PARAPHRASE EXTRACTION BY USING MACHINE LEARNING ALGORITHMS- A REVIEW

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Abstract: Data mining, copyright detection, Authorship authentication, information extraction and text summarizing are among applications that require paraphrase detection. To recognize paraphrases that compare various corpus-based, and particularly deep learning (DL) models. Students' comments on subject forums are compared to the performance of standard machine learning algorithms and two deep learning techniques in obtaining subject keywords. Student comment data over the past two years was collected for this purpose, with a portion of the raw data being manually labelled. The present review focused on comparisons that included naive Bayes, logistic regression, support vector machines (SVM), artificial neural network (ANN), and Long Short-Term Memory with Attention (LSTM) (Att-LSTM). The four evaluation measures were used to measure the performances. This strategy is the most effective for extracting concept keywords from student comments, based on our experiment and visualization statistics. A certain degree of symmetry is also found in the findings of the algorithms and the depiction of the results. There is practically a reflection symmetry in the retrieved subjects from comments posted at the same phases of different training sessions.

Keywords: key paraphrase extraction logistic regression, Naïve Bayes, Deep learning (DL).

1.0 Introduction

As a service industry, higher education is expected to match customer requirements through reevaluating education. Universities are aware of the value of student feedback and take it very seriously. Students' comments, in particular, are viewed as a useful tool to explore learning challenges on the internet. [1] When it comes to teaching and learning, comments made by students on forums are quite significant. Student comments are developed to extract for keyword analysis to improve teaching quality.[2] Text summarization, terms index, categorization, filtering and topic identification have all been accomplished using topic keywords [3]. Domain experts frequently extract topic keywords. It is a time-consuming and difficult task. Automatic extraction, on the other hand, is extremely efficient. This process involves automatically identifying relevant and topical words in the document [4]. Although different approaches give

better results. All of these approaches are being tested to determine which one is most effective at automatically extracting subject keywords from a particular type of data source. To increase the accuracy of subject keyword extraction, however, there are a number of problems to address. Unstructured data are omnipresent on the internet as a result of big data's rapid growth rate. In addition, there are typically many linguistic fragments or documents without theme keywords. Hence, processing and analyzing them become even more challenging. In aspects of keyword extraction, there are a range of methods and applications. [5] Topic keyword extraction accuracy must be continually improved. Keywords, or their embedding in each comment, are utilized as a feature vector to forecast its category designation. Several ways to extracting topic elements from student comments are investigated.

1.1 Applications:
- Key phrases may serve as a mini-summary
- Partial indexing
- Automated key phrases can help an author with some keywords or phrases he may have missed
- Labels for text documents
- Providing of highlights for a document.

1.2 Problem of the statement:
- In the proposed system we find the neighbor documents for the given document d_0, for which key phrases are to be identified.
- Document d_0 is expanded to a small document set D which provides more knowledge and clues for key phrase extraction from d_0.
- A graph-based algorithm modifies a graph-based algorithm to utilize both word relationships in d0 and neighboring documents once the document collection has been formed.

1.3 Scope of the work:
In key phrase extraction, the neighbour papers are topically close to the given document, and they provide a neighborhood information context for it.

2. Literature review
Deep learning is a machine learning method based on artificial neural networks that has obtained exceptional performance in a number of fields. Deep learning algorithms for subject extracting features are used in this research. Deep learning [6] neural networks with numerous levels of complexity Recently, it was able to extract phrases from raw text with significant success in a variety of fields. Many tasks in deep learning fall within this domain, including language modeling and machine translation. Kohavi [7] Since NB's performance on huge datasets was inferior to that of decision trees, NB-Tree was developed. So, our strategy combined the advantages of both Nave Bayesian classifiers and Decision Tree classification methods. Yasin et al. [8] supervised learning was used to extract subject keywords from the text using a Nave Bayesian classifier. In their work, they believed that the keyword features were distributed

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normally and separately. A reduced classification accuracy was achieved by Kim et al. [9] when NB was used as the parameter estimation procedure. In order to increase its performance, the researchers presented text standardization and feature weighting algorithms for different files. The NB classifier performed well in the classification task. By assuming that the structure was analyzed by a multivariate Poisson model, the Poisson NB increased the weight of the input text. For tasks involving more than one class, it's trivial to add new functionality to the system. In these conditions, the Logistic function determines whether or not a given trait would be present as a result. In their study, Tsien et al. [10] employed a classification tree and LogR to diagnose myocardial infarction. In comparison to Edinburgh and Sheffield datasets, the Kennedy LogR showed improved ROCs of 94.3 percent and 91.25 percent, respectively. Padmavathi [11] Provided criteria that could have a variety of effects and stages in developing the regression model. It is a model of supervised learning used in machine learning algorithms, and it has good classification performance. Data records represent points in space, and SVM tries to locate a hyperplane and partition them into two different groups. Basically, it tries to locate a hyperplane through a dataset that separates the output into two categories with a largest probability in between them. There are five different kernel types in SVM: polynomial, Neural, Epanechnikov and Gaussian combination. Zhang et al. [13,14] utilized SVM to extract a subset of subject keywords from texts in order to describe the "meaning" of the content. Global visual elements and local attribute values were used to extract topic keyword phrases from images. In order to complete the tasks, an SVM was developed. The results showed that the methods performed better than the baseline methods, and that feature extraction accuracy was significantly improved as a result. Isa et al. [15] utilized a hybrid technique using NB and SVM approaches to anticipate the text's topic. Bayesian techniques vector text through random variable. SVM overcame the effect of dimensionality reduction by calculating the probability of each category in the document. The integrated method can be applied to any dataset, and it is compared to other standard methods. It decreases training time while improving accuracy. Krapivin et al. [16] Discussion keywords were collected from the documents using natural language processing techniques to boost machine learning methods, such as SVM and Local SVM.

## 3. IMPLEMENTATION OF MACHINE LEARNING ALGORITHMS IN DATA MINING

Process mining is a data-driven approach that comes from the fields of process management and data science. It is designed to help organizations discover, monitor, and improve business processes. It uses event logs, which are lists of activities with start and end time-stamps from IT systems. Event logs can include activities such as when an order is received, product delivered, customer contacted, payment made, and more. This data-driven approach provides insight into what people, systems, and organizations are actually doing, as opposed to what they think they're doing. The insights help identify bottlenecks and compliance issues to improve. Artificial intelligence (AI) is increasingly being applied to process mining to extract greater insights

Process mining is composed of several techniques, including:

- Process Visualization / Discovery - Enables the visualization of a process, which is typically generated automatically from event log data. The purpose is to provide data-driven insight into actual processes.
- Conformance Checking - Assesses an actual process against a reference model (target model) of that same process in order to identify deviations. Advanced process mining vendors can detect variations automatically.
- Performance Analysis - Measures the efficacy of a given process by assessing factors such as cycle time or costs.
- Root-Cause Analysis - Applies advanced artificial intelligence (AI) to identify patterns in your processes, enabling you to automatically identify the root cause of process issues. This data-led / fact-based approach to optimization eliminates perceptions that historically have biased analysis.
- Prediction Analysis - Makes automated predictions about future process behaviors. Based on machine learning models that are trained on your processes.
- Process Management Lifecycle - Enables continuous improvement and optimization of business processes.
- The lifecycle generally has six phases: Process strategy, technical specifications, process optimization, determined experimentally, process execution, and process control.
- KPI Monitoring - Monitors all relevant metrics pre- and post-analysis to track performance. Typically done via shared dashboards, which provide a central source of truth.

3.1 Supervised learning

Process strategy, technical specifications, process optimization, determined experimentally, process execution, and process control. As a classification algorithm, we refer to a model that creates discrete categories. An algorithm returns whether a class is true or false in the majority of the cases (between 0 for impossible and 1 for definite). Normally, we would classify any probability greater than 0.50 as 1, however this threshold might be changed as needed to improve algorithm performance.
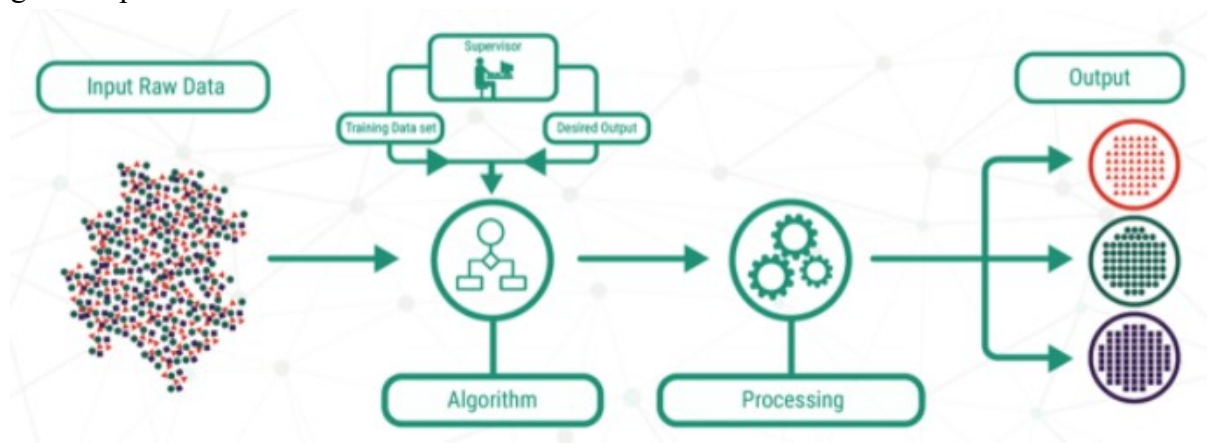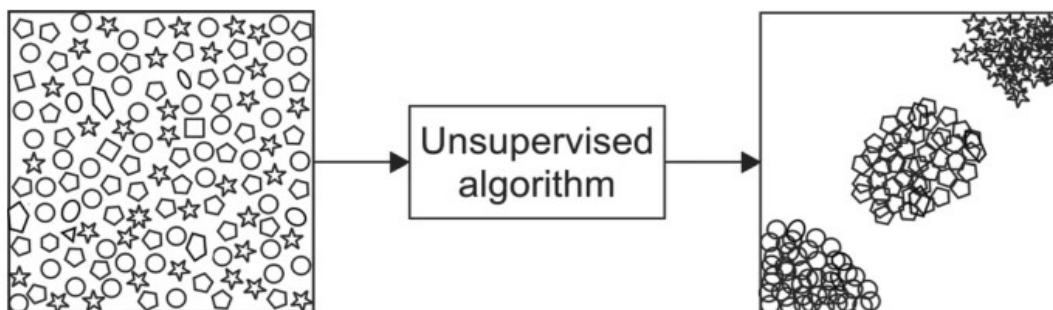

Figure:1 Supervised learning algorithms

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An algorithm is normally created by employing a dataset that contains several variables and an appropriate result. When performing some operations, such as object recognition and language processing, a feature selection is required. A feature picker chooses out qualities from the dataset that can be expressed numerically and recognized by the algorithm. For example, the color of a pixel or the number of times a particular word appears in a text are both characteristics that may be measured. Examples of outcomes include a malignant or benign cancer on an image or recorded interview replies that suggest a vulnerability to mental health problems.

3.2 Unsupervised Machine Learning

The result of unsupervised learning is not predetermined like that of supervised learning. Algorithms search for patterns in unsupervised learning without the user's input. When compared to supervised procedures, unsupervised techniques serve as exploratory tools to find patterns or clusters that exist in datasets. Proposed method, latent Dirichlet analysis, and t-Distributed Nonlinear Neighbour Embedding are all methods for reducing dimensions (t-SNE) Even though this study focuses on supervised machine learning (ML), unsupervised Deep learning methodologies are also considered. To reduce the amount of characteristics in an analysis, however, unsupervised methods are sometimes utilized along with the methods described above. Problems like as multiple-collinearity or excessive computing costs can be avoided by compressing the information in a dataset into smaller features, or dimensions. Unsupervised dimension reduction technique is illustrated in Figure 1.

Figure:2 A visual illustration of an unsupervised dimension reduction technique

The algorithms employed in unsupervised learning approaches are comparable to those used in traditional statistics for clustering and dimension reduction. Numerous unsupervised learning approaches are derived from Principal Component Analysis and Factor Analysis.

3.3 Major Difference between Data mining and Machine learning

- Introduce data mining techniques with a two-component approach. Database and machine learning are the first two. The database provides data administration tools, whereas machine learning gives data analysis methods. Algorithms, however, were utilized to introduce machine learning methods.
- To obtain useful information, Data Mining makes use of a larger number of data points, and these data points will help anticipate future outcomes. Machine learning, on the other

hand, does not rely heavily on data, as in the case of a marketing organization that uses previous year's data to estimate sales. It is based on algorithms. Machine learning algorithms are used by many transportation companies, like OLA and UBER, to calculate ETA (Estimated Time of Arrival) for rides.

- Data mining is not capable of self-learning. It follows the guidelines that are predefined. It will provide the answer to a specific problem, but machine learning algorithms are self-defined and can alter their rules according to the situation, and find out the solution for a specific problem and resolves it in its way.

- The main and most important difference between data mining and machine learning is that without the involvement of humans, data mining can't work, but in the case of machine learning human effort only involves at the time when the algorithm is defined after that it will conclude everything on its own. Once it implemented, we can use it forever, but this is not possible in the case of data mining.

3.4 Paraphrase extraction Methods

The process of extracting a paraphrase is as follows. After parsing each sentence in a pair with KNP2, linguistically well-formed dependency tree fragments are recovered.

Candidate phrases will be used to refer to the dependency tree fragments that were extracted. All leaf nodes must be nominal, and all constituents must be sequential in the sentence in order to be considered as candidate phrases for the predicate phrase category. As a predicate, KNP determines if each candidate phrase is predicated by its morphological placement.

BM method: The BM procedure evaluates as follows when dealing with parallel sentences, such as several translations of the same source text. In the first step, it collects from the comparable phrases identical word pairs and their surroundings as positive instances, and those of dissimilar word pairings as negative examples (POS N-grams with indices denoting corresponding words throughout associated contexts).

SMT method: When given a collection of two sentences that are translations of each other, our SMT approach extracts a phrase table using Moses that has two phrase pairs that are translations of each other. For monolingual parallel sentence pairings, it should provide a set of two phrases that are paraphrases of one another. In this experiment, all parameters were set to their default levels. According to Moses, we ranked the extracted phrase pairs based on their product of two phrase translation probability in both directions.

Mrt method: A method to extract paraphrases from two manual dictionaries has been proposed. If two definition sentences for the same word differ from each other, then the difference is considered a paraphrase possibility, according the system. An unsupervised scoring approach that implements their assumption is used to rank paraphrase candidates. When a paraphrase candidate is surrounding by infrequent strings and/or appears numerous times in the data, they assume that it is a viable paraphrase.

3.5 Compared Algorithms:

In this section, we provide a quick overview of the algorithms we compared in this work. A feature vector (x) and its related label (y) are used to extract topic keywords from a comment. Predicting its y label for a given x comment is the challenge.

Naïve Bayes: Since all features are considered independent, NB makes the following assumption: Thus, it is known as "Nave." Formula for Bayes' theorem:

$p(y|x) = p(x, y)/p(x)$……………. (1)

$p(y|x)$ is the class parallel to classify y into distinct classes based on the features vector x, $p(y)$ is the class prior, and $p(x)$ is the probability that instance x will be observed. As an input, the method takes a set of feature vectors (x) and outputs labels (y) in the feature space (X). Data are classified using a maximum likelihood conditional probability model.

Logistic Regression:

When dealing with a classification problem with two outcomes, LogR uses probability. Prediction models for classification problems produce values between 0 and 1. It will be classified as class one if it exceeds the threshold, otherwise it will be categorized as class two. The following is the equation for the Logistic Function.

$$y = f(x) = \frac{L}{1 + e^{-k(x-x_0)}}$$ ………………….. (2)

4. PROCESS PARAMETERS OF DATA MINING AND MACHINE LEARNING APPLICATIONS

It is the process of extracting information from large datasets. Data mining is a technique for recognizing patterns in a data set that are precise, innovative, and helpful. It is a subset of business analytics and is comparable to experimental research in its approach. Databases and statistics are at the foundation of data mining.

Authors	Study	Methods	Conclusions
Ashok Kumar Behera (2011)	Analysis and Design of Software Visualization Tool for the Behavior of Object-Oriented Programming	This research will investigate similar tools, as well as the product design of our Software Visualization, which focuses on class diagrams with properties and operations in object-oriented programming.	These systems are meant to provide a wide range of object-oriented computing environments. This tool is already in use in our lab. This course will be most advantageous to research students and industries who use C++ programming as a computer language.

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Amirah Mohamed (2015)	Data Mining Techniques for Estimating Academic Performance was presented at the World Conference on Information Systems.	As a means of student achievement, a thorough literature review on data mining methods for predicting student performance is presented.	In summary, the meta-analysis of student performance evaluation has motivated us to conduct additional research that can be used in our environment.
Swapna Gottipati (2018)	Students' feedback is analyzed using text analytics to identify program enhancement suggestions.	Existing text mining and data prediction models are incorporated into the solution.	Students' emotions and input will be captured in class, and deep learning will be used to unearth insights that can be used by faculty to enhance teaching approaches.
Abdallah Namoun (2021)	Predicting Student Performance Using Data Mining and Learning Analytics Techniques:	To classify student performance, regression and supervised machine learning models are most often used.	To implement the recommendations concerning (1) the prediction of program-level outcomes and (2) validation of the predictive models using multiple datasets from different majors and disciplines.
Karunendra Verma (2016)	To study the Data mining methods are often implemented for analyzing available data and extracting	The implementation of data mining methods and tools for analyzing data available at educational institutions, defined as Educational Data Mining (EDM)	The results of applying selected data mining methods for classification to the academic sample data demonstrate that the accuracy rates are not extraordinary (vary between 52-67 percent).

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Aysha Ashrafa (2018)	To evaluate the effectiveness of data mining techniques in predicting student performance.	study of various recently used data mining techniques, classification algorithms,	Improvement of student performance and enhancement of quality of education is of utmost importance for all educational institutes.
Astha Soni (2018)	Students' performance can be predicted with the help of data mining techniques	When modeling the relationship between dependent and independent variables, the regression approach can be used to analyze the data.	To conduct out an additional test that will be used in our academic institutions. It is therefore possible to use this model to evaluate student performance in a reasonable manner in the educational system.
Durgesh Ugale (2020)	To Student performance prediction using data mining techniques	In order to learn the improves communication function, we use four types of categorization models. As a result of the models, experimental study is conducted.	Universities/institutions need improved assessment, analysis, and prediction technologies in order to better administrate and serve their immigrant communities.
P. Kavipriya (2016)	Predicting Students' Academic Performance Earlier, Using Data Mining Techniques	Researchers employ data mining methods to evaluate given data and uncover unknown facts and knowledge, which helps them make more informed decisions.	In the subject of education, numerous classification and clustering applications are used to improve prediction speed and accuracy.

Sayana T S (2015)	To measure the connection between various attributes which will help to develop the student's academic performance	K-means is the most used method of clustering prediction. The students are automatically clustered using the K-means technique. Students' performances are classified using this technique.	When using K-means clustering, this dynamic method can deliver more accurate results. A more efficient and less time-consuming system is the result. We'll have to find a system that's more effective than the present approach.
Vinod Kumar Patel (2020)	Data Mining Techniques for Predicting Student Performance	Data Mining is one of the efficient methods for predicting student 's performance in large educational databases.	Neural Network, Decision tree, Naïve Bayes, K-Nearest Neighbor and Support Vector Machine are the classification methods used for prediction of student performance
HANAN ABDULLAH (2020)	To help organizations in admissions decision making, this paper investigates how data mining techniques can be used to predict applicants' academic performance at university.	Currently, researchers employ EDM to evaluate and predict educational achievement due to its importance in decision making.	Student CGPAs that were excellent or very good in their first year increased by 31 percent when the new entrance weighting scheme was introduced.
S. MAHESWARI (2020)	To study the Predicting Student Performance Using Deep Learning Technique	The proposed methodology denotes the classification algorithms for analysis from the	The multi-class logistic regression algorithm gives better performance in the predicted outcome

		student dataset to the predicted outcome	
J. Preethi, S. Maheswari (2020)	Student Performance System using Machine Learning Techniques	Educational Data Mining Techniques make life simple and more practical to improve a student's performance and success. Educators and educational institutes could earn and suffer from data mining techniques.	Data Mining approaches have become more popular as they produce categorization rules that are easier to implement and analyze.
Asiah Mat (2019)	To develop the best prediction model, a large number of factors were selected and tested to determine the most influential characteristics.	Good input data and variables, a suitable predictive method and a powerful, robust prediction model are all required for an effective predictive model to be developed.	Most mixed approaches are used to give a robust mechanism with a greater prediction accuracy model.
Lakshmipriya. K (2017)	To study comprehensive literature review and classification methods for data mining techniques applied to academic information	The Data mining techniques, namely Decision Trees, Naive Bayes	This study will also work to identify those students which needed special attention to reduce fail ratio and taking necessary action for the future career
Amirah Mohamed Shahiri (2015)	to provide an overview on the data mining techniques that have been used to predict students'	To performance by using data mining techniques is proposed to improve students'	the meta-analysis on predicting students' performance has motivated us to carry out further research to be applied in our

	performance.	achievements	environment
Akanksha Gujar (2020)	To study the Predicting Student's Performance using Data Mining Techniques	In the proposed system we will build a performance predicting model using data mining technique	It is expected that the Naïve Bayes algorithm outperforms the Random Forest Algorithm. This study will help both the college and the students to boost the performance.
Dr. Anjali B Raut (2017)	As part of their research, they used segmentation techniques such as decision trees to measure student performance.	In other words, we wanted to be able to assist students towards a high score that they would like obtaining.	It is possible to increase student performance by extra coaching and counseling by analyzing individuals at risk of low performance.
Mr Prakash Varma (2020)	Identify distinctive DM techniques for predicting the pupil's overall performance in academics	In EDM, predicting pupil instructional overall performance usually, we use predictive modelling	Students, teachers, administrators, and officials can all benefit from our educational device by following college students over time.

5. CONCLUSIONS:

Machine learning algorithms are discussed in this article. Machine learning is currently being used by everyone, whether they are aware of it or not. From getting a product recommendation when buying online to upload images on social networking sites, even though the analytical algorithms are developed more quickly, their performance depends on the specified characteristics. Deep learning algorithms produced high accuracy but at the cost of a more extended training period. Of the two deep learning algorithms compared, Att-LSTM performs the best across all criteria. Because constraints may be overcome, a combination strategy may perform better than a single approach. Moreover, the results were affected by the quality of the data. Moreover, machine learning algorithms have shown promising results in a wide range of application domains during the past few years.

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