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Comparative Analysis of Data Storage Solutions for Responsive Big Data Applications

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ABSTRACT

The volume of produced digital data & everyday usage is increasing as a result of rising man-machine interaction, process automation, and falling hardware and software costs. The vast amount of digital information produced per second worldwide in unstructured, structured, and semi-structured formats is referred to as big data in this context. Big data analytics is a new topic that has inspired researchers all over the world to create, develop, and implement a variety of mechanisms, technologies, architectures, and areas for evaluating the enormous amount of data createdevery day. Traditional database management systems struggle to make sense of the massive amounts of data that make up "big data."The paper describes a few analyses, including word count, sentiment analysis, and responsive analysis.

Responsiveness is crucial for improving the system, identifying vulnerabilities, and ensuring that tasks are distributed fairly. Responsive is important data that can be used for making wise decisions. Responsive is significant for both strengths and weaknesses, not just when it identifies flaws. If the responsive analysis is performed incorrectly, the analysis's conclusion will likewise be incorrect. As a result, the system as a whole will be inaccurate because the pattern that was discovered will also be incorrect. We will utilize the Map-Reduce framework to create this suggested system for responsive analysis, and Hadoop will be used for storage.

INTRODUCTION

Process automation and digitalization have ushered in an age of technology that will usher in the big data era. Due to the significant changes, it has brought about in the storage and processing of massive and complex data, big data is currently a research buzzword. The current generation of large-scale, unstructured data was too much for the conventional database management system. Every single person now generates more than 1 GB - 2.5 GB of data every single day as the level of daily human–machine contact reaches its pinnacle. Additionally, the created data differ in terms of type, value, and complexity. Data must be kept and evaluated to handle ongoing data generation beneficially and humanely. We are merely taken to the area of big data analytics by this. The research team is constantly working to develop newer methods for data analysis.
The researcher's ongoing involvement has enabled the development of several algorithms and platforms for big data analytics. Big data's ability to deal with data that is unorganized with ease is one of its main benefits. The gathering of responsiveness is crucial since it demonstrates the system's significance. Responsive is also useful in identifying system flaws. Once flaws are discovered, proper planning for improvement may be formed, and subsequent action can be taken.

The analysis paper that is being given is organized as follows. Section 1 introduces Responsive Analysis systems and provides a summary of big data's properties. Module 2 reviews the prose on the categories of the Responsive Analysis system and provides an audit of the technologies and tools framework. The suggested framework for the Responsive Analysis System is described in depth in Section 3. Section 4 details the implementation activities that were done after the Paper concludes in Section 5.

ANALYSING THE EXISTING LITERATURE

Big data refers to the constantly growing quantities of unstructured, organized, semi-structured, and complex data made by machinery and often used by people[1]. With traditional warehousing, it took a lot of work to handle and review the vast amounts of data because of the tools and systems that were already in place. People and machines connect with nature every day, creating a lot of data that is now called "Big data." We needed new technology and services to store and analyze massive quantities of data from many different sources.

SQL-based queries from RDBMS systems could not handle the issue posed by the large volume of data and could not be used for big data research. As a result, numerous marketable database tools and technologies have emerged with the aid of data managing technologies.Hadoop is an open-source framework and it is one of the best platforms for data processing and storage. The need for big data analytics is brought on by the vast amount of data that major corporations like Facebook and Google are producing. These new tools, such as Hadoop, Pig, Scala, Hive, Mapping-Reducing, etc., were developed to analyze Big Data in a way that is unstructured [2]. Big data has several distinctive qualities that necessitate the use of specialized tools to examine the data. The details of these big data traits are provided in the section that follows. Five elements that define big data are as follows: Volume, Velocity (Speed), Variety, Value and Veracity (Realism)[2][3]. The volume of big data is made up of the enormous amount of data that is produced daily by numerous businesses and consumers around the world. Velocity indicates how quickly data is generated and updated as a result of people using computers at an ever-increasing rate. The information changes quickly over time, thus there is a potential that information that is accurate at one point in time might not be accurate at another. There is variety in the form and content of the data, such as structured data that adheres to a predetermined format, such as online transactions, semistructured data that adheres to a flexible framework, such as emails, and unstructured data, such as photographs and videos, that do not adhere to any predetermined pattern[5].

Data's veracity determines its quality. Veracity is one of the key properties of big data analytics because it can only be used with reliable and precise information that can generate relevant insights. Data that has been produced by the entity and will be used by it has value based on how it looks[6]. Responsive can be viewed as a cognitive technique for acquiring and refining knowledge, whether it comes from a living thing or something artificial. It is a two-way channel with an inherent flow of useful information between humans to machines and vice versa[7]. Collecting information about how effective or ineffective a given system was is a common phenomenon. It could be done exclusively or naturally. For instance, customer assessments and responsiveness represent a buyer's response to a company's goods or services. Two methods—qualitative & quantitative—are used to widely analyze the user-collected data[8]. offering specific performance pointers, having continuing performance talks, and providing corrective counsel are a few situations where offering constructive criticism is necessary. When problems go unsolved, someone wants your conception of how they perform, faults keep happening, and an employee's performance falls short of assumptions, these are some signs that helpful counsel is required.

The following are the key benefits of responsive analysis: Responsive can be divided into various categories, making it possible to build new features or improve existing ones to stabilize systems across a wide range of fields. If a response is given constructively during the subject's development or planning, hidden weaknesses can be easily changed[9]. The following are the drawbacks of the response analysis:

Analysis of responsiveness must be transparent and focus on its fundamental requirements of it; otherwise, important system components may go unnoticed and minor sections that may not require much attention may undergo frequent adjustments. After receiving input, introducing changes too frequently should be one of the main factors stabilizing the current system, therefore careful planning of modifications to the design must also be carried out. Fig. 1 displays the sentiment analysis from social media platforms.

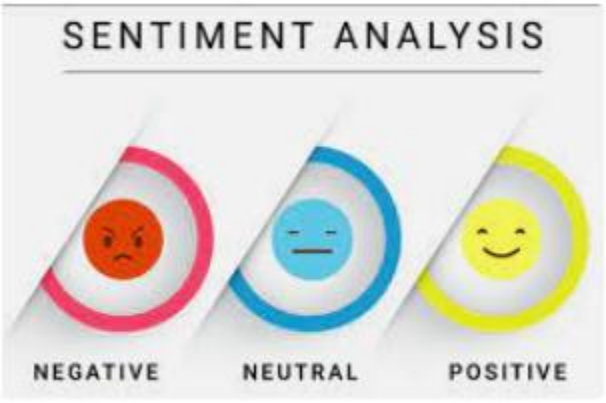

Fig. 1: Sentiment Analysis from Social Media Platforms

Sentimental analysis, also known as judgment extracting or evaluation mining, is a technique for gathering sentimental opinions that are motivated by behaviour, social norms, or local religious beliefs for any gesture, thing, or circumstance

[10]. When making a purchase decision, we frequently consult with friends, relatives, and those who have previously utilized the item in question[11].

However, the response we receive is largely based on the individual's ideas, therefore estimating a rough outcome is quite helpful. Reaching the right conclusions may require a significant amount of responsive data. Consumers are provided forms for business objectives, and they are requested to respond to products or services based on their subjective opinions. This aids in assembling a solid knowledge base of needs and potential upgrades to the commodities. The following are the key benefits of sentiment analysis [12].

Creating polls for likes and dislikes surveys, interest and voting expectations may be an extremely helpful process as sentimental analysis delivers helpful data about the existing and prospective services or items. Sentiment analysis is most useful when it can determine what people think about your business, its products and services, advertising campaigns, plans for interaction with others, internet content, etc. Right even before the launch of new commodities analyzed changes can surprise customers. Sentiment analysis enables businesses to learn about consumer attitudes toward their competitors as well, which can help them develop more successful advertising and promotional strategies and enhance the reputation of their brands. In the past few years, numerous sentiment analysis approaches have been created.

Table 1. Comparison Of Decision Tree Algorithms (DTA) & Naive Bayes (NB).

DTA	NB
1. Heuristic algorithms that rarely produce non-optimal information nodes, such as fuzzy logic and greedy algorithms, are used to facilitate the decision-making procedure. The best decision tree can't be guaranteed by this algorithm.	1. When independence assumptions are true, Naive Bayesian performs better than other algorithms and requires less training data.
2. The constructed tree could be completely different from expected if the data sources aren't reliable.	2. It is quick and reliable, and it is simple to forecast the type of test data. Additionally, it excels in complex item sets.
3. There are some concepts, like XOR, the level of parity or multiplexed difficulties, that are challenging to understand because decision trees can not simply explain them.	3. Compared to a number variable, it does well with categorical factors. The bell curve, built on a strong assumption, shows the normal distribution of numbers.

Based on text classification, the classification is to place the text into either an adverse sentiment group or an optimistic feeling group. Although all text has been scanned, specific terms must be included. If a word in a piece of writing conveys an emotion, that emotion may be positive or negative, and a sentiment score would be assigned to the word based on how the word represented each emotion. It is a burdensome task to sustain a lexicon of concepts to estimate the opinionattain. Supervised and unsupervised algo, such as the NB and DT algorithms, are also designed for this logic. Figure 2 illustrates using the Word Count feature of MapReduce to do efficient word processing. The MapReduce programming model facilitates the concurrent processing of enormous volumes of data with comparatively inexpensive hardware. Using a map, the tasks of inquiry, deconstruction, information are converted into handling,processing and task distribution to various nodes.The performance of several tasks is parallelized via the MapReduce algorithm [13].

The Map step's output is combined into multiple kinds in the Reduce stage, which also computes result sets and provides the reduced data. The greatest tools for processing data and distribution are Hadoop and MapReduce. HBase increases system efficiency by using HDFS as its basic storage. A Hadoop system programming technique is called MapReduce. The MapReduce technologies are used to process large amounts of data more quickly [14]. Key-value pairs are used as the input and output for both the map and reduce stages. Using the MapReduce library, the shuffle phase uses the map phase's output as input for the reduce phase. The map phase creates a set of intermediary key-value pairs by applying a user-defined mapper function to a set of input key-value pairs (kj, vj). The quantity of KV pairs is decreased by at least an sort of scale with each reduced stage[15]. When information is transported as of mapping responsibilities to reducing tasks, the shuffle step of a Hadoop application consumes the most processing time.

PROPOSED FRAMEWORK

A system for responsive analysis is shown in Fig.3. The proposed framework has been designed in a way that allows for application adaptation. It indicates that it can be applied to a variety of sectors, including medicine, education, governance, etc. Finding specific views about a group of systems is the process of gathering responses, which is useful for assessing the efficacy of data mining and modelling, which will ultimately enhance decision-making abilities. Responsive comes in a variety of naturally occurring formats, including plain text, pictures, statistics, etc. Additionally, there are several ways to gather a public response, including through one-on-one interactions, the Internet, and the media. Different ways, therefore, aid in identifying system issues and effectiveness. The gathering of responsive can take place in a variety of methods, thus it is possible to categorize it generally according to the source and survey medium into the following forms: Both digital and manual responsive collection are available.

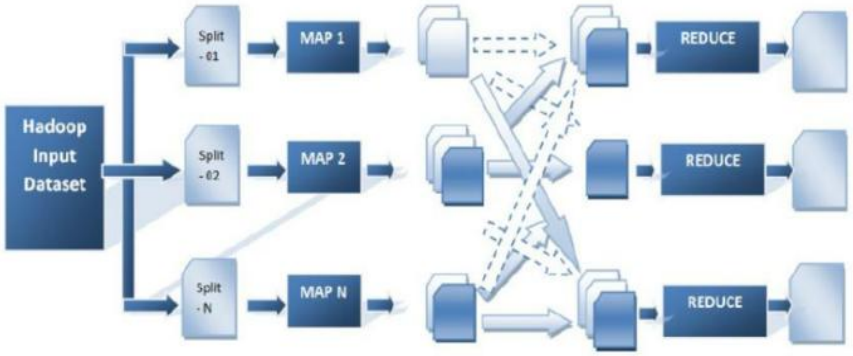

Fig. 2: Process Flow of Map-Reduce

Digital responsive surveys use online or internet-based media as a foundation for responsive transmission. This frequently makes use of the internet, online user forms, star ratings, polls from mobile apps, online questionnaires, telephony voting, etc. Although manual responsive may seem a little conventional, it is widely employed as a key technique in offices, businesses, schools, etc. This involves doing surveys by hand or otherwise not using the internet. This takes into account physical responsive forms, screenings, in-person conversations, question-and-answer sessions, etc.

Before manual responsive can be input into the system for evaluation by the system, it must first be digitized. This is where the digital technology process is involved. This action shows the data that has been gathered is fed into the system by applying one of the two data collection procedures.

It is possible to supply the system with data by utilizing conceptualization, extraction, and logical storage techniques to facilitate notable mining in the subsequent phases. Word Count, with knowledge is coming from different places and taking so many different forms, it is constantly important to save the useful information in the right places so this evaluation is carried out properly. As a result, it's necessary to input huge amounts of data into big data systems. because it is difficult for a database to maintain such large data collections. Hadoop enters the scene in this situation.

We preserve data using the MapReduce process in a way that is globally categorized. Hadoop is a relatively new technique for analyzing the volume of data, which is growing at an exponential rate by Gigabytes, Terabytes, Petabytes, and so on. Methods for analyzing responsiveness, This approach is centred on gathering input in its most straightforward form. Meaning that the information in this area consists primarily of one-to-one responses to questions presented as texts, photographs, videos, polls, etc. Sentiment analysis, often known as thought gathering, is a procedure for gathering customer opinions through comments or evaluations of goods, movies, political figures, events, or societal issues. When we're trying to make a decision, such as whether to buy a costly product, enrol in a system, or join a company, we talk it over with our loved ones, instructors, mentors, and friends with whom relevant information. An outcome of Responsive and Sentimental Analysis, as gathering a large number of responsive has a substantial cognitive component that ultimately involves improving the systems. Therefore, the helpful information and outcomes that the above method provides can be utilized to iterate through the system's numerous rising levels. The improvement of the current system is divided into three primary parts.

A. Modification of an Existing System Component

Small adjustments at the component level are advised if the efficient section of the shifting terrain is significantly smaller than the entire system. This guarantees that the current features are preserved and continue to function effectively, as demonstrated by the positive reactions. This lowers the cost of re-engineering systems and allows for a significant improvement in the final product with just one little adjustment.

B. Changing the settings or components of current systems to new, superior systems
Introducing components that have already been tried and true in the current systems is another option to incorporate the improvements. This might result in good design adjustments and integration, but it can guarantee that the right adjustments are made professionally.

C. Modification of the current system
The only situation where changing the existing is the only option is when the overall performance response has failed miserably. As a result, the approaches mentioned above are ineffective. Redesigning the entire system and making significant modifications following the system analysis may be a better strategy to stop this.

METHODOLOGY

Hadoop and MapReduce will be utilized, together with a few other presently accessible technologies and procedures for data analysis, to bring the proposed system into operation.Text classification will be done using supervised and unsupervised algorithms including Decision Trees, Naive Bayes and Support Vector Machines. The most well-liked supervised classification technique that may be applied to text categorization is the naive Bayes algorithm. Sentiment analysis of digital data to distinguish between favourable, unfavourable, combined views and feelings about customers' postings, tweets, reviews, and responses is one of the common applications of Naive Bayes algorithms. A variety of data generators, including sensors, healthcare, telecommunications, purchasing goods online, online communities, digital videos and images, Medical, Finance, purchase-sell transactions, and others, contribute to the exponential growth of data over time. Big data is a collection of enormous data sets that a conventional database management system is unable to handle.

Hadoop is a relatively new technique for analyzing an enormous amount of data, which is growing at an exponential rate by Gigabytes, Terabytes, Petabytes, Zetabytes, and so forth[16]. Using different clusters of commodity machines, the open-source Hadoop system distributes the processing of enormous data volumes. It has a great level of fault tolerance and scalability. Hadoop is made up of two basic parts [17]. MR and HDFS. The storage and processing components of Hadoop are its two main parts.

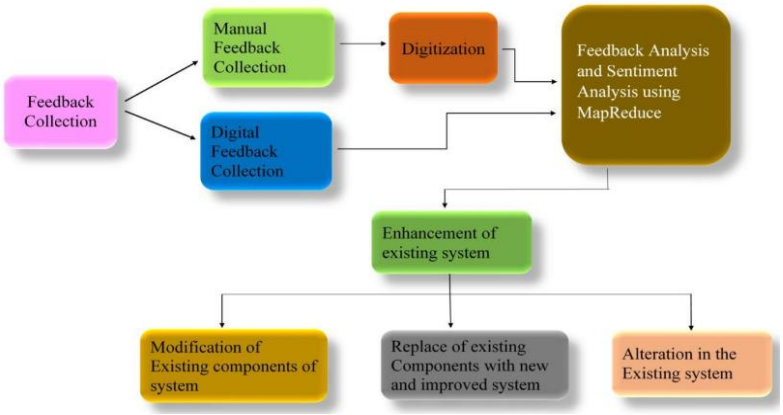

Fig. 3: Responsive/Responsive Analysis System

For storing and handling enormous amounts of data, Java programmers created the distributed, fault-tolerant, scalable and portable file system known as HDFS. HDFS stores every bit of information that will be executed while Hadoop makes numerous replicas of the task and distributes them around cluster nodes (machines) [18]. It makes data access dependable and quick. MapReduce is a framework that carries out distributed data processing using the MapReduce programming model. It is the part of Hadoop that handles the processing. Map and reduce are the first two steps in the MapReduce process. The map stage divides the input tasks into more manageable subtasks. After completing the necessary tasks for each subtask, it provides certain interim results. The map step's intermediate outputs are combined in the reduce stage to produce the final output.
Hadoop's beating heart is MapReduce. For MapReduce to process and analyze data in two phases, namely mapping and reducing, it needs to have effective analytical capabilities [19]. It is required for the MapReduce method to have a shuffle

step in between the map phase and the reduce phase to completely interchange the intermediate output that the mapper created.

RESULT

Every system that is developed, constructed, and deployed has flaws and shortcomings that become apparent only when it is used on a daily basis. If done appropriately and successfully, responsive analysis may be a boon to the whole organization and its operations. The primary goal of the responsive mechanism is to discover any flaws or areas for enhancement in the current system, resulting in a fully functional process. The generated contents produced by the system's different activities are an excellent source for evaluating these flaws and shortcomings. These data are only input into the responsive analytic technique given in this study, which aids in system growth and constructive change. This suggested system for responsive analysis will be built using the Map-Reduce architecture, with storage provided by Hadoop.

REFERENCES

[1]. Narasimhan, Ravi, and T. Bhuvaneshwari. "Big data—a brief study." Int. J. Sci. Eng. Res 5 (2014): 1-4.
[2]. Shilpa and Manjit Kumar.: “Big Data And Methodology-A Review”,IJARCSSE, 991-995 Vol- ,October,(2013).
[3]. Agrawal, Pratik K., and Abrar S. Alvi. "Textual Feedback Analysis: Review."Computing Communication Control and Automation (ICCUBEA), 2015 International Conference on. IEEE, 2015.
[4]. Kumar, Alok, and Renu Jain. "Sentiment analysis and Feedback Evaluation."MOOCs, Innovation and Technology in Education (MITE), 2015 IEEE 3rd International Conference on. IEEE, 2015.
[5]. Mane, Sunil B., et al. "Real Time Sentiment Analysis of Twitter Data Using Hadoop." IJCSIT) International Journal of Computer Science and Information Technologies 5.3 (2014): pp.3098-3100.
[6]. Sahane, Manisha, Sanjay Sirsat, and Razaullah Khan. "Analysis of Research Data using MapReduce Word Count Algorithm." Internl. Journal of Advanced Research in Computer and Commn. Engg 4 (2015).
[7]. Selvan, Lokmanyathilak Govindan Sankar, and Teng-Sheng Moh. "A framework for fast-feedback opinion mining on Twitter data streams."Collaboration Technologies and Systems (CTS), 2015 International Conference on. IEEE, 2015.
[8]. Mandal, Bichitra, Srinivas Sethi, and Ramesh Kumar Sahoo. "Architecture of efficient word processing using Hadoop MapReduce for big data applications." 2015 International Conference on Man and Machine Interfacing (MAMI). IEEE, 2015.
[9]. Kusum Yadav, Manjusha Pandey, Siddharth Swarup Rautaray. "Feedback analysis using big data tools", 2016 International Conference on ICT in Business Industry & Government (ICTBIG), 2016.
[10]. B.P.Rao, P.Saluia, N.Sharma, A.Mittal, S.V.Sharma, Cloud computing for Internet of Things & sensing based applications, in: Proceedings of the Sensing Technology(ICST), 2012 Sixth International Conferenceon,IEEE, 2012, pp.374–380.
[11]. B. Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, Wiley. com John Wiley Sons Inc, 2012.
[12]. D.J.Abadi, P.A.Boncz, S.Harizopoulos, Column-oriented database systems, Proc.VLDB window2(2009) 1664–1665.
[13]. M. Seeger, S. Ultra-Large-Sites, Key-Value stores: a practical overview, Comput. Sci. Media (2009).
[14]. Rajashree Y.Patil, Dr. R.V.Kulkarni, A Review of Data Cleaning Algorithms for DataWarehouse Systems, Rajashree Y. Patil et al, / (IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 3 (5) , 2012, PP 5212 - 5214.
[15]. J. Quackenbush, Micro array data normalization and transformation, Nat.Genet.32(2002)496–501.
[16]. L.Neumeyer, B.Robbins, A.Nair, A.Kesari, S4: Distributed Stream Computing Platform, Data Mining Workshops (ICDMW), IEEE International Conferenceon, 2010, pp.170–177, 13-13 Dec. 2010.
[17]. Y.Chen, S.Alspaugh, R.Katz, Inter active analytical processing in big data systems: across-industry study of MapReduce workloads, Proc. VLDBEndow.5 (2012)1802–1813.
[18]. Prathibha.P.G, Dileesh.E.D “Design of a Hybrid Intrusion Detection System using Snort and Hadoop” International Journal of Computer Applications (0975 – 8887), Vol. 73– No.10, July 2013.
[19]. Seref SAGIROGLU and Duygu SINANC, Big Data: A Review, Collaboration Technologies and Systems (CTS), 2013 International Conference on, PP 42-47, 20-24 May 2013.
[20]. Ankit Kumar Tiwari, Hemlata Chaudhary and Surendra Yadav, A Review on Big Data and Its Security, Innovations in Information, Embedded and Communication Systems (ICIIECS), 2015 International Conference on, PP 1 - 5 , 19-20 March 2015.

[21]. Kavali, Rama Venkata S., Lawrence D'silva, Venugopala Rao Randhi, and Damodarrao Thakkalapelli. "Electronic system for monitoring and automatically controlling batch processing." U.S. Patent Application 17/188,901, filed September 1, 2022.
[22]. Grandhye, Nagendra B., Venugopala Rao Randhi, Vijaya Kumar Vegulla, Rama Venkata S. Kavali, and Damodarrao Thakkalapelli. "SYSTEM AND METHOD FOR SPLITTING DATA ELEMENTS FOR DATA COMMUNICATION BASED ON TRANSFORMATION TYPES IMPLEMENTED ON THE DATA ELEMENTS AT DIFFERENT DEVICES." U.S. Patent Application 17/583,634, filed July 27, 2023.
[23]. Kavali, Rama Venkata S., Lawrence D'silva, Venugopala Rao Randhi, and Damodarrao Thakkalapelli. "Electronic system for monitoring and automatically controlling batch processing." U.S. Patent 11,604,691, issued March 14, 2023.
[24]. Dr. Sourabh Sharma, Dr. Stella Bvuma, Damodarrao Thakkalapelli, "Corporate Patenting AI and ML in Healthcare: Regulatory and Ethical Considerations", International Journal of New Media Studies, ISSN: 2394-4331, 10(1), 2023. Retrieved from: https://ijnms.com/index.php/ijnms/article/view/193
[25]. Damodarrao Thakkalapelli, "System and method for determining the shortest data transfer path in data communication Banking and Finance", Published in "Deccan Herald" on 26th October, 2023, Retrieved from: https://www.deccanherald.com/brandpr/system-and-method-for-determining-the-shortest-data-transfer-path-in-data-communication-banking-and-finance-2742999
[26]. Damodarrao Thakkalapelli, "Research on the use of Cloud Platforms for Training and Deploying Machine Learning Models and AI Solutions" IJIRMPS, Volume 11, Issue 6, (2023), Retrieved from: https://www.ijirmps.org/research-paper.php?id=230360
[27]. Damodarrao Thakkalapelli, "Discussing About Artificial Intelligence (AI) in Data Science with Damodarrao Thakkalapelli -Data Solutions Architect, Tribune India News Service (2023), Retrieved from: https://www.tribuneindia.com/news/impact-feature/discussing-about-artificial-intelligence-ai-in-data-science-with-damodarrao-thakkalapelli-data-solutions-architect-556765
[28]. Damodarrao Thakkalapelli, "Data Flow Control and Routing using Machine Learning", Analytics Insight, Published on 25 October, 2023, Access at: https://www.analyticsinsight.net/data-flow-control-and-routing-using-machine-learning/
[29]. Damodarrao Thakkalapelli, "Cost Analysis of Cloud Migration for Small Businesses", Tuijin Jishu/Journal of Propulsion Technology, ISSN: 1001-4055, Vol. 44 No. 4, (2023).
[30]. Grandhye, Nagendra B., Venugopala Rao Randhi, Vijaya Kumar Vegulla, Rama Venkata S. Kavali, and Damodarrao Thakkalapelli. "System and method for determining the shortest data transfer path in data communication." U.S. Patent 11,716,278, issued August 1, 2023.
[31]. Kavali, Rama Venkata S., Venugopala Rao Randhi, Damodarrao Thakkalapelli, Vijaya Kumar Vegulla, and Rajasekhar Maramreddy. "Data flow control and routing using machine learning." U.S. Patent Application 17/576,539, filed July 20, 2023.
[32]. Randhi, Venugopala Rao, Damodarrao Thakkalapelli, Rama Venkata S. Kavali, and Ravindra Dabbiru. "Correction, Synchronization, and Migration of Databases." U.S. Patent Application 17/830,849, filed September 22, 2022.
[33]. Randhi, Venugopala Rao, Damodarrao Thakkalapelli, Rama Venkata S. Kavali, and Ravindra Dabbiru. "Correction, synchronization, and migration of databases." U.S. Patent 11,416,454, issued August 16, 2022.
[34]. Thakkalapelli, Damodarrao. "Cloud Migration Solution: Correction, Synchronization, and Migration of Databases." Tuijin Jishu/Journal of Propulsion Technology 44, no. 3 (2023): 2656-2660.
[35]. Talluri, Saritha, Venugopala Rao Randhi, Damodarrao Thakkalapelli, and Rama Venkata S. Kavali. "Multicomputer System with Machine Learning Engine for Query Optimization and Dynamic Data Reorganization." U.S. Patent Application 17/307,173, filed November 10, 2022.
[36]. Thakkalapelli, Damodarrao, Rama Venkata S. Kavali, Venugopala Rao Randhi, and Ravindra Dabbiru. "Correction, synchronization, and migration of databases." U.S. Patent 11,379,440, issued July 5, 2022.
[37]. Vegulla, Vijaya Kumar, Rama Venkata S. Kavali, Venugopala Rao Randhi, and Damodarrao Thakkalapelli. "Systems and methods for evaluating, validating, correcting, and loading data feeds based on artificial intelligence input." U.S. Patent Application 17/680,561, filed August 31, 2023.