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A Framework to Implement Data Mining Algorithms with IoT Data to Enable Safe and Rapid Decision-Making Process

S.Immanuvel[1], P.Radhakrishnan[2], Md. Shohel Sayeed[3]

[1, 2] Assistant Professor, PG and Research Department of Computer Science,

Don Bosco College (Co-Ed),Guezou Nagar, Yelagiri Hills, (Affiliated to Thiruvalluvar University),

Tirupattur District, Tamil Nadu, India.

[3]Professor, Faculty of Information Science & Technology, Multimedia University

Abstract: -Internet of Things (IoT) devices produce a significant amount of data in a real-time manner, it is crucial to make decisions and move forward using the information provided by the sensors that are a part of the IoT environment. In order to handle the analysis of enormous IoT data sets, this interdisciplinary methodology is used. Based on the tasks involving the data and the types of data we deal with during the process, data mining techniques are chosen for IoT data. Again, by choosing the appropriate methods, it is possible to reduce large data sets, clean up the data, and format it as needed. Therefore, the best algorithms for creating, controlling, and monitoring IoT-based applications in various fields are improving IoT process performance. The framework that is suggested will be used to build the appropriate algorithms for IoT Data in related applications, enabling safe and quick decision-making in real time..

Keywords: *Data Mining, IoT, Decision Making, Clustering, and Classifications*

1. Introduction

Massive mounts of data are generated by smarter apps during their processes, and it's crucial to make decisions in real time so that the process may be activated at the same pace of connectivity and in the proper direction. In this situation, the suggested framework will assist society in making decisions based on information gathered from integrated smarter devices. It is concentrated on doing numerous operations on the same platform in order to carry out a particular target-based system, so it involves numerous processes that can be activated based on a decision made based on the anticipated input. With the use of a certain data mining technique, real-time judgments can be made more effectively.

The IoT system can use the current data-mining model, but any smart system that wants to make decisions using data mining algorithms may need extra capabilities. The author offers an early evaluation of the suitability of many well-known data mining algorithms to actual IoT information. The methods are Nave Bayes (NB), C4.5, C5.0, Artificial Neural Networks (ANNs), and Deep Learning ANNs (DLANNs) [1]. They also include K-Nearest Neighbors (KNN), Linear Discriminant Analysis (LDA), Support Vector Machine (SVM), and Deep Learning ANNs (DLANNs).

High record of performance noticed on Random Forest data mining classifiers compared to other. This model is useful for decision-making process with different field for any IoT Smart systems. Real health care data sets with 18 attributes were collected and different data mining algorithms have been evaluated, namely SOM (bdk and xyf), C4.5 and Random Forest yields best result out of all other methods [2].

The Supervised learning framework is integrated in distributed data mining system and Conventional Neural network to satisfy the goal of the user. The efficiency are noted when demonstrate with this framework, in specific the interaction with system when we apply the data mining is highly appreciable with lower cost. It was also implemented in the smart building environment for the success in SVM process [3].

To precisely determine the amount of transmissions needed by forwarders, a novel smart routing model is provided [4], along with an algorithm for choosing a forwarder set with a more optimal number of transmissions. The outcome demonstrates that the proposed mechanism can provide more energy-efficient communications and satisfy minimum transmission requirements for wireless edge IoT applications.

In comparison to the solar panel's calibrated values based on various solar radiations, the observations from solar panel systems are compared [5]. When there is a significant difference in the amount of power provided by the solar panels, the proposed model warns the maintenance crew. A control unit that can handle some of the minor maintenance tasks on the connected solar panels can be added to the proposed work to make it more comprehensive.

The measured data is used to validate [6] the modified BigDataACO method. The enhanced algorithm significantly reduces the uncertainty of data fusion when compared to K-means, D-S evidence theory, and Bayesian algorithms.

Using Apache Spark on Yarn as the infrastructure, a novel big data mining method of PSO-based BP neural network models for financial risk management distributes the implementation of machine learning algorithms with a large dataset to increase the effectiveness of risk control. On the cluster of data nodes where the dataset is distributed stored, Hadoop HDFS is first started [7].

The ability to choose appropriate Data Mining techniques for the anticipated goal, which is frequently facilitated by researchers or developers through multiple time-consuming procedures, is a positive implication. These approaches often include repeatedly examining a number of existing DM algorithms to determine which one is the best fit for a given dataset. Then, time-consuming tests are conducted on the implementation assistance provided by data mining tools like WEKA, Scikit-learn, pure Python, or C code. The studies provided in the study demonstrate that automatic selection of the DM method can help to reduce the time and expense of these additional steps needed to complete a data mining operation. Therefore, it could be claimed that the suggested framework represents the nascent field of data mining in a fluid IoT context [8].

In this situation, having a good model to choose an algorithm that can enable decision-making on a dynamic smart application is crucial. The decision-making process is broken down into various parts in order to pinpoint the precise algorithm. The method can be evolved using real-time data and pattern, as is explained in the part that follows. It requires greater intelligence to choose the knowledge pattern because decision-making must be performed in the safest and quickest amount of time possible. The knowledge pattern will speed up the entire smart application procedure.

2. Procedure to identify the Knowledge Pattern

Smart IoT applications generate enormous amounts of heterogeneous and homogeneous data, and they also need a decision to move the process ahead. It is advised that the prescribed model be defined for the decision-making process and used each time the system encounters a situation that is comparable. The user purpose, preprocessed data, and common algorithms from artificial intelligence, machine learning, deep learning, and data mining should all be taken into account while defining a prescribed model. It is necessary to identify the knowledge through this method.

In the Intelligent Dynamic Data Mining (IDDM) method, we combine modern data science algorithms (A), user goals (G), and data from smart applications (D) to establish the knowledge pattern. These inputs are transformed via the intelligence process into knowledge data (KD), knowledge goals (KG), and knowledge algorithms (KA). The knowledge pattern (KP) was then derived from the matching process that started with KG, KA, and KD at this point..

3. Extraction of Knowledge

The preparation of the data received from IoT Smart Applications is the first step in the extraction of knowledge data (KD). The data should first be grouped or correlated as they are present in the database. The grouping was completed by combining relevant data, and unrelated data were taken into consideration in a different format. Additionally, the extracted data is correlated in order to help find data similarities and the locations of similar data. The data are grouped with the aid of the following formula. If similarity occurs, it can be combined as one part or included in the other section. D = Union (Di), where i is the set of integers

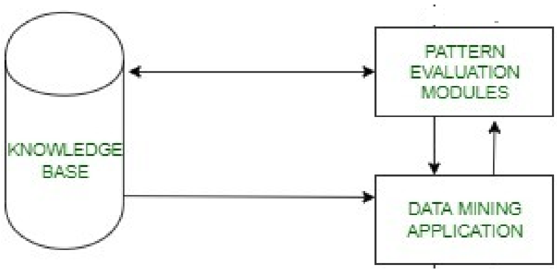

Fig 1: Process of Pattern Evaluation

Multiple steps are used in the Pattern Evaluation Modules to achieve the goal. It is necessary to formulate various knowledge and map each one to additional interrelated factors. One of the process metrics taken from the IoT Smart Application is the Knowledge Data. Another crucial piece of information is user goals. Every user has a different objective when it comes to handling IoT environment activities to activate or deactivate them. To get the desired results, the Data and Goal (KG) must be combined with the necessary knowledge.

4. Identify the Algorithmic Knowledge

The Third parameter of knowledge pattern process is Algorithmic Knowledge (KA) which are involved in various areas of Data Science.

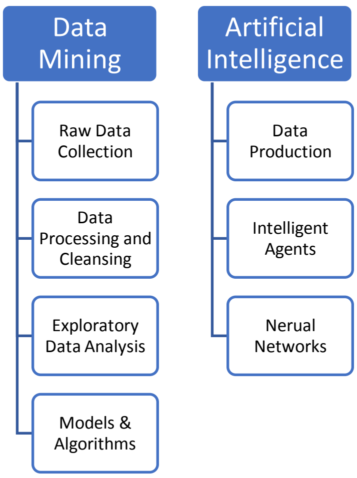

Fig 2: Data mining vs AI

AI-specific algorithms are created or combined by the interaction of machine learning algorithms and data mining processes. It is crucial to include algorithms from Machine Learning, Data Mining, Deep Learning, and Artificial Algorithms because these techniques are also used in AI algorithms. The following particular actions are required to finish the data mining process. Data, Target Data, Preprocessed Data, Transformed Data, and Patterns are all components of the Knowledge Drawn process. Through selection, preprocessing, transformation, data mining, and evaluation, each process step is improved.

5.

Fig 3: Knowledge-drawing process Bar

Data mining's knowledge-drawing process starts with the selection of the data, followed by preprocessing, transformation, pattern identification, and knowledge design. Once the KD, KG, and KA have been determined, they can be integrated and processed to build the pattern, which serves as a knowledge module to aid in decision-making. It enables customers to go forward quickly with the decision-making process so that choosing an IoT smart application is safer and faster.

The following framework illustrates the entire procedure for safely and quickly implementing the data mining method.

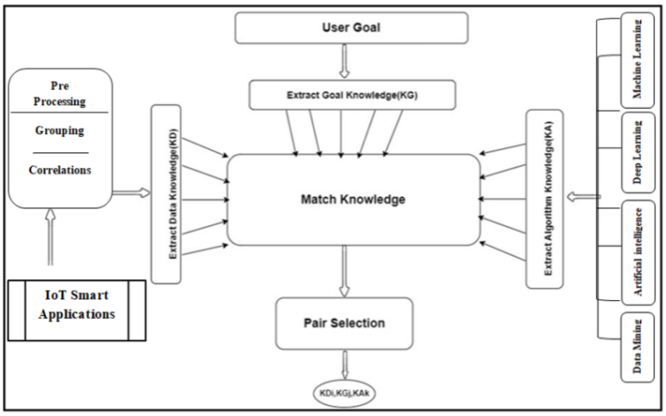

Fig 4: Framework to select Data Mining Algorithms with IoT Data

Once the knowledge module is created, pairing together data, goals, and algorithms is completely comfortable. The process of choosing an algorithm that can be implemented in an IoT Smart application depends on the data and the purpose.

5. Conclusion

This study concentrated on choosing a specific algorithm to test dynamic IoT data based on datasets, aims, and objectives. This framework is suggested to offer broad accuracy and speed up the development of smart applications. Knowing the optimal algorithm to use for a given set of data and application goals will result in high accuracy. Furthermore, the accuracy of the data and goals for the tasks are taken into account for a knowledge pattern based on the chosen AI algorithms frequently outperformed the results reported in previous study. With the data set, the results are more precise and adaptable. The proposed framework can be expanded in a number of ways as future work to make it adaptable to any Data and Goal format. Depending on the results of the suggested framework in real-time, integrate the Knowledge Pattern with IoT Smart applications with service providers to various services inside a certain application domain. The Knowledge Module can serve as an illustration of a process where decisions are made in smart applications like those found in homes, hospitals, and agricultural settings..

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