BAYES THEOREM IN MEDICAL SCIENCE

[Document subtitle]

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Introduction of Application

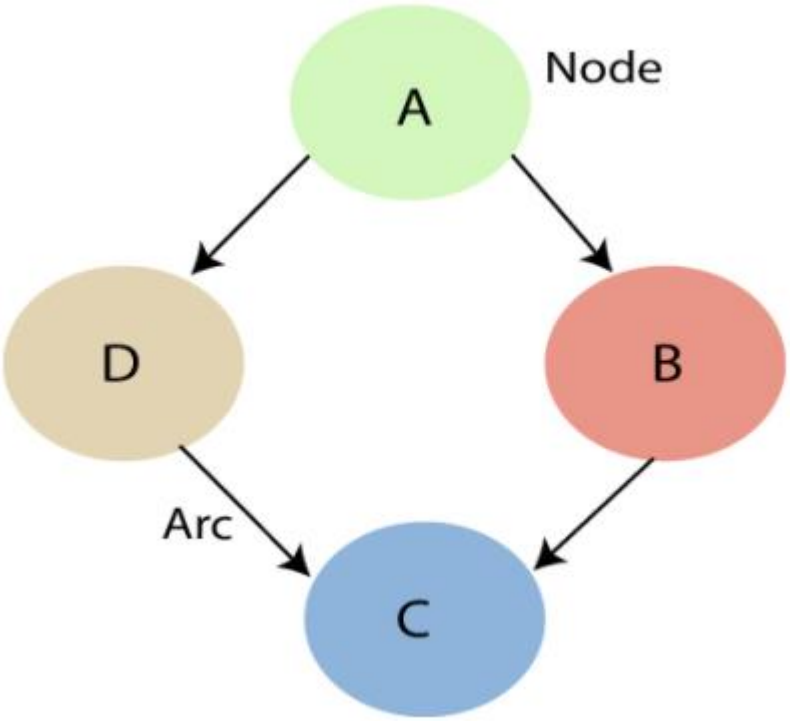
Artificial intelligence has modernized the world with the development of state-of-the-art systems that are very much efficient in terms of time, accuracy, cost, and maintenance. Bayes's theorem of artificial plays a vital role in the development of real-life applications because of its applicability and reasoning. One of the most important applications of the Bayesian theorem is in the field of medical science. The application can be described as a diagnostic of patients based on their clinical reports. These reports are the electronic information of patients which are collected through wearable devices related to the internet of things. The key importance of the Bayesian theorem in these applications is the decisions making, treatment suggestions, and make future predictions based on prognostic reasoning. The application includes mortality of patients, the decision of treatment, and classification of disease partials. Many other scenarios and applications of artificial intelligence are achieved through the Bayesian theorem but this piece of work is limited to the specific direction of medical science.

Bayes Theorem Application

Bayes' theorem known as Bayesian reasoning helps in the probability of events with a certain amount of knowledge. The application of Bayes' theorem is based on its equation which is mentioned at the end of this paragraph. Bayesian network is the key thing in artificial intelligence applications such as the probability of events and solving a problem with uncertainty.

This theorem can be applied to the types of diseases that spread from one patient to other. The diseases include such as covid19, polio, cancer, and others as well. These types of diseases are spread through the virus that is transferred through the environment and point of contact. Bayes' theorem will help to determine the detection, reasoning, prediction, analysis, and decision of uncertainty.

One specific disease that is taken as a subject matter to apply Bayes' theorem is covid19. First of all, there will be a need to check the type of covid19 that is founded in the patients. Let's suppose there are three types of covid19 virus diagnosed in different patients. Now we need to examine the ratio and rate of spread of these viruses to estimate the affected people in different cities and countries. The algorithm and theorem that will be used for this task is Bayes' theorem. Bayes' network will be used to build the models for different types of viruses. Two types of models can be developed by using this network that is directed acyclic graph and a table of conditional probabilities. The table will be generated for all the probabilities based on the particles that cause the virus. The Bayes network is created by defining suitable variables for different types that will be connected to reach a specific goal. The following figure shows a real example of the network of nodes.



These variables A, B, C, and D are the nodes of the network that are connected to create a network. Each node has a probability of condition that will decide collectively the reason for a particular node.

Another important that the Bayes theorem gives is the classification algorithm that is termed a naïve Bayes classifier. The Naive Bayes classifier is used as a classification algorithm to classify data in the form of different classes for accuracy and speed. The following equations show the Naive Bayes classifier as a machine learning classification algorithm.

For example, A is a vector that is consisting of 'n' attributes, such as A = {a1, a2, a3, …, an}.

Suppose there is N number of classes {C1, C2, Cn}. The classifier will need to predict A belongs to a certain type of covid19 class. The highest type of posterior probability will be selected as the best class. So mathematically,

P(Ca | X) = [P(X | Ca) * P(Ca)] / P(N) (The Bayes theorem can be applied this way. Similarly more equations will be developed for determining and coming to a decision.)

Challenges

The challenge that can occur through this theorem is a minor mistake because medical science is a very sensitive field and making decisions and predictions will lead to a specific action. If there occurs a minor mistake in terms of the wrong prediction for example during the diagnosis of patients a wrong sample or any other experiment has been performed. The patients get the treatment according to the guidance of experts that has mistaken then thousands of patients will get into danger that may affect their health. So, there is a need to be very careful and caring while performing experiments and making decisions. Other challenges include expertise, knowledge base, area of focus, and continuous efforts toward achieving goals. This whole process needs a lot of dedication and patience because things can be achieved in nights and months. This process takes years of hard work, dedication, and patience to getting the logical and right decision.

Opinion for improvement

In every aspect of life, change is inevitable and there is nothing hundred percent accurate. So, there are also chances of accuracy while making predictions and probabilities of different types of experiments. The improvement specifically in terms of medical science can be the testing of the treatments such as if the scientists and domain experts suggest a particular disease then the sample of that medicine must be tested on other species such as frogs. The testing can also be performed by giving basic doses rather than giving a heavy dose. After testing, there should settle a period that will be used to check and monitor the well-being of those patients. If those patients have good and improved health for a particular disease then the treatment should be offered in public and private sector hospitals and medical stores.

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