MATHEMATICAL STRUCTURE THEORY AS A SOURCE FOR BIG DATA SCIENCE

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Abstract

The recent expansion of research into big data has set an exciting goal for mathematicians, Computer scientists as well as business professionals. Though, the absence of a Sound architecture of mathematics presents itself by way of a actual experiment in the Big Data advancement community. The paper's goal is to propose a possible theory of mathematical structure as per a basis of research into big data. The analysis of the application a mathematical modelling can be strongly well-thought-out as a theory of the Big data transforming technologies, systems, data management and processing tools. In amassing, the premise of big data's inanity is constructed on the calculus & principle and set theory. Its suggested method in this paper, encourage and open up more open doors for large information research and advancements on Big data information knowledge, business analytics, big data information investigation, big data Computing information technology as well as big data Computer science.

Keywords: Big data; mathematical modelling; big data analysis; big data computing.

I. Introduction

Mathematics is all over the place, and with the development of big data it turns into a valuable implement while separating data and evaluating enormous datasets. Big data information has progressed as one of the best limits for imaginative innovative work in software engineering, Industry and business. It has additionally become a key resource for the business visionaries, associations, ventures, organizations, singular lives and the security of a country.

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The big data has brought about big market opportunities. The big data takes moreover been a basic empowering effect of investigating commercial enterprise bits of knowledge and economic aspects of administrations. At long last, mathematicians have likewise given expanding consideration to the emotional improvement of big data and its effect on mathematics over and done with offering courses like mathematical science of Big data & processing work place strendy of big Data on mathematical modelling.

Nonetheless, in turnout is definitely not writing going arranged the mathematical Structure of big data dependent always the pursuit utilizing yahoo researcher & Google research etc. It shows outlining big data's mathematical structure has lingered a long way here are the big data's big practice and big market potential.

Suitable scientific demonstrating. When the scientific displaying is chosen, at that point all the relevant investigation will pursue normally. As we push forward in the continuation, we diagnosed the term "big" as a mathematical operator. We will survey the semantic which means of cardinality (There are no infinite cardinalities between the measurement of the natural numbers and the size of the real numbers), massive facts and the big data as well as the real positive number set to have the same cardinality. Although extension of the mathematical procedure, determine the attribute of a necessary thought out infinity creature carefully connected to the big data. The formal concepts and properties of big data information and their mathematical manipulations grant a formal framework of big data theories underpinning a large range of real-world functions in big data engineering.

I.i. a. Mathematical Structure (Modelling) for Big Data

The science of decoding is the mathematical structure from the area of application for identifiable mathematical formulations, the Theoretical analysis and numerical analysis of which provides vision, responses and useful direction for the original application. In many applications, mathematical structure is essential. Discusses aspects of the association between Mathematical Modelling (MM) and Big Data in the scope of mathematical education. Our aim in this research is mean a Mathematical demonstrating for big data. A system with a series of mathematical objects like other sets, relationships, or operations that provide additional structure. If we can achieve a logical structure and framework for the problem, it is anything but difficult to build up a to some degree extreme mathematical investigation to the logical force. Request the presence of the order of the discrete mathematics, we perceive two essential qualities of big data; the first is BIG's computational operator, and the second is to analyse big data's cardinality. It at that point gives a mathematical model to Search through big data.
II. BIG linguistic factor as an operator in the theory of big data.

Discrete procedure of arithmetic with different frameworks throughout mathematical analysis. Separate arithmetic includes logic, theory of graphs, operations, pure math structures, theory of lattices and set theory. Here and now, to make a concept for big data, it is our intention to invoke the idea of the separate arithmetic. In order to achieve our goal, the conception of linguistic variables in fuzzy set needs to be verified and logic theory permits. To take care of a better platform level for the good thing about a giant information theory, North American nation. Several comprehensive definitions were initially introduced.

Definition 1: Let $M$ be a non-empty set, a function $o: M \rightarrow M$ is referred to as big data operation $o$ if for any $x$ variable, $x \in M$, $o(x) = \text{big } x \in (M)$.

From Definition 1, $M$ can be a set of different data-based computing tasks. The bulk of this operation's function is to turn the computing tasks set into a BIG data scenario. Using the following example, we will explain the process on 'o' operation

Example 1: $M$ be a non-empty set of items on or after a Technology and research website (O Can't be defined for any significance value), & $x_i = i$ data at that time $o(x) = o(data) = \text{big } data$. This means that $o$ means a concept of data management & processing techniques, systems and resources that turn data into big data.

We can say the Internet is a perfect sample of BIG Operation $o$. Social Media is same a BIG operation $o$ while we’re not categorizing BIG operation $o$ addicted to exceptional this papers groups.

Then $o$ should not be used more than once. e.g. $o(o(data)) = o(\text{big data}) = \text{big big data}$ its Result on “big big data” will be meaningless of mathematical practices, then “big big data” can be clarified as actual big data.

There are many important properties in the operation $o$

Let's begin with symbol + in a natural language reflect a logical "and" operation.

Distributive law. Addition & Multiplication operations have been symbolically specified, $a(b + c) = ab + ac$;

Fig. 1 Modelling cycle from a cognitivist probability
There's a distributive operation \( o \), i.e., for any \( s, t \in M \),
\[ o(s+t) = o(s) + o(t) = b(s + t). \]

Commutative law with +, operations of addition and multiplication, stated symbolically: \( s + t = t + s \).

The operation \( o \) is commutative with +, for any \( a, b \in M \),
\[ o(a+b) = a + o(b) = o(a) + o(b) = o(b + a). \]

Element-wise application of \( o \). Let \((x, y) \in M \times M\) be a Vector, then
\[ o(x, y) = (ox, oy) = (b(x, y)). \]

Data analytics is a Set of assignments that can be expressed as the equation that follows.

Data analytics = Data + Data Analysis + Data Warehouse + Data Mining + Machine Learning+ statistical Modelling + Visualization (1)

Now Apply BIG operation \( O \) on both sides of Equation (1)
\[ O\text{ (Data analytics)} = O\text{(Data)} + O\text{(Data analysis)} + O\text{(Data Warehouse)} + O\text{(Data mining)} + O\text{(Machine Learning)} + O\text{(statistical modelling)} + O\text{(Visualization)}. \]

Then
\[ O\text{ (Data analytics)} = \text{Big data analytics} \]
\[ = \text{Big Data} + \text{Big Data analysis} + \text{Big Data Warehouse} + \text{Big Data mining} + \text{Big Machine Learning} + \text{Big statistical modelling} + \text{Big visualization} \]

We have Big Data analytics from the above formula, What should be described in Big analytics by means of the conclusion of \( o \text{(analytics)} \).

In the big data era, velocity, volume, variety and veracity are four very simple qualities.
This may be the case displayed by means of data = Volume, Velocity, Variety, Veracity) Use of such a object \{attribute method. Carrying out BIG operations \( o \) on left hand side & right hand side of this equation, We’ve got it.
\[ O\text{(data)} = \text{bigdata} = (O\text{(Velocity)}, O\text{(Volume)}, O\text{(Variety)}, O\text{(Veracity)}) \]
\[ = (\text{big Velocity}, \text{big Volume}, \text{big Variety}, \text{big Veracity}) \]

Fig. 2 Growth of the key characteristics of big data


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III. Big data Cardinality

Big data cardinality by using the theory of mathematical structure and the solution to the large data size. Unanimously, they find volume to be the very first big data attribute. They listed, for example, peta-bytes (PB, $2^{50}$B), Exabyte (EB, $2^{60}$B), zetta bytes (ZB, $2^{70}$B) Instead of through as yotta byte(YB, $2^{80}$B) for sample the volume of big data. The larger the volume of data, the other key it seems. It can be easily understood that from mining large volume of data, valuable knowledge and information can be discovered.

![Big Data: Volume](image)

Definition 2. Assumption R be a set. If R contains exactly n distinct elements, wherever n remains a Non-negative integer, Let assume R is a finite set, and n is R's cardinality. The cardinality of R is symbolized by $| R |$.

III.i.a. Big Data mathematical approach concern.

Proposes a mathematical strategy to the quest for large data trouble. Let $x \in X$ be a continuous file (Document) on the Web (Internet). X might be a Microsoft office Word file in (.docx) otherwise information in portable document file (pdf). Let $y \in Y$ be a value for the attribute can be a word like or “big” or “Analytics” or “intelligence” or “data.”

Definition 3. Its searching tool, referred to by way of $R: X \rightarrow Y$ remains describe by way of $R(y) = x$ if $y \in x$.

If we're using some "analytics" search engine, denoted as $y$, now we have searched a business analytics service area directory, defined as $x$ including $y$.

Theorem 1. The search result for operation $Y$’s in big data's finite world.
Theorem 2. In the Infinite world of big data when \( n \to \infty \) The following query as an operation \( \lor \) asset is included in the Web search:

\[
S(y_1 \lor y_2 \lor \ldots \lor y_n) = \prod_{i=1}^{n} F(y_i)
\]

(2)

Equations (2) and (3) respectively are theorems of representation Search for the finite world and the infinite universe of big data.

Theorem 3. The practical search results \( \land \) are available in the finite world of big data.

\[
S(y_1 \land y_2 \land \ldots \land y_n) = \prod_{i=1}^{n} F(y_i)
\]

(3)

Theorem 4. In the Big Data Infinite World. When \( n \to \infty \) The resulting search properties as Operation \( \land \) in the Web search is carried out:

\[
S(y_1 \land y_2 \land \ldots \land y_n \land \ldots) = \prod_{i=1}^{\infty} F(y_i)
\]

(4)

III.i.ii.a Big Data approach to Fuzzy Logic

Fuzzy logic is a form of accountability of knowledge that is suitable for concepts that cannot be precisely defined, but that depends on their framework (context)?Fuzzy logic seems to be the approximate logic, rather than exact more of reasoning. Fuzzy Logic value always take the value [0, 1], apart from these two values cannot take other value. The theory of Fuzzy sets successfully applied in several fields, including data collection, pattern recognition, learning the Database (Server) and computer, to label an insufficient. The fuzzy set of large proceeding N, written by way of A, aimed at big, is described With an affiliate role(function)\( f_{\text{big}}(n) \) Which would be connected for each number \( \in M \) With only a real interval number \([0,1]\), i.e.: \( f_{\text{big}}(r) \in [0,1] \).

When \( f_{\text{big}}(m) = 1 \) We've got it \( m \in M \) is big,
When \( f_{\text{big}}(m) < 1 \), We've got it \( m \in M \) Isn't that big

Definition 4 (Ref. 10). Let R and S be two fuzzy sets: A membership function

are \( f_R(x) \) and \( f_S(x) \), correspondingly, wherever \( x \in X \). R and S intersection (\( \cap \)) it will be a fuzzy set T inscribed such as \( T = R \cap S \) member function define by

\[
f_T(x) = \min (f_R(x), f_S(x)) \quad x \in X.
\]

Definition 5 (Ref. 10). Let R and S be two sets of fuzzy: A membership operates

are \( f_R(x) \) and \( f_S(x) \), respectively, where \( x \in X \). R and S is the Union(\( U \)) of a fuzzy set T describe as the function \( T = R U S \) is defined by

\[
f_T(x) = \max (f_R(x), f_S(x)) \quad x \in X.
\]
IV Conclusion

This paper explores a mathematical modeling. At least a big data mathematical theory contains the head queries and the alternative big data theory? 2. What’s the fuzzy-logic concept of big data? Viewing forward to impending promising fields for research study, given the Big Data analytics life cycle, it may be fitting toward survey and accelerate creation of Big Data and Big Data analytics optimisation. Fuzzy logic reading and so, too. Several fuzzy optimization parameters, the real champion of which is the mathematics of ambiguity combination with conventional mathematics. The mainstream mathematical theory suggests that it is possible to consider the so-called BIG procedure as an abstraction of data management and processing techniques, structures and methods that turn data into big data.

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