle of declinism," according to Adam Gopnick, "was reached in 1918 in the book that gave decline its good name in publishing: German historian Oswald Spengler's thousand-page bestseller The Decline of the West."[89]

Impact Bias

Impact bias

In the psychology of affective prediction, impact bias, a form of durability bias, is the tendency of people to overestimate the duration or intensity of future emotional states.

People tend to overestimate the intensity and duration of affect when making predictions about their emotional responses. It is a cognitive bias that has been found in various populations, from college students (e.g., Dunn, Wilson, & Gilbert, 2003; Buehler & McFarland, 2001) to sports fans (Wilson et al, 2000) to registered voters (Gilbert et al, 1998).[90]

Pessimism Bias

Pessimism bias

The tendency of some people, especially those suffering from depression, to overestimate the likelihood of negative things happening to them;

The opposite of optimism bias is pessimism bias (or pessimistic bias) since the principles of optimism bias also apply in situations where individuals see themselves as worse off than others. Optimism can arise either from a bias toward one's estimates, which represents personal optimism, or from a bias toward others, which means personal pessimism.

Pessimism bias is an effect in which people overestimate the likelihood of something negative happening to them. It is in contrast to optimism bias.[91]

Planning Fallacy

Egocentric bias

The tendency to underestimate one's completion times for tasks.

The planning fallacy is a phenomenon in which predictions about how much time will be needed to complete a future task have an optimistic tendency and underestimate the time required. This phenomenon sometimes occurs regardless of whether the person knows that previous tasks of a similar nature have taken longer than they had planned. The bias involves only predictions about one's tasks; when outside observers predict the duration of task completion, they tend to have a pessimistic bias and overestimate the time required. The planning bias involves more optimistic estimates of task completion times than those on similar projects in the past.[92]

Time-Saving Bias

Logical fallacy

The concept of time savings describes the tendency of people to misestimate the time that could be saved (or lost) when increasing (or decreasing) speed.

In general, people underestimate the time they could save if they assume a relatively low speed (e.g., 25 mph or 40 km/h) and overestimate the time they could save if they assume a relatively high speed (e.g., 55 mph or 90 km/h). People also underestimate the time that could be lost going down from a low speed and overestimate the time that could be lost going down from a high speed. [93]

Pro-Innovation Bias

Pro-innovation bias

The tendency to be overly optimistic about the benefits of an invention or innovation to society, often overlooking its limitations and weaknesses.

In innovation diffusion theory, a pro-innovation attitude is a belief that innovation should be adopted by society as a whole without the need for change. Unfortunately, the "champion" of innovation has such a strong bias in favor of the innovation that s/he fails to recognize its limitations or weaknesses and continues to promote it anyway.[94]

Projection Bias

Projection bias

Projection bias is the tendency to project current preferences onto a future event falsely. When people try to assess their emotional state in the future, they attempt to make an unbiased assessment. However, people's assessments are influenced by their current emotional state. Therefore, it may be difficult for them to predict their emotional state in the future, a process known as mental contamination. For example, if a student is currently in a negative mood because he has just learned that he failed a test, and if the student predicts how much he will enjoy himself at a party two weeks later, his current negative mood may affect his prediction. To make an accurate prediction, the student would need to be aware that his prognosis is biased due to mental contamination. He would need to be motivated to correct the bias. Finally, he would need to be able to fix the bias in the right direction of the proper magnitude.[95]

Restraint Bias

Egocentric bias

Restraint bias is the tendency of people to overestimate their ability to control impulsive behavior. An exaggerated notion of self-control can lead one to be more exposed to temptation and become more impulsive. Therefore, the tendency toward self-control has an impact on addiction. For example, someone might use drugs simply because they believe they can resist a possible addiction. A person's inability to control himself or control his temptation may result from various visceral impulses. Visceral impulses include hunger, sexual arousal, and fatigue. These impulses provide information about the current state and behavior required to satisfy the body.[96]

Consistency Bias

Memory

The term "consistency bias" (Sadler & Woody, 2003) refers to the tendency of people to judge their own interpersonal behavior in a given situation in accordance with their general self-images, even if their actual conduct in the situation is partially disregarded.[97]

NEED TO ACT FAST

To act, we must be confident we can make an impact and feel what we do is important.

Overconfidence Effect

Egocentric bias

The overconfidence effect is a well-known bias in which a person's subjective confidence in their judgments is reliably more significant than the factual accuracy of those judgments, especially when confidence is relatively high. Overconfidence is an example of a misperception of subjective probabilities. In the research literature, overconfidence has been defined in three different ways:

(1) overestimation of one's actual performance;

(2) overestimation of one's performance relative to others;

and

(3) overconfidence in expressing unwarranted certainty about the correctness of one's beliefs.[98]

Social-Desirability Bias

Social-desirability bias

In social science research, social desirability bias is a type of response bias, i.e., the tendency of survey respondents to answer questions in a way that will be evaluated positively by others. It can manifest itself in their overstating "good behavior" or understating "bad" or undesirable behavior. This tendency poses a severe problem when conducting self-report surveys. In addition, this bias affects the interpretation of average tendencies and individual differences.[99]

Third-Person Effect

Egocentric bias

The third-person effect hypothesis states that people tend to estimate the effect of mass media on others more strongly than on themselves due to personal prejudices. The third-person effect manifests itself in individuals overestimating the effect of a mass-communicated message on the generalized other or underestimating the effect of a mass-communicated message on themselves.

These types of perceptions arise from self-motivated social desirability (not feeling influenced by mass messages boosts self-esteem), social distance (distancing oneself from others who may be influenced), and perceived exposure to a message (others choose to be influenced by persuasive communication). Other names for the effect include "third-person perception" and "web third-person effect." Since 2015, the impact has been referred to as the "web third-person effect," as evidenced in social media, media websites, blogs, and websites.[100]

False Consensus Effect

Egocentric bias

The tendency of people to overestimate the degree to which they agree with others.

In psychology, the false consensus effect, also known as consensus bias, is a widespread cognitive bias that causes people to "regard their own behavioral choices and judgments as relatively general and appropriate to existing circumstances," i.e., they assume that their characteristics, traits, beliefs, and actions are relatively widespread in the general population.[101]

Hard-Easy Effect

Hard-easy effect

The hard-easy effect is a cognitive bias that manifests itself in a tendency to overestimate the likelihood of one's success on a task perceived as complex and to underestimate the possibility of one's success on a task perceived as easy. The difficult-easy effect occurs, for example, when individuals show some degree of underconfidence in answering relatively easy questions and some degree of overconfidence in answering relatively difficult questions. "Difficult tasks tend to lead to overconfidence but poorer-than-average perception," reported Katherine A. Burson, Richard P. Larrick, and Jack B. Soll in a 2005 study, "while easy tasks tend to result in below-average self-confidence and above-average affect."[102]

The Lake Wobegon Effect

The Lake Wobegon effect

The Lake Wobegon effect, a natural human tendency to overestimate one's abilities, was named in honor of the fictional town. The characterization that "all women are strong, all men are handsome, and all children are above average" described a natural and widespread human tendency to overestimate one's accomplishments and abilities relative to others. In support of the view that people generally need to believe they are above average (Lake-Wobegon effect), one author points out that only 2% of students said they were below average in leadership skills in a survey of high school students. In addition, the authors of one study point out that what they call the "Lake-Wobegon effect" can, in some cases, negatively affect physicians' treatment recommendations when physicians portray patients as "above average" in treatment planning.[103]

Dunning-Kruger Effect

Dunning-Kruger effect

The tendency of unskilled people to overestimate their abilities and the tendency of experts to underestimate their abilities;

The Dunning-Kruger effect is a cognitive bias in which low ability individuals overestimate their abilities on a task. Some researchers also include the opposite effect for high achievers: their tendency to underestimate their abilities. The Dunning-Kruger effect is usually measured by comparing self-assessment and objective performance. For example, participants in a study are asked to complete a quiz and then estimate how well they did. This subjective estimate is then compared to their actual performance. This can be done either relatively or, i.e., compared to one's peer group as a percentage of superior performance or compared to objective standards as the number of questions answered correctly.[104]

Egocentric Bias

Egocentric bias

It occurs when people claim more responsibility for themselves for the results of a joint action than an outside observer would grant them.

Egocentric bias tends to rely too heavily on one's perspective and/or have a higher opinion of oneself than reality. It appears to result from the psychological need to satisfy one's ego and be advantageous for memory consolidation. Research has shown that experiences, ideas, and beliefs are more easily recalled when they match one's own, causing a narcissistic outlook. Michael Ross and Fiore Sicoly first identified this cognitive bias in their 1979 paper, "Egocentric biases in availability and attribution." However, most psychologists refer to egocentric bias as a general umbrella term under which other related phenomena fall.[105]

Optimism Bias

Optimism bias

Optimism bias (or optimistic bias) is a cognitive bias that leads someone to believe that they have a lower probability of experiencing an adverse event. It is also referred to as unrealistic optimism or comparative optimism.

Four factors can cause a person to have an optimistic bias: (1)Their desired end state; (2)Their cognitive mechanisms; (3)The information they have about themselves compared to others; (4)Their general mood.

Optimistic bias shows up in several situations. For example, people who believe that their risk of being a victim of crime is lower, smokers who believe that they are less likely to get lung cancer or disease than other smokers, bungee jumpers who jump for the first time believe that their risk of getting hurt is lower than other jumpers, or traders who believe that they face fewer potential losses in the markets.[106]

Barnum Effect

Egocentric bias

The Barnum effect, also called the Forer effect or, less commonly, the Barnum-Forer effect is a widespread psychological phenomenon in which individuals give high accuracy ratings to descriptions of their personalities that are supposedly specific to them but are actually vague and general enough to apply to a wide range of people. This effect may provide a partial explanation for the widespread acceptance of some paranormal beliefs and practices such as astrology, fortune-telling, aura reading, and some types of personality tests.[107]

Self-Serving Bias

Attribution bias

The tendency to take more responsibility for successes than failures; can also manifest itself in people's tendency to evaluate ambiguous information in ways that benefit their interests (see also group-serving bias).

A self-serving bias is a cognitive or perceptual process that is distorted by the need to maintain and enhance self-esteem or the tendency to perceive oneself in an overly favorable manner. It is the belief that people tend to attribute successes to their abilities and efforts but failures to external factors. When individuals reject the validity of negative feedback, focus on their strengths and accomplishments but overlook their failures and mistakes, or value their group's work more than that of other members, they protect their self-esteem from threat and injury. These cognitive and perceptual tendencies maintain illusions and misconceptions. Still, they also serve the self's need for esteem—for example, a student who attributes a good grade on an exam to theirs.[108]

Actor-Observer Asymmetry

Actor-observer asymmetry

Actor-observer asymmetry (also actor-observer bias) is a bias that people exhibit in forming attributions about the behavior of others or themselves, depending on whether they are actors or observers in a situation. For example, when people judge their behavior, they attribute their actions to their position rather than their personality. However, when an observer explains another person's behavior, they are more likely to attribute that behavior to the actor's personality rather than to situational factors.[109]

Illusion of Control

Egocentric bias

The illusion of control is the tendency of people to overestimate their ability to control events. It was named by U.S. psychologist Ellen Langer and is thought to influence gambling behavior and belief in the paranormal. Together with the illusory superiority and optimism bias, the control illusion is one of the positive illusions.

The illusion may arise because a person lacks direct introspective insight into whether they are in control of events. This has been called the introspection illusion. Instead, the person may judge their degree of power using an unreliable process. As a result, they see themselves as responsible for events with little or no causal relationship.[110]

Illusory Superiority

Egocentric bias

In social psychology, illusory superiority is a state of cognitive distortion in which a person overestimates their qualities and abilities relative to the same attributes and skills. Illusory superiority is one of many positive illusions about the self that are evident in the study of intelligence, the adequate performance of tasks and tests, and the possession of desirable personal qualities and personality traits.

The term illusory superiority was first used by researchers Van Yperen and Buunk in 1991. The phenomenon is also known as the superiority effect, superiority bias, hindsight bias, sense of relative superiority, primus-inter-pares effect, Dunning-Kruger effect, and Lake Wobegon effect, named after the fictional town where all children are above average.[111]

Fundamental Attribution Error

Attribution bias

In social psychology, fundamental attribution error (FAE), also known as correspondence bias or attribution effect, refers to the tendency of people to undervalue situational and environmental explanations for a person's observed behavior" while overvaluing dispositional and personality explanations. This effect has been described as "the tendency to believe that what people do reflects who they are," that is, to over-attribute their behavior (what they do or say) to their personality and to subordinate it to the situation or context. The mistake is to view a person's actions solely as an expression of their character, rather than viewing them to some extent as an expression of their personality and explaining them largely in terms of circumstances. It is a kind of circular reasoning in which the answer to the question "Why would he do that?" is "Because he would."[112]

Defensive Attribution Hypothesis

Egocentric bias

The defensive attribution hypothesis (or bias, theory, or simply defensive attribution) is a social psychological term in which an observer attributes the causes of a mishap to minimize their fear of being a victim or cause in a similar situation. Attribution of blame is negatively correlated with the similarity between the observer and the individuals involved in the mishap, i.e., more responsibility is attributed to the individuals involved who are dissimilar to the observer. The attribution of responsibility leads the observer to believe that the mishap was controllable and thus avoidable.[113]

Trait Ascription Bias

Egocentric bias

Trait ascription bias is the tendency of people to view themselves as relatively variable in terms of personality, behavior, and mood while viewing others as much more predictable in terms of their traits in different situations. More specifically, it is a tendency to describe one's behavior in words of situational factors while preferring to describe the behavior of others by ascribing fixed dispositions to their personalities. This may be because one's internal states are more readily observable and available than others.[114]

Effort Justification

Effort justification

Effort justification is an idea and paradigm in social psychology that goes back to Leon Festinger's theory of cognitive dissonance. Effort justification is the tendency of a person to place a higher value on an outcome that they have had to work hard to achieve than the objective value of the result.[115]

Risk Compensation

Risk compensation

The tendency to take more significant risks when perceived safety increases;

Risk compensation is a theory that people generally adjust their behavior to the perceived level of risk, becoming more cautious when they perceive more significant risk and less attentive when they feel better protected. Although this effect is usually minor compared to the essential benefits of safety measures, it can lead to lower net benefits than expected or even to higher risks.

For example, it was observed that motorists drove closer to the vehicle in front when the cars were equipped with antilock brakes. There is also evidence that the phenomenon of risk compensation may explain the failure of condom distribution programs to reduce HIV prevalence and that condoms may promote disinhibition so that people engage in risky sex both with and without condoms.[116]

Peltzman Effect

Peltzman effect

The reduction in the predicted benefits of regulations designed to increase safety is sometimes referred to as the Peltzman effect, in recognition of Sam Peltzman, an economics professor at the University of Chicago Booth School of Business, who published "The Effects of Automobile Safety Regulation" in the Journal of Political Economy in 1975, in which he controversially posited that "compensation (due to risk offsets) is virtually complete, so regulation has not reduced traffic fatalities." Peltzman claimed to have made this theory in the 1970s, but it was used against mandated train safety equipment as early as the 19th century (Adams 1879). Reanalysis of his original data revealed numerous errors, and his model could not predict the number of fatalities before regulation (Robertson 1977). According to Peltzman, regulation was useless at best and counterproductive at worst. Peltzman noted that the extent of risk compensation in response to highway safety regulations was complete in the original study. However, "Peltzman's theory does not predict the extent of risk-compensatory behavior."[117]

To stay focused, we favor the immediate, relatable thing in front of us.

Hyperbolic Discounting

Extension neglect

Discounting is the tendency of people to favor immediate payoffs over later payoffs. Hyperbolic discounting leads to inconsistent decisions over time - people make decisions today that they would instead not have made in the future, even though they make the same considerations. They are also known as Current Moment Bias and Present Bias related to Dynamic Inconsistency. An excellent example of this: one study showed that when choosing food for the coming week, 74% of participants chose fruit, while when choosing food for the current day, 70% chose chocolate.[118]

Appeal to Novelty

Appeal to novelty

The appeal to novelty (also called argumentum ad novitatem) is a fallacy. One hastily asserts that an idea or proposal is correct or superior simply because it is new and modern. In a controversy between the status quo and new inventions, an argument based on novelty is not a valid argument. The fallacy can take two forms: Overestimating the new and modern by assuming prematurely and without investigation that it is the best case, or underestimating the status quo by assuming prematurely and without analysis that it is the worst case.[119]

Identifiable Victim Effect

Identifiable victim effect

The "identifiable-victim effect" refers to the tendency of individuals to offer more help when a specific, identifiable person ("victim") is in need, compared to a large, vaguely defined group with the same condition. The effect is also observed when subjects distribute a punishment rather than a reward. Research has shown that subjects are more willing to impose punishment, even at their own expense, when they punish specific, identifiable individuals ("offenders").[120]

To get things done, we tend to complete things we've invested time and energy in.

Sunk Cost Fallacy

Sunk cost fallacy

In economics and business decision-making, sunk costs (also referred to as retrospective costs) are costs that have already been incurred and cannot be recovered. Sunk costs contrast with prospective costs, which are future costs that can be avoided if action is taken. In other words, sunk costs are amounts paid in the past that are no longer relevant to future decisions. Even though economists argue that sunk costs are no longer relevant to future rational choices, in everyday life, people often include past expenditures in situations such as repairing a car or house in their future decisions regarding these objects.[121]

(Irrational) Escalation of Commitment

Logical fallacy

Escalation of commitment is a human behavior pattern. An individual or group faced with increasingly negative consequences of a decision, action, or investment continues the behavior anyway rather than changing course. The actor maintains behaviors that are irrational but consistent with previous decisions and actions.

Economists and behavioral scientists use the related term sunk-cost fallacy to describe the justification for an increased investment of money or effort in a decision based on the cumulative prior investment ("sunk cost"), even though new evidence suggests that the future costs of continuing the behavior exceed the expected benefits.[122]

Generation Effect

Memory

The generation effect is a phenomenon in which information is better remembered when generated from one's mind rather than read. Researchers have struggled to explain why developed information is remembered better than reading data, but no single explanation has been sufficient.[123]

Loss Aversion

Prospect theory

Loss aversion is the tendency to avoid losses instead of making equivalent gains. This principle is widely accepted in economics. The difference between loss aversion and risk aversion is that the benefit of a monetary payoff depends on what happened or was expected to happen before. Some studies have found that losses have twice the psychological impact of gains. Amos Tversky and Daniel Kahneman first noted loss aversion.[124]

IKEA Effect

IKEA effect

The IKEA effect is a cognitive bias in which consumers place a disproportionate value on products they have partially made themselves. The name refers to the Swedish manufacturer and furniture retailer IKEA, which sells many pieces of furniture that require assembly.

A 2011 study found that subjects were willing to pay 63% more for furniture they assembled themselves than equivalent pre-assembled items.

The IKEA effect was identified and named by Michael I. Norton of Harvard Business School, Daniel Mochon of Yale, and Dan Ariely of Duke, who published the results of three studies in 2011. They described the IKEA effect as follows: "Work alone can be enough to elicit a greater preference for the fruits of one's labor: even building a standardized dresser, a tedious, solitary task, can lead people to overvalue their (often poorly constructed) creations."[125]

Zero-Risk Bias

Zero-risk bias

Zero-risk bias favors the complete elimination of a risk in a subdomain over alternatives with more significant overall risk reduction. It is often evident in cases where decision-makers address health, safety, and environmental problems. Its impact on decision-making has been observed in surveys in which hypothetical scenarios were presented.

Critics of the zero-risk bias model argue that it tends to neglect the reduction in the overall risk. For example, when two side effects are eliminated, it is assumed that the complete elimination of only one side effect is preferable to reducing the overall risk.[126]

Disposition Effect

Prospect theory

The disposition effect is an anomaly discovered in behavioral finance. It refers to the tendency of investors to sell assets that have increased in value while holding investments that have decreased in value.

Hersh Shefrin and Meir Statman identified and named the effect in their 1985 paper, in which they found that people dislike losing significantly more than they dislike winning. The disposition effect has been described as one of the most potent facts associated with individual investors because investors hold stocks that have lost value and sell stocks that have gained importance."[127]

Pseudocertainty Effect

Prospect theory

In prospect theory, the pseudo-certainty effect refers to the tendency of people to view an outcome as inevitable when in fact, it is uncertain when it comes to multistage decisions. As a result, evaluating the certainty of the result in a previous decision-making stage is disregarded when selecting an option in subsequent steps. Not to be confused with the certainty effect, the pseudo-certainty effect was discovered in an attempt to find a normative application of decision theory to the certainty effect by relaxing the cancellation rule.

The pseudo-certainty effect was demonstrated by Daniel Kahneman, who won the Nobel Prize in Economics for his work on decision making and decision theory in collaboration with Amos Tversky. The studies they examined used real and hypothetical money games and were often used in student classrooms and laboratories.[128]

Backfire Effect

Confirmation bias

The backfire effect means that people who receive evidence against their beliefs may reject them and believe in them even more strongly. The term was coined by Brendan Nyhan and Jason Reifler in 2010. However, subsequent research has failed to replicate the backfire effect results. A study conducted by Ohio State University and George Washington University examined 10,100 participants with 52 different topics expected to trigger a backfire effect. While the results showed that people were reluctant to absorb facts that contradicted their pre-existing ideology, no cases of backfire effects were found. As a result, the backfire effect is now a rare phenomenon rather than an everyday occurrence (cf. the boomerang effect).[129]

To avoid mistakes, we aim to preserve autonomy and group status, and avoid irreversible decisions.

System Justification

Prospect theory

System justification theory (SJT) is a theory of social psychology according to which system justifying beliefs have a psychologically palliative function. It assumes that people have several basic needs that vary from person to person and can be satisfied by defending and justifying the status quo, even when the system is disadvantageous to specific individuals. People have epistemic, existential, and relational needs that are satisfied by and manifest in ideological support for the prevailing structure of social, economic, and political norms. For example, the need for order and stability, and thus resistance to change or alternatives, may motivate individuals to view the status quo as good, legitimate, and even desirable.[130]

Reverse Psychology

Reverse psychology

Reverse psychology is a technique of asserting a belief or behavior opposite to the one desired, with the expectation that this approach will lead the person to be persuaded to do what is actually desired. This technique is based on the psychological phenomenon of reactance. A person has an adverse emotional reaction to being influenced and therefore chooses the option being argued against. This can work exceptionally well with naturally recalcitrant individuals, while direct appeals work best with compliant individuals. The manipulated person is usually unaware of what is going on.[131]

Reactance

Reactance (psychology)

The urge to do the opposite of what someone asks you to do because you want to resist a perceived attempt to limit your freedom of choice.

Reactance is unpleasant motivational arousal (reaction) to offers, people, rules, or regulations that threaten or eliminate certain behavioral freedoms. Reactance occurs when a person feels that someone or something is taking away their choices or limiting their choice of alternatives.

Reactance can occur when someone is strongly pressured to accept a particular view or attitude. Reactance can cause the person to adopt or reinforce an idea or attitude contrary to the actual intention and increase resistance to persuasion. People who use reverse psychology play on reactance and try to influence someone to choose the opposite of what they want.[132]

Decoy Effect

Framing effect

Preferences for either option A or B change in favor of option B when option C is presented, which is entirely dominated by option B (inferior in every respect) and partially dominated by option A;

In marketing, the decoy effect (or attraction effect or asymmetric dominance effect) refers to the phenomenon that consumers tend to change their preference between two options when they are also presented with a third option that is asymmetrically dominated. An alternative is asymmetrically dominated if it is inferior to one choice in all respects but low to the other option in some regards and superior in others. In other words: Concerning specific preference-determining properties, it is completely dominated by one option (i.e., it is inferior to it) and only partially defeated by the other. When the asymmetrically dominated option is present, more consumers will prefer the dominant option than when the asymmetrically dominated option is not current.[133]

Social Comparison Bias

Social comparison bias

The tendency to favor potential candidates who do not compete with one's particular strengths when making decisions;

The majority of people in society base their moods and feelings on how well they are doing compared to others. Social comparison bias occurs regularly in everyday social life. Social comparison can be defined as feelings of dislike and competition towards someone who is seen as physically or mentally better than oneself. This can be compared to social comparison, which is thought to be central to achievement motivation, feelings of unfairness, depression, jealousy, and willingness to stay in a relationship or job. People often compete for the best grades, the best jobs, and the best houses. In many situations, social comparison is pretty self-explanatory.[134]

Status Quo Bias

Prospect theory

Status quo bias is an emotional bias, a preference for the current state of affairs. The current baseline (or status quo) is taken as a reference point, and any deviation from this baseline is perceived as a loss. Status quo bias should be distinguished from a rational preference for the status quo ante, such as when the current state of affairs is objectively superior to available alternatives or when imperfect information is a significant problem. However, there is ample evidence that status quo bias often influences human decision-making.

Status-quo bias should also be distinguished from psychological inertia, which refers to a lack of intervention in the current state of affairs.[135]

We favor simple–looking options and complete information over complex, ambiguous options.

Ambiguity Effect

Prospect theory

The tendency to avoid options where the probability of a favorable outcome is unknown.

The ambiguity effect is a cognitive bias in which decision-making is influenced by a lack of information or "ambiguity." The result states that people prefer options where a favorable outcome is known over an option where the probability of a good product is unknown. Daniel Ellsberg first described the result in 1961.

For example, when buying a house, many people opt for a fixed-rate mortgage, where the interest rate is fixed for a certain period (usually several years), rather than an adjustable-rate mortgage, where the interest rate fluctuates with the market, possibly from one month to the next. Even though an adjustable-rate mortgage has been statistically proven to save money, this is the case.[136]

Information Bias

Information bias

Information bias is a cognitive bias to seek information when it has no impact on action. People can often make better predictions or decisions with less input: more information is not always better. An example of information bias is the assumption that the more information obtained to make a decision, the better, even if that additional information is irrelevant to the decision.[137]

Belief Bias

Truthiness

Belief bias refers to the tendency to judge the strength of arguments based on the plausibility of their conclusion rather than on how strongly they support that conclusion. A person is more likely to accept an idea that supports a conclusion that is consistent with their values, beliefs, and prior knowledge while rejecting counterarguments to that conclusion. Bias is a very common and, therefore, a significant form of error; we can easily be blinded by our beliefs and reach an incorrect conclusion. Beliefs have influenced various reasoning tasks, including conditional reasoning, relational reasoning, and transitive reasoning.[138]

Rhyme-as-Reason Effect

Truthiness

Rhymed statements are perceived as more truthful. A famous example of this was the defense's use of the phrase "If the gloves don't fit, you must be acquitted" in the trial of O.J. Simpson.

The rhyme-as-reason effect, or the Eaton-Rosen phenomenon, is a cognitive bias in which a saying or aphorism is judged to be more accurate or true when it is rewritten in rhyme.

In experiments, subjects judged variations of sayings that rhymed and did not rhyme and considered those that rhymed as more true (controlled for meaning). For example, the phrase "What soberness hides, alcohol reveals" was rated as more accurate, on average, than "What soberness hides, alcohol exposes," with samples across different groups of subjects (each of whom rated the truthfulness of only one of these statements) rating.[139]

Law of Triviality

Law of triviality

The Law of triviality is C. Northcote Parkinson's 1957 argument that people in an organization usually or typically give disproportionate weight to trivial issues. Parkinson gives the example of a fictitious committee whose task was to approve plans for a nuclear power plant and which spent most of its time discussing relatively trivial but easily grasped issues, such as what materials to use for the staff bicycle shed while neglecting the proposed design of the plant itself, which is far more important and a much more difficult and complex task.

The Law has been applied to software development and other activities. The terms bike shed effect, bike shed influence, and bike shed was coined based on Parkinson's example; it was popularized in the Berkeley software distribution community in 1999 by Danish software developer Poul-Henning Kamp and has since become popular in the field of software development in general.[140]

Conjunction Fallacy

Extension neglect

The conjunction fallacy (also known as the Linda problem) is a formal fallacy that occurs when it is assumed that certain conditions are more likely than a single general condition.

The tendency to believe that certain conditions are more likely than a more general version of the same conditions. For example, in one experiment, subjects considered the probability that a woman is both a bank employee and a feminist to be more likely than the probability that she is a bank employee.[141]

Occam's Razor

Occam's razor

Occam's razor, also known as the principle of parsimony or the law of parsimony, is the problem-solving principle that "entities should not be multiplied beyond necessity." It is generally understood that when there are competing theories or explanations, the simpler one, such as a model with fewer parameters, should be preferred. The idea is often attributed to the English Franciscan monk William of Ockham (c. 1287-1347), an educational philosopher and theologian, although he never used the words. This philosophical razor states that when faced with competing hypotheses about the exact prediction, one should choose the solution with the fewest assumptions. This is not meant to choose between theories that make different predictions.[142]

Less-is-Better Effect

Extension neglect

The less-is-better effect is a type of preference reversal when the smaller alternative of a set is preferred when evaluated separately but not together.

In a 1998 study, Hsee, a professor at the University of Chicago's Graduate School of Business, discovered the less-is-better effect in three contexts: "(1) a person who gave away a $45 scarf (of scarves between $5 and $50) was perceived as more generous than a person who gave away a $55 coat (of coats between $50 and $500); (2) an overstuffed serving of 7 ounces of ice cream was rated higher than an understuffed serving of 8 ounces of ice cream; (3) a dinnerware set with 24 intact pieces was rated more favorably than one with 31 intact pieces (including the same 24) plus a few broken pieces. "

Hsee noted that the "less-is-better" effect was observed only "when the options were evaluated separately, and reversed when placed side by side."[143]

WHAT SHOULD WE REMEMBER?

We edit and reinforce some memories after the fact.

Misattribution of Memory

Memory

In psychology, memory misattribution or source misattribution is the misidentification of the origin of memory by the person retrieving the memory. Misattribution is likely to occur when individuals cannot monitor and control the influence of their attitudes on their judgments at the time of retrieval. Misattribution is divided into three components: Cryptomnesia, false memories, and source confusion. It was originally referred to as one of the seven sins of memory by Daniel Schacter.[144]

Source Confusion

Memory

Memories relating to oneself are recalled better than similar information relating to others.

Source confusion is a characteristic that can be seen in different people describing the same event after hearing others talk about the situation. An example of this would be a witness who listened to a police officer said he had a gun, and that witness said he saw the gun. Understanding the source of one's memories is essential for the memory processes necessary for daily living. Memories arise from perceptual experiences and a person's thoughts, feelings, reasoning, and imagination.[145]

Cryptomnesia

Memory

Cryptomnesia occurs when a forgotten memory returns without being recognized as such by the person who thinks it is something new and original. This is a memory disorder in which a person falsely remembers having originated a thought, idea, melody, name, or joke, not intentionally plagiarizing but experiencing a memory as if it were a new inspiration.

The term was first used by the psychiatrist Théodore Flournoy in the case of the medium Hélène Smith (Catherine-Élise Müller) to refer to the frequent occurrence of "latent memories of the medium, sometimes greatly distorted by a subliminal work of imagination or thought, as so often happens in our ordinary dreams."[146]

False Memory

Memory

A form of misattribution in which a fantasy is mistaken for a memory.

In psychology, false memory is a phenomenon in which someone remembers something that did not happen or remembers it differently than it happened. Suggestibility, the activation of associated information, the reception of misinformation, and the misattribution of sources are considered to be different mechanisms underlying different types of false memories.[147]

Suggestibility

Memory

Suggestibility is the quality that one tends to accept and act upon the suggestions of others. One can fill in gaps in specific memories with false information given by others when recalling a scenario or moment. Suggestibility uses cues to distort memory: if the subject has repeatedly been telling something about a past event, their memory of the event matches the repeated message.

A person who experiences intense emotions is usually more receptive to ideas and, therefore, more easily influenced. In general, suggestibility decreases with age. However, psychologists have found that individual self-esteem and assertiveness make some people more suggestible than others; this finding led to the concept of a spectrum of suggestibility.[148]

Spacing Effect

Memory

The spacing effect shows that learning is more effective when learning units are spread out over time. In addition, this effect indicates that more information is absorbed into long-term memory through spaced learning units, also known as spaced repetition or spaced presentation, than through massed display ("cramming").

Hermann Ebbinghaus first identified the phenomenon, and his detailed study of it was published in 1885 in the book “Über das Gedächtnis”. Investigations in Experimental Psychology". From this, active recall with increasing time intervals reduces the probability of forgetting information. Studies on many explicit memory tasks such as free recall, recognition, cued recall, and frequency estimation (for reviews, see Crowder 1976; Greene, 1989).[149]

We discard specifics to form generalities.

Implicit Stereotype

Pre-reflective attribution

In social identity theory, an implicit bias or stereotype is the pre-reflective attribution of specific characteristics by a person to a member of a social group.

Implicit stereotypes are thought to be shaped by experience and based on learned associations between specific characteristics and social categories, including race and/or gender. Individuals' perceptions and behaviors can be influenced by implicit stereotypes, even if they are sometimes unaware that they hold such stereotypes. Implicit bias is an aspect of implicit social cognition: the phenomenon that perceptions, attitudes, and stereotypes can operate before conscious intention or confirmation. The existence of implicit biases is supported by many scientific articles in the psychological literature. Implicit stereotypes were first defined by psychologists Mahzarin Banaji and Anthony Greenwald in 1995.[150]

Prejudice

Prejudice

Prejudice can be an affective feeling toward a person based on that person's perceived group membership. The word is often used to describe a preconceived (usually unfavorable) evaluation or classification of another person based on their perceived political affiliation, gender, gender identity, beliefs, values, social class, age, disability, religion, sexuality, race, ethnicity, language, nationality, color, beauty, height, occupation, wealth, education, criminality, sports team affiliation, musical taste, or other personal characteristics.

The word "prejudice" can also refer to unfounded or template beliefs and denote "any unreasonable attitude that is unusually resistant to rational influence."[151]

Fading Affect Bias

Memory

Fading affect bias, better known as FAB, is a psychological phenomenon in which memories associated with negative emotions tend to be forgotten more quickly than those related to positive emotions. It is important to note that FAB refers only to the feelings one associate with the memories and not to the memories' content. Early research examined FAB retrospectively or through personal reflection, which led to some criticism because the retrospective analysis can be influenced by subjective retrospective bias. However, more recent research based on non retrospective memory studies has found evidence for FAB, and the phenomenon is now widely accepted.[152]

We reduce events and lists to their key elements.

Peak-End Rule

Peak-end rule

The peak-end rule is a psychological heuristic. People judge an experience primarily by how it made them feel at its peak (i.e., its most intense point) and its end, rather than by the total or average of all moments in the experience. The effect occurs regardless of whether the experience is pleasant or unpleasant. According to the heuristic, no information other than the climax and the end of the experience is lost, but it is not used. This includes the net value of pleasant or unpleasant and the duration of the experience. A climax-ending rule is thus a specific form of the more general extension and duration neglect.[153]

Leveling and Sharpening

Memory

Leveling and sharpening are two functions that occur automatically and are present in memory. Sharpening is usually the way people remember small details in retelling stories they have experienced or are retelling. Leveling means that people leave out parts of stories and try to tone down those stories so that some features are excluded. This makes it easier to fill in the memory gaps that exist.[154]

Misinformation Effect

Memory

The misinformation effect occurs when a person's recollection of episodic memories becomes more inaccurate due to the following information. The misinformation effect has been studied since the mid-1970s. Elizabeth Loftus is one of the most influential researchers in this field. One theory is that the original and misleading information presented after the event are mixed together. Another idea is that misleading information overwrites the original information. Finally, researchers suggest that the misleading information is more easily retrieved because it is the most recent.

The misinformation effect is an example of retroactive interference that occurs when later information interferes with the ability to retain previously encoded information. It has also been shown that individuals are susceptible to incorporating misleading information into their memory when presented in the context of a question.[155]

Serial Recall Effect

Memory

Serial recall is the ability to recall things or events in the order they occurred. The power of humans to store items in memory and recall them is essential for the use of language. Imagine recalling the different parts of a sentence but in the wrong order. The ability to remember in the correct order has been found in humans and several non-human primate species, and some non-primates. Imagine mixing up the order of phonemes, meaningful sound units, in a word so that "easy" becomes "style." Serial order also helps us remember the sequence of events in our lives, our autobiographical memories. Our memory of the past seems to move along a continuum where more recent events are more easily remembered in the correct order.[156]

Duration Neglect

Extension neglect

Neglecting duration is the psychological observation that people's judgments of the unpleasantness of painful experiences depend little on the time of those experiences. Numerous experiments have found that these judgments are influenced by the peak (when the incident was most painful) and the rate at which the pain decreases. If it falls more slowly, the experience is perceived as less painful. Hence, the term "peak-end rule" describes this evaluation process.

Duration neglect is a particular form of the more general extension neglect.[157]

Modality Effect

Memory

Modality can refer to several features of the learning material presented. However, the term is usually used to describe the better recall of the final elements of a list when that list is presented orally versus visually. The effect is evident in free recall (recall of list items in any order), serial recall (recall of list items in the order of study), short-term sentence recall (recall of specific words from sentences with similar meaning), and paired recall (recall of a pair after the presentation of one of its members). The effect was limited to an increased recall probability for the last 2 or 3 pairs studied for paired associations. In free recall and serial recall, the modality effect is simply considered for exaggerating the recency effect in tests where the presentation is auditory. In studies of short-term memory of sentences, the focus is on words in a list of distracters when information from the recalled sentence is retrieved. This indicates that the modality effect may be more than auditory or visual.[158]

Memory Inhibition

Memory

In psychology, memory inhibition refers to the ability not to remember irrelevant information. The scientific concept of memory inhibition should not be confused with the everyday use of the word "inhibition." Scientifically, memory inhibition is a type of cognitive inhibition, the complete or partial interruption or suspension of a mental process, with or without intention.

Memory inhibition is a critical component of an effective memory system. While some memories are retained for a lifetime, most memories are forgotten. According to evolutionary psychologists, forgetting is adaptive because it facilitates the selectivity of rapid, efficient recall. For example, a person who wants to remember where he parked his car would not want to remember every place he has ever parked. Therefore, to remember something, it is essential to activate relevant information and suppress irrelevant information.[159]

Primacy Effect

Memory

In psychology and sociology, the primacy effect is a cognitive bias that causes a subject to remember primary information better than information presented later. For example, an issue reading a sufficiently long list of words is more likely to remember the comments at the beginning than the words in the middle.

Many researchers have attempted to explain this phenomenon in free recall [null tests]. Coluccia, Gamboz, and Brandimonte (2011) describe free memory as participants trying to recall information without prompting.[160]

Recency Effect

Memory

Two traditional categories of theories explain the recency effect.

Dual-store models: These models assume that recently listed learning content is retrieved from an easily accessible short-term buffer, i.e., short-term storage (STS) in human memory. As a result, recently learned content has an advantage over the previously known range since earlier learning content requires more effort to retrieve from long-term memory.

Single-store models: According to single-store theories, a single mechanism is responsible for serial position effects. The first type of model is based on relative temporal distinctiveness. The temporal interval between the study of each list item and the test determines the comparative competitiveness of an item's memory trace at retrieval. In this model, things at the end of the list are assumed to be more distinct and easier to recall.[161]

Part-Set Cuing Effect

Memory

The "part-set cuing effect" was initially discovered by Slamecka (1968), who found that providing part of the items to be remembered as test cues often impaired recall of the remaining, non-clued items compared to performance in a control condition without a cue (free recall). Such an effect is intriguing because cues usually are expected to aid recall (e.g., Tulving & Pearlstone, 1966). Henry L. Roediger III, a prominent figure in retrieval-based inhibition research, was one of the first psychologists to propose that retrieval of an item reduces the subsequent accessibility of other stored items. Becoming aware of the part-set cueing effect minimizes this effect. Relearning part of a set of previously learned associations can improve recall of the associations that were not relearned.[162]

Serial-Position Effect

Memory

The row position effect refers to a person's tendency to remember the first and last elements of a row best and the middle parts worst. Hermann Ebbinghaus coined the term based on studies he conducted on himself and referred to the finding that recall accuracy varies as a function of the position of an item within an examination list. When people are asked to identify a list of items in any order (free recall), they begin to recall with the end of the list and remember those items best (recency effect). The first few items are recalled more often than the middle items for earlier list items (primacy effect).[163]

We store memories differently based on how they were experienced.

Levels of Processing Model

Memory

The levels of processing model, developed by Fergus I. M. Craik and Robert S. Lockhart in 1972, describes memory retrieval of stimuli as a function of depth of mental processing. Deeper levels of analysis produce more detailed, longer-lasting, and more substantial memory traces than shallow levels of analysis. Depth of processing falls on a continuum from superficial to deep. External processing (e.g., based on phonemic and orthographic components) results in a fragile memory trace that can quickly decay. Conversely, deep processing (e.g., semantic processing) leads to a more durable memory trace.[164]

Absent-Mindedness

Memory

Absent-mindedness means that a person exhibits inattentive or forgetful behavior. It can have three different causes:

1. a low level of attention ("blanking" or "zoning out")
2. the intense attention to a single object (hyperfocus), causing the person to forget events around them
3. unwarranted distraction of attention from the object of concentration by irrelevant thoughts or events in the environment.

Absent-mindedness is a mental state in which the person experiences low levels of attention and frequent distractions. Absent-mindedness is not a diagnosed condition but rather a condition that people experience in their daily lives for various reasons, such as boredom, sleepiness, or focusing on internal thoughts rather than the external environment. People who suffer from absent-mindedness tend to show memory loss and weak recall of recent events.[165]

Testing Effect

Memory

The testing effect (also known as retrieval practice, active retrieval, practice testing, or test-based learning) suggests that long-term memory is improved when a portion of learning time is devoted to retrieving information from memory. It is distinct from the more general practice effect, defined by the APA Dictionary of Psychology as "any change or improvement resulting from practice or repetition of tasks or activities."

Cognitive psychologists are working with educators to figure out how to take advantage of testing-not as an assessment tool, but as a teaching tool because testing prior knowledge is more beneficial to learning than reading or passively studying material, especially if the test is more challenging to memory.[166]

Next-In-Line Effect

Memory

The "next-in-line" effect refers to people's inability to remember information about events that immediately precede their performance.

The effect was first studied experimentally by Malcolm Brenner in 1973. In his experiment, participants read a word from an index card in turn and, after 25 words, were asked to remember as many of the words they had read as possible. The results of the experiment showed that words read aloud within about nine seconds before the subject's own turn were remembered more poorly than other words.[167]

Google Effect

Memory

The Google effect, also called digital amnesia, refers to the tendency to forget information that can be easily found online using Internet search engines. According to the first study on the Google effect, people are less likely to remember specific details they believe can be accessed online. However, the study also claims that people's ability to learn information offline remains the same. This effect can also be seen as a change in the information and level of detail that is considered essential to remember.[168]

Tip of the Tongue

Memory

Tongue-tip (also called TOT or lethologica) refers to the phenomenon of not being able to recall a word or concept from memory while at the same time partially remembering it and feeling that recall is imminent. The phenomenon's name comes from the saying, "It's on the tip of my tongue." The tip-of-the-tongue phenomenon shows that lexical access occurs in stages.

Individuals who experience the tongue-tip phenomenon can often recall one or more features of the target word, such as the initial letter, its syllable stress, and words with a similar sound, similar meaning, or both sound and meaning. Sufferers report a sense of being gripped, mild anxiety when searching for the word, and relief when the word is found.[169]

ALGORITHMIC BIAS

A brief introduction to algorithmic bias as it is becoming increasingly important.

What is Algorithmic Bias?

Algorithmic bias describes systematic and repeatable errors in a computer system that lead to unfair results, favoring one arbitrary group of users over others. Bias can arise from many factors, including but not limited to algorithm design or unintended or unanticipated use or decisions regarding how data are coded, collected, selected, or used to train the algorithm. For example, algorithmic biases have been observed in search engine results and social media platforms. These biases can have effects ranging from unintentional privacy violations to reinforcing social biases related to race, gender, sexuality, and ethnicity. However, the study of algorithmic bias focuses primarily on algorithms that reflect "systematic and unfair" discrimination. Moreover, this bias has been addressed in legal frameworks such as the European Union General Data Protection Regulation (2018)[170] and the proposed Artificial Intelligence Act (2021)[171].

As algorithms expand their ability to organize society, politics, institutions, and behavior, sociologists have become concerned with how data's unpredictable output and manipulation can

affect the physical world. Because algorithms are often viewed as neutral and unbiased, they can falsely purport greater authority than human expertise (in part due to the psychological phenomenon of automation bias). In some cases, reliance on algorithms can substitute for human accountability for their outcomes. In addition, bias can enter algorithmic systems due to preexisting cultural, social, or institutional expectations, technical limitations of their design, or through use in unanticipated contexts or by target audiences not considered in the original design of the software.

Algorithmic biases have been cited in cases ranging from election results to the spread of hate speech online. They have also occurred in criminal justice, health care, and hiring, reinforcing existing racial, socioeconomic, and gender biases. For example, the relative inability of facial recognition technology to accurately identify dark-skinned faces has been linked to numerous wrongful arrests of black males, a problem attributed to unbalanced data sets. Difficulties in understanding, exploring, and detecting algorithmic bias exist due to the proprietary nature of algorithms, which are typically treated as trade secrets. Even when full transparency is provided, the complexity of specific algorithms presents a barrier to understanding how they work. In addition, algorithms may change or respond to inputs or outputs in ways that are not predictable or easily reproducible for analysis. In many cases, even within a single website or application, there is no single "algorithm" to study but rather a network of many related programs and data inputs, even between users of the same service.

Types of Algorithmic Bias

Technical

Technical bias arises from the limitations of a program, computing power, design, or other system limitations. For example, a search engine that displays three results per screen can favor the first three results slightly more than the other three, as in an airline price display. Another case is software that relies on random numbers to ensure an equitable distribution of results. However, suppose the mechanism for generating random numbers is not truly random. In that case, it can lead to bias, such as biasing selection in favor of items at the end or beginning of a list.

Correlations

When large data sets are compared, unpredictable correlations can arise. For example, data collected on Internet browsing behavior may match signals that flag sensitive data (such as race or sexual orientation). By selecting specific behaviors or browsing patterns, the result would be almost identical to discrimination by using direct race or sexual orientation data. In other cases, the algorithm concludes correlations without understanding those correlations. For example, a triage program gave asthmatics with pneumonia a lower priority than asthmatics without pneumonia. The program algorithm did this because it simply compared survival rates: asthmatics with pneumonia have the highest risk. For the same reason, asthmatics in hospitals usually receive the best and most immediate treatment.

Pre-existing

Pre-existing bias in an algorithm is a consequence of underlying social and institutional ideologies. Such ideas can influence or create personal biases in individual designers or programmers. Poorly selected input data or simply data from a biased source will affect the results produced by machines. Coding pre-existing biases into the software can preserve social and institutional biases that, without correction, could be repeated in all future applications of the algorithm.

Emergent

Emergent biases result from using and relying on algorithms in new or unexpected contexts. Algorithms may not have been adapted to account for new forms of knowledge, such as new drugs or medical breakthroughs, new laws, business models, or changing cultural norms. This can result in groups being excluded by the technology, with no clear indication of who is responsible for their exclusion. Similarly, problems can arise when training data (the samples "fed" to a machine, which it uses to model certain conclusions) do not match the contexts an algorithm encounters in the real world.

Unexpected use

When unexpected audiences use an algorithm, bias can occur. For example, machines may assume that users can read, write, or understand numbers or that they identify with an interface through metaphors they do not understand. These exclusions can be exacerbated as biased or exclusionary technologies become more deeply integrated into society.

Feedback loops

Emergent biases can also lead to a feedback loop or recursion when data collected for an algorithm leads to real-world responses that feedback to the algorithm. For example, simulations of PredPol software (PredPol) used in Oakland, California, suggested increased police presence in black neighborhoods based on crime data reported by the public. The simulation showed that the public reported crimes based on the sight of police cars, regardless of what the police were doing. The simulation interpreted the sightings of police cars in modeling their crime predictions and, in turn, assigned an even more significant police presence in those neighborhoods. The Human Rights Data Analysis Group, which ran the simulation, cautioned that such feedback loops could reinforce and perpetuate racial discrimination in policing in places where racial discrimination is a factor in arrests. Another well-known example of an algorithm that engages in such behavior is COMPAS, software that determines the likelihood that a person will become a felon. The software is often criticized for being much more likely to classify blacks as criminals than others and then feeding the data back into itself when a person becomes a criminal, reinforcing the bias created by the data set to which the algorithm responds.

Impacts of Algorithmic Bias

A few examples:

Gender Discrimination

In 2016, it was noted that the professional network LinkedIn recommends male variants of female names in search queries. However, the website did not give similar recommendations when searching for male characters. For example, searches for "Andrea" asked if users meant "Andrew," but searches for "Andrew" did not ask if users wanted to find "Andrea." The company said this resulted from an analysis of users' interactions with the site.[172]

In 2012, the department store company Target was sued for collecting data points that could be used to infer when customers were pregnant, even if they had not announced it, and then sharing that information with marketing partners. Because the data was predicted and not directly observed or reported, the company was under no legal obligation to protect the privacy of these customers.[173]

Web search algorithms are also accused of bias. For example, Google's results can favor pornographic content for search terms related to sexuality, such as "lesbian." This bias goes so far that the search engine displays popular but sexualized content for neutral search queries. For example, "Top 25 Sexiest Women Athletes" articles are displayed on the first page when searching for "women athletes."[174]

In 2017, Google adjusted these results and others that showed hate groups, racist views, child abuse, pornography, and other

disturbing and offensive content.[175] Other examples include displaying better-paying jobs for male applicants on job search websites.[176]

Discrimination based on race and ethnic origin

Algorithms have been criticized as a method of masking racial bias in decision-making. However, because of the way certain racial and ethnic groups have been treated in the past, data can often contain hidden biases. For example, blacks are likely to receive longer sentences than whites for the same offense.[177] This could mean that a system is reinforcing the original prejudices in the data.

In 2015, Google apologized when black users complained that an image recognition algorithm in the Photos application identified them as gorillas.[178] In 2010, Nikon cameras were criticized because image recognition algorithms asked Asian users if they blinked. Such examples are the result of biases in biometric datasets. Biometric data is derived from aspects of the body, including observed or inferred racial characteristics, which can then be translated into data points. For example, speech recognition technology can have varying accuracies depending on the user's accent. This may be due to a lack of training data for speakers of that accent.[179]

Biometric data on race can also be inferred rather than observed. For example, a 2012 study showed that names commonly associated with blacks were more likely to lead to search results indicating arrests, regardless of whether police recorded the person's name.[180] A 2015 study also found that blacks and Asians are assumed to have worse lung function

because racial and occupational exposure data are not included in the lung function prediction algorithm model.[181]

In 2019, a research study found that a healthcare algorithm sold by Optum favors white patients over sick black patients. The algorithm predicts how much patients would cost the health care system in the future. However, the costs are not race-neutral, as black patients incurred about $1,800 less in medical costs per year than white patients with the same number of chronic conditions, resulting in the algorithm rating white patients at the same risk for future health problems as black patients who suffered from significantly more diseases.[182]

A study conducted by UC Berkeley researchers in November 2019 found that mortgage algorithms discriminated against Latino and African Americans, which discriminated against minorities based on "creditworthiness," which is enshrined in the U.S. Fair Lending Act that allows lenders to determine whether a person is creditworthy based on identifying measures. These particular algorithms were present in FinTech companies and were shown to discriminate against minorities.[183]

Commercial influences

Corporate algorithms could be biased to invisibly favor financial agreements or collusion between companies without the user's knowledge, who might believe the algorithm to be impartial. For example, American Airlines developed a flight search algorithm in the 1980s. The software presented customers with various flights from different airlines but weighed factors that favored its flights, regardless of price or convenience. Before

the U.S. Congress, the airline's president said the system was developed to gain a competitive advantage through preferential treatment.[184]

In a 1998 paper describing Google, the company's founders had adopted a policy of transparency in search results concerning paid placement, arguing that "ad-supported search engines will be inherently biased toward advertisers and away from consumer needs." This bias, they claim, is an "invisible" manipulation of the user.[185]

Voting behavior

A series of studies of undecided voters in the U.S. and India found that search engine results can influence election outcomes by about 20%. The researchers concluded that candidates "have no way to compete" when an algorithm - with or without intent - raises page listings for a competing candidate. In addition, Facebook (meta) users who saw news related to the election were more likely to vote.[186] A 2010 randomized study of Facebook users found a 20% increase in turnout (340,000 votes) among users who saw messages encouraging voting and pictures of their friends who had voted.[187] Legal scholar Jonathan Zittrain warned that this could lead to a "digital gerrymandering" effect in elections, i.e., selective presentation of information by an intermediary pursuing its agenda rather than serving its users when intentionally manipulated.[188]

Law enforcement and litigation

Algorithms already have numerous applications in legal systems. One example is COMPAS, a commercial program

widely used by U.S. courts to assess a defendant's likelihood of recidivism. ProPublica claims that the average recidivism risk of black defendants as determined by COMPAS is significantly higher than the moderate risk of white defendants as determined by COMPAS. Black defendants are twice as likely to be incorrectly classified as "high risk" as white defendants.[189]

A study, "Risk, Race, and Recidivism: Predictive Bias and Disparate Impact," asserts that black defendants are twice as likely as white defendants to be classified as higher risk (45 percent versus 23 percent), even though they objectively did not recidivate over a two-year observation period.[190]

Online hate speech

In 2017, a Facebook (Meta) algorithm designed to remove hate speech on the Internet was found to favor white males over black children when rating offensive content, according to internal Facebook documents.[191] The algorithm, a combination of computer programs and human content reviewers, was designed to protect broad categories, not just specific subsets of types. So, for example, posts denouncing "Muslims" would be blocked, while posts criticizing "radical Muslims" would be allowed. An unexpected consequence of the algorithm is that hate speech against black children is permitted because it denounces the "children" subgroup of blacks rather than "all blacks," while "all white males" would trigger blocking because whites and males are not considered subgroups.[192] Facebook (Meta) also allowed ad buyers to target "Jew-haters" as a user category, which the company said was an unintended result of algorithms used to score and categorize data. The company's

design also allowed ad buyers to exclude African Americans from viewing housing ads.[193]

While algorithms are used to detect and block hate speech, some algorithms were found to flag information posted by black users as hate speech at 1.5 times the likelihood and flag information written in ebonics as such at 2.2 times the likelihood.[194] In addition, slurs and epithets were flagged without context, even when used by communities that reappropriated them.[195]

Surveillance

Surveillance camera software can be seen as inherently political, requiring algorithms to distinguish normal from abnormal behavior and determine who belongs in certain places.[196] The ability of such algorithms to recognize faces within a racial spectrum is limited by the racial diversity of the images in the training database; if the majority of the photos belong to one race or gender, the software is better able to recognize other members of that race or gender.[197] However, even audits of these image recognition systems are ethically questionable. Some scholars have pointed out that the context of the technology will always have a disproportionate impact on communities whose actions are overly monitored. A 2002 analysis of software used to identify people in CCTV images found several examples of bias in matching against crime databases. The software identified men more often than women, older people more often than young people, Asians, African Americans, and other races more often than whites.[198] Further studies of facial recognition software have found that the opposite is true when the software is trained on non-

criminal databases, with the software being the least accurate in identifying dark-skinned women.[199]

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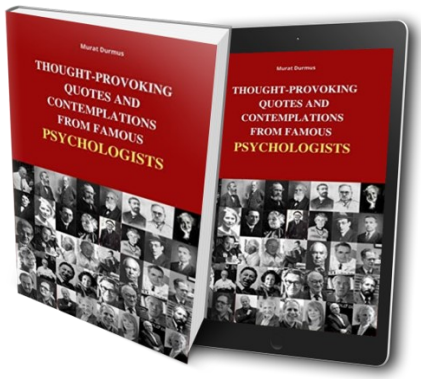

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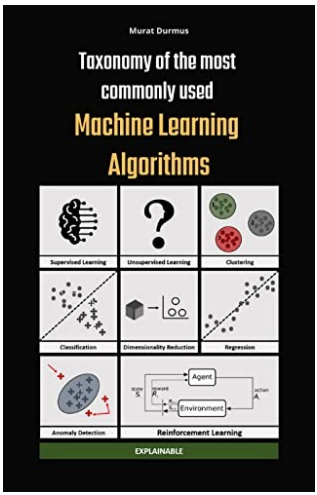

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