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# Introductory Chapter: Bayesian Thinking

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## 1. Introduction

Bayesian inference is developed based on the simple Bayesian rule in the probability theory but this method of thinking is one of the most important findings in the history of science. It means that we can modify our beliefs about the nature by gathering data from phenomenon or by analyzing the behavior of people around us or by investigating about historical events.

We start with an estimate of the probability that any claim, belief, hypothesis is true, then look at any new data and update the probability given the new data. Bayes' theorem is a method for analyzing the correctness of beliefs (hypotheses, claims and propositions) based on the best available evidence (observations, data, information). Here is the basic description: initial belief plus new evidence = improved belief.

We change our beliefs with objective information: initial beliefs + new objective data = posterior belief. Each time the system is updated, the posterior becomes the prior of the new stage. It was an evolving system; every bit of new information was closer to correct solution. This technique can be expressed both mathematically and philosophically about how we learn about the universe: that we learn about it through approximation, getting closer and closer to the fact as we gather more evidence [1].

Bayesian thinking is based on the idea that we can increase our information about a physical situation than is contained in the data from a single experiment. Bayesian methods can be applied for analyzing the data from different experiments, for example. In other situations, there may be sound reasons about the allowable values that can be assigned to a parameter. But often the data are scarce or noisy or biased or all of these. Experimental results are compared with predicted values, and the predictions are modified by arbitrarily subtracting off the discrepancy based on the difference. When new data are collected, once again the values disagree with predictions, and another "correction" is applied, leading to an aggregate of ad hoc tweaks, certainly not best practice, however common. But Bayesian methods can be used here to avoid these heuristics [2].

In fact, we all employ Bayesian inference in decision-making about the real problems in life. When we want to select a solution for a problem among several solutions, then we usually analyze the past data from each solution or we try to predict the outcome of each solution then the solution with higher success probability is selected. Thus, this process is very similar to Bayesian thinking when the decisions are selected based on posterior probabilities updated by Bayesian formula.

It is seldom possible to take findings and methodologies from a basic conceptual framework and apply them directly to a real problem. Often, the findings of another field must be adapted to the problem. Thus, we need a methodology that can refine the results and data from different fields in an analytical framework such that these data lead to an appropriate solution for the problem at hand. Since every kind of information, including qualitative or quantitative or fuzzy data can be used in Bayesian thinking, so this technique can be used in most real issues.

When choosing the right choice from several available options, we need to analyze the observations from each of the options. Now, if there is some kind of competition between options, we need to balance them somehow so that each of the options can produce observations close to their actual performance. This is the reason for combining game theory and Bayesian inference in real cases.

Also, mathematical methodologies such as game theory and dynamic programming and others should be redefined using Bayesian thinking. For example, in dynamic planning, since decisions are selected stage by stage, after observing information in each stage, we can update the probability functions of random variables and solve the problem for the number of remaining stages that may lead to a change in optimal policy. In the game theory, it can be assumed that after one stage of game and observing the rewards of each decision, it is possible to replay the game, assuming that rewards are random variable such that their probability function is determined based on past data and the optimal decision after each stage may change. The author thinks that three concepts of dynamic programming and game theory and Bayesian inference should be considered in the formulation of each real problem because the interests of decision-makers in each problem are different and the decisions are effective on the future and the next stages and the new data will be available in each new stage thus a new mathematical formulation is needed regarding these issues.

The main disadvantage of Bayesian thinking is the existence of false information that cripples the mechanism of this method and results in disastrous issues in real terms. It should be noted that our view of life is based on the information we receive and, if there is a deviation in the part of the information received, will lead to wrong decisions. Then, we have to treat the human as mad people or animals where his only sin is to receive false information. Maybe, this is the reason for thinking about the paradise for the poor people.

When there is a lot of false information around us, we can only hope for God to provide small light in this darkness. In the case of sacred books, it should be noted that the prophets knew that these books would also be read by their enemies, so the facts are usually in the veil of insight and understanding of the facts that require consideration in many complications.

In fact, understanding the secret of mankind is still the most important challenge for humans, why the creature is so complex, and why some people come to a point where absolute destruction is called. Perhaps this is because learning the right way to think about is the most important duty of wise people who have been missing out on this training. Perhaps this should stay as secret because of unknown reasons.

If we cannot instruct the right way of thinking to humans or we teach wrong beliefs because of the economic benefits and so on, then we have unknowingly created monsters that will once again come back to their sources. If scientists could teach the right thinking to all human beings, then there would never be imaginary thoughts and superstition that this illusion would be the root of the misery of the human race. The most dangerous illusion in the present world is to think that our beliefs and words are based on religion and divine law and it is in the interest of God and the law of nature, while even the foundations of our thinking are verged on actual sacrilege.

Even if one can analyze the events of human societies on the basis of Bayesian thinking, these methods cannot be implemented because the assumptions of human societies are based on concepts that cannot be explained by the use of classical science, and this may be the main reason for human disasters in the human history. The happiness of man depends on being able to think right.

But, we should note that if a wrong thought takes a lot of power, any wrong decision will cause great harm, and it is better to try to survive in this situation. If we look carefully at the present situation of the world and the leaders of the great powers, the equilibrium point of power warfare based on historical data will be probably in a difficult situation unless the wise men take over the world's affairs. If the wrong information is given to even a good person by the time gradually, then the soul of the individual will lose the ability to understand the truth at all because he becomes accustomed to the wrong information, and ultimately, it will be like a human with evil spirit. Usually, when a great mistake or sin is committed, most people will fall asleep and false data are generated.

Almost all ethnicities in the world with every religion have proven that their brutality is not limited; therefore, if these brutal thoughts are to be strengthened and combined simultaneously in all parts of the world, it will be a matter of concern. Maybe that is why the talk of the global village can have a reverse effect. When we cannot understand the alarming data in the present world, it may be the time to destroy all the ethical issues of the human race. Without ethical issues, there would be no reason for human interaction.

Thus, it is possible that many wars in the history of human have occurred due to wrong information while this information is generated by the winners of the wars before the wars.

When the human runs into a lot of trouble so that he cannot tolerate them then unconsciously he will think of supernatural power and ask for help. Perhaps understanding this vague relationship is the most important point in human intervention and fate, while God is not responsible for providing a life with prosperity and happiness to man, but he is surely responsible for ensuring a decent life for man.

## 2. Bayesian thinking at the time of Chaos in society

In common usage, “chaos” means “a state of disorder.” However, in chaos theory, the term is defined more precisely. Chaos theory concerns deterministic systems whose behavior can in principle be predicted. Chaotic systems are predictable for a while and then appear to become random. Chaos can occur in societies that can effect on the human history and these effects must be analyzed in order to prevent any harm in the future.

The basis of all the sciences and knowledge is the order of the universe that the purpose of the knowledge is the discovery of this order. One of the important methods for discovering how the world order is ruling is to employ empirical method that, based on the data collected, we can identify the pattern in the behavior of phenomena in order to anticipate patterns and future relationships, or even to design and optimize, according to these detected relations.

But we know that there will be a chaos in some conditions, which, based on the concept of chaos theory, it will lead to disorder in order to create a new order. The chaos theory is a complicated and disputed mathematical theory that seeks to explain the effect of seemingly insignificant factors. The chaos theory name originates from the idea that the theory can give an explanation for chaotic or random occurrences. When the data are analyzed at the time of the disorder, no specific conception and result can be observed, since the data are not produced based on a specific pattern and they do not have a specific behavior.

But it can be said that the more the disorder is, the new order will be more important. Also, when a disorder occurs in a community, most people in the community will experience a psychological breakdown in a variety of ways, which can be stressful. Anyway, the greater the degree of disorder, the greater the damage done to these individuals.

Such people usually have very contradictory behaviors and are quite isolated and alone, but it can be said that they have a stronger understanding of their surroundings and, when they cannot adapt the conditions of society to their logical criteria, they experience a kind of paradox and contradiction. Thus these Attitudes with respect to the conditions of society and their stress will lead to some kind of psychological breakdown.

Such people usually have to live in a fantasy world, and this imagination will lead to a departure from the real situation. These people are somehow the victim of this new order, but the data that they produce will be quite close to the features of the new order because their damaged psyche grows and reconstructs in accordance with the new order, and the insinuation of these people takes form in the new order.

Therefore, it can be said that the existential essence of these people actually represents the new order that is being created. So, if the psychosocial vulnerability of these people is analyzed accurately, according to the data produced by these individuals, one can identify problems of the new order.

But the feature of new orders in the present world is their complexity. In fact, understanding the behavior of such people and analysis is not simply possible, because the truth is never told and what is seen in public is more of a show. Perhaps the root cause of the mental problems in the current societies is generation of false beliefs. Because every information is transmitted

simply, which is recognized as an advantage of the current world, but false and malicious information is also simply exchanged.

Perhaps the main reason for the misconduct of human beliefs and thoughts is that the received information is wrong, leading to wrong decisions and behaviors. Repeating these mistakes results in the stress that it will slowly lead to a mental problem, so these people will also be victimized by the complex order prevailing in the world. The major problem is that these people usually do not know about their own deterioration, and the behaviors that are legitimate for them may be very hideous on the basis of divine law.

Therefore, living in a time of chaos in the community will be accompanied by a lot of troubles and problems, because most people will be away from humanity and there will be plenty of psychological harm to the people of the society, whose effects will remain for the next generations. But any chaos ultimately leads to the order. If we can analyze the data of the chaos effects on human, and analyze the cause of the destruction of the social, religious, and cultural foundations, then the principles of the new order can be effectively designed so that better people can be trained. People who remain loyal to ethical issues in the most difficult conditions. Perhaps this ideal goal cannot be achieved, but it seems to be the only way for human in the near future.

Given the current state of the world, it can be said that the current situation in the world is rapidly jumping to an intensive chaos. In fact, what is worrying is that this disorder is being systematically created by world powers, and they certainly are aware of the disadvantages and effects of this chaos and there is no justifiable reason to create this chaos at this very high level. It seems that key and critical problems are solved based on instantaneous and emotional decisions. Mistaken decisions under butterfly effect may lead to global disruptions, such that no wise person can solve them.

What is mentioned in the foregoing is only my own perceptions of Bayesian thinking that is based on limited experiences and studies.

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