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AN INTRODUCTION OF GRAPH THEORY IN APPLIED MATHEMATICS

SWATI, DR. CHINTA MANI TIWARI

Abstract: Graph theoty is an important area of Applied Mathematics with a broad spectrum of applications in many fields. Graph theoretical concepts are widely used to study and model various applications, in different areas. Further, with connections to other branches of mathematics, many various tools are being employed to considerable effect from algebra, analysis, geometry, number theory, probability, and topology. The main objective of this paper is to introduce the main concepts of Graph theory. Graph theory is a branch of mathematics which has wide application in the area of mathematics as well as in other branches of science. This paper aims to emphasize the applications of graph theory in Applied Mathematics, in Computer science, Operation Research, Chemistry etc

Keywords: Graph theory, Graph theoretical concepts, graph algorithms, Graph theory and its Applications

Introduction

Graph theory is becoming interestingly significant as it is being actively applied in biochemistry, nanotechnology, electrical engineering, computer science, and operations research. The powerful combinatorial method found in graph theory has also been used to prove the results of pure mathematics.

Graph theoretical ideas are extremely utilized by computer discipline applications. particularly in research areas of computer discipline such data mining, image segmentation, clustering, image capturing, networking etc., For example a data structure can be designed in the form of tree which in turn utilized vertices and edges. Similarly modelling of network topologies can be done using graph concepts. In the same way the most important concept of graph colouring is utilized in resource allotment, setting up. Also, paths, walks and circuits in graph theory are used in wonderful applications say travelling salesman problem, database design concepts, resource networking. This leads to the development of new algorithms and new theorems that can be used in tremendous applications.

A graph is a pictorial representation of a set of objects where some pairs of objects are connected by links. The interconnected objects are represented by points termed as vertices, and the links that connect the vertices are called edges. A graph is a pair (V,E), where V is a finite set and E is a binary relation on V. V is called a vertex set whose elements are called vertices.

E is a collection of edges, where an edge is a pair (u,v) with u,v in V. Graphs are one of the prime objects of study in discrete mathematics. Certain discrete problems can be profitably analyzed using graph theoretic methods.

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Abstract: The word probability develops the concept of prediction in our mind and it is a certain relationship between the expected outcomes divided by total outcomes [Countable, Uncountable]. It gives a mathematical numerical certainity for an uncertain condition or situation. Moreover not only in mathematics, probability is widely used in all other areas related to prediction like sports, gambling, statics, weather reports, congenital disabilities etc. The proof of prophecy about many situations can be easily seen from the ancient time. We focused here on the concept of probability like its origin, definition, derivation of its formula, uses etc in mathematics. We looked for some previous studies, results, application on probability and research in mathematics to support our studies. Lastly, We tried to conclude the final result from all the supported material.

Keywords: *Probability, Gambling, Types of probability, Origin of Probability.*

Introduction

Probability is more likely based on prophecy or possibilities for something to happen. According to Oxford Dictionary definition 'Probability is how likely something to happen (countable, uncountably) or in more simple words it means chances of happening.'

The roots of probability in history is found from italian mathematician Gerolamo Cardano in the 1560s. Cardano's Liber de ludo aleae (Book on Games of Chance) is often considered the first work in the direction of study mathematical Probability. The major turn in this regard was the year 1654 when some dice problems came in contact with french mathematician Blaise Pascal and Pierre de Fermat. Before this it was just a fun game of dice to entertain.
When 16th Century passed many work related to probability came in light and the topic attracted the the mathematicians of the world.
In later studies, probability was also studied with statistics. Probability handles the study of chance, and statistics teaches us to handle data using different analysis techniques and methods. Probability is defined as the all possible outcomes of an event divided by the total number of outcomes whose frequency always lies between 0 and 1. The study of probability opens the doors to a certain critical logical thinking towards estimation. This develops more scope to organise the uncontrolable situations in many areas. Probability now is a part of different dimensions like statistics, mechanics, physics, sports strategies etc.

Objectives of the study

The main aim for this paper is to intone the origin of probability, types of probability, applications of probability and included the major contributions of Jacob Bernoulli and Andry Kolmogorov.

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Probability is a word derived from Latin form 'probabilis' meaning "something likely to be true" is from 1570s.
The probability concept came in light in 1654 because of an interesting incident between a gambler Chevalier de Mere approached the well known French philospher and mathematician Blaise Pascal and mathematician Pierre de

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Probability is a kind of prophecy which defined mathematically. To understand probability in simple words, it is the method to find the possibility of an event to happen out of the total possibilities. Let us try to understand this with an example.

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The first classical definition of probability is given by Jacob Bernoulli and Pierre-Simon Laplace. They stated that the probability of an event is the ratio of the number of cases favourable to it, to the number of all cases possible when nothing leads us to except that any one of these cases should occur more than any other, which renders them, for us, equally possible.

Another interesting formula to find probability is given by Thomas Bayes in 1763, which is used to determine the conditional Probability of an event.

The Bayes Theorem is stated as

$$P(A/B) = \{ P(B/A)\ P(A) \}/\ P(B)$$

where, the P(A/B) is the probability of occurring of an event A, when it is given that event B has occurred same condition is applied on P(B/A).

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Axiom 1: P(E)€R, P(E)>=0, for all E€F; where F is an event space, P(E) is always finite.

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Jaynes & Richard Threlkeld Cox derived set of axioms that worked under every true false logic under uncertainty.

Types of Probability

Probability has been studied in many different Conditions and situations, inventing mainly 3 types of probability.

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This is the easiest way to expect the possibility of something to happen without actually conducting the experiment in reality with the help of the general definition of Probability i.e., total number of favourable outcomes divided by total number of possible outcomes. Some examples are flipping coin, number cubes, spinner etc.

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Lokenath Debnath, Kanadppiya Basu A short history of Probability theory and its applications 2015 This paper deals with brief history of probability theory and its applications to Jacob Bernoulli's.

Conclusion

The world started to notice the concept of probability as a topic to study and research mainly after it discovered that there were many logic and pattern in some dice problems to formulate. Researchers found that not only there was one type of probability but more others like conditional, axiomatic, therotical, experimental etc. Some important contribution by mathematicians like Bayes Jacob Bernoulli, Laplace, Cox and Jayne is commendable. These formula would help us in many business risks, share market risks, sports strategies, Game theory etc.

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Logic of Meyons: A Fuzzy Logic Based Approach

[1]H.N. Singh, [2]Riddhi Garg, [3a]Nitesh Dhiman & [3b]M. K. Sharma

Abstract

This physical world is mathematically modelled in terms of Binary Logic (BL) and Fuzzy Logic (FL) to get the output of an Objective-Function (O-F). The BL is qualitatively associated with Definite Philosophy (DPh) and complete certainty about the output while the FL talks about the Probabilistic Philosophy (PPh) of all sorts of possibilities in between the end limits of the output under the considered problem. In this communication, an attempt has been made to extend the concept of Meyon, the energy quanta of O-F generated by human mind which is the source of all kinds of Artificial Intelligence (AI). The Meyon Algorithm, Synchronisation Algorithm, and Optimization Algorithm of sample of Meyons to get the desired output have been discussed. We also applied fuzzy logic approach to develop a fuzzy inference system using eight input factors and one output factor to obtain the various categories of Meyon.

Key Words: Meyons, Synchronization-Algorithm (SA), Optimization, Fuzzy Inference system (FIS), Optimization.

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1. Introduction

The energy and matter are the duality of this 3-dimansional physical world in terms of content while in terms of behaviour there is again duality but it is in form of wave character and particle character. The matter associated every phenomenon and the several energy patterns (EP) interaction with energy itself as well as matter, are uninterruptedly flow in the4-dimension called time. Each component of this universe and knowledge created in its either form: artificial or natural [5], have their own: "Configuration (C)", "Brain (B)", "Emotions (E)", "Mind (M)" and "Individual Consciousness (IC)"(**CBEMIC**) in situation of active units, and (**CEMIC**) in situation of lifeless items where there is no B but M is present. The **C EMIC** of lifeless objects of this universe have their own exceptional energy designs of each **CEMIC** at a period and authorised with the in-built features of reconfiguration with the passageway of time. But human is the ultimate creation of cosmos and a broad replica of cosmos in form of Meyons once produced in their concluding touch about to complete the outcomes of an O-F by its maker, have their own Configuration C, Logic L, Emotions E, and the HC of the creator **[CLEHC].** It is the EP of **CLE** with the HC of its creator; their synchronization [1, 3, 6] and modulations yield the superiority and control of a Meyon formed by the mind to figure the O-F. The optimization of an illustration of Meyons created by M materializes the anticipated outcome of the O-F in least time with ideal form as the "prescribed time" by the maker. The Meyons formed by the M can be classified mainly of 4-types; **Thoughts (T), Concepts (C), Ideas (I),** and **Reasoning (R)** (**TCIR**) with diverse frequencies definite by the maker of Meyon.

M relates with the cosmos and eco-system in arrangement of Meyons moulded by it to materialize a dream, to address a challenge, to visualise a future project, to perform a task, etc. Since a Meyon contains of a big amount of wave designs each of diverse frequency, attitude,

***Corresponding Author: H.N. Singh**
Address: *[1]Department of Physics, R.S.S. P.G. College, Pilkhuwa, Uttar Pradesh, India
[2]Department of Mathematics, IFTM University, Mordabad, India-244102
[3]Department of Mathematics, Chaudhary Charan Singh University, Meerut-250004, Uttar Pradesh, India
*[1]Emails: hnsinghphysics@gmail.com,
[2]Email: Riddhi.garg@iftmuniversity.ac.in,
[3a] Email: niteshdhiman91@gmail.com,
[3b]Email: drmukeshsharma@gmail.com

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