

**Exam Question Classification Based On Bloom Taxonomy  
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This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of  
Science in Computer Science and Engineering

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**DAFFODIL INTERNATIONAL UNIVERSITY**

**DHAKA, BANGLADESH**

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## **APPROVAL**

This Project titled “Exam Question Classification Based On Bloom Taxonomy”, submitted by Taslima Akter, Most. Rokeya khatun and Sahariar Islam to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering (BSc) and approved as to its style and contents. The presentation has been held on 28<sup>th</sup> January 2021.

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## DECLARATION

We hereby declare that, this project has been done by us under the supervision of Mr. Raja Tariqul Hassan Tusher, Lecturer, Department of CSE Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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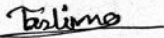
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## **ABSTRACT**

Examination has an important role in the process of learning. The assessment of examination is important in educational institutions because examine is one of the most common ways to assess student achievement in a particular field. Therefore, there is a crucial need to create a balanced and high-quality test, which satisfies different levels of comprehension. Therefore, many educators rely on the understanding field of Bloom's taxonomy, which is a popular framework designed to examine students' skills and abilities. There are several proposed activities to automatically manage the classification of queries according to Bloom's taxonomy. Most of these activities classify questions according to a specific domain. As a result, there is a shortage of questionnaires for multi-domain sites. The purpose of this paper is to introduce a classification model to separate exam questions based on Bloom's tax administration in multiple areas. Here, the difficulty level of each question deposited in the question paper is determined from the criteria of keyword/s found in the question. A knowledge-based approach and text mining technique will be used to identify and extract information and keywords from textual content in the exam paper. using the prototype system developed, an illustration of the overall analysis for level of difficulty of examination question paper will be obtained. The outcome of our idea should be significant in classifying questions from multiple domains based on Bloom's taxonomy.

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# CHAPTER 1

## Introduction

### 1.1 Introduction

Assessment is a vital part in the process of learning and also teaching at every education levels. The main usefulness of classroom evaluation is to improve the process of learning. It plays an elemental role in assessment how students' competency in any educational platform. It helps the student in the long run in there near future, so we can say that any evaluation system will decide what learners learn and how they will do this. A learner learning style and behavioral can be developed based-on the examination result.

Many types of assessment procedure are available like written exam, viva exam but written exam is the most popular and renowned way of evaluating student. For assessment of student, when an examination is taking place question paper plays there a vital role to make the process of assessment solid. A solid assessment paper must have various kind of problem levels to tolerate the different capability of the examinee. This is a part of categorization of the examinee into different levels like weak medium or strong type of students. We can apply some guidelines to have the most expected result from it. Therefore, this project tries to follow Bloom's Taxonomy concept in making the best assessment question paper.

## **1.2 Motivation**

Examination is always a part of our life. We all have to go through examinations. As it is a vital part in the process of learning. To know how a student is performing in any area of education in any educational institute examination is very important because examine is one of the most common ways to assess student achievement in a particular field. If we could upgrade the examinee method then it will be easy and reliable to do the assessment. We are trying to create a quality full and solid test, which will fulfill the purpose of different levels of comprehension. The outcome of our idea should be remarkable in categorized questions from various domains based on Bloom's taxonomy.

## **1.3 Rationale of the Study**

Machine learning is a very common topic now a days and its field is also getting broad now-a-days. And the demand of machine learning in various field is also increasing. Like many others data scientists are working with it and they need it, data scientists need it because machine learning can make better decision and take many kinds of smart action according to situations without any kind of help of human.

To analyze large data qualifications machine learning helps the most as a technology, It makes the work easy for the data scientists by doing the work as its own by default and gains more recognition and trust. Machine learning replace the procedure of extracting the data and interpreted by including default sets of standard methods which has been replaced by some previous techniques of mathematics.

## 1.4 Expected Outcome

We are doing this project to solve the proposed problem and implement the methodology in to the system of assessment in examinations. The initial objective of the project is to solve the problem and propose a methodology which can make the assessment solid and trust worthy, which can make the process more accurate and remarkable. There are also some minor or secondary objective in it. The secondary objectives are should be solved also as the following ones:

- To make effective & skillful questions by understanding the level of Students Capability
- The system will also tell about the qualification of question's
- It will help teachers to understand that type questions are appropriate for which level of0 students.

## **1.5 Report Layout**

### **Chapter 1:**

In chapter 1 we have the problem summary, then the objective of the project, motivation and then the introduction.

### **Chapter 2:**

In this chapter we have the background and the related works. We also have discussed about the related works about the project, scope of the problems and also research summary. We faced some difficulties while making it which is described in this chapter.

### **Chapter 3:**

This chapter includes the techniques what we have used in the research in broad. It also tells us the methodology as well. Data collection process and implementation requirements is also a part of this chapter.

### **Chapter 4:**

Process of implementation laid in this chapter. The proposed methodology has been implemented into a python script. we used diagram and contents to show the implementation of the proposed methodology and we have described it in detail.

### **Chapter 5:**

From our research we have got some findings and also the outcome after the research which is described in this chapter briefly. The detailed description with statistical analysis and also accuracy of the findings is given in this chapter.

### **Chapter 6:**

In the last segment which is chapter 6 have the conclusion, future scopes and limitations of the project.

## CHAPTER 2

### 2.1 Background

We are working with a system called Bloom's taxonomy. It is a technique of categorization of educational purpose which is basically based on the class of student comprehension required for success or comprehension. Education researcher Benjamin Bloom have proposed 6 different categories of learning by simple reading from simple memory or factual identification, such as the lowest level, the most abnormal and abnormal levels of cognitive, to the highest level, which is considered experimental.

Everything in the world is being digitalized. Assessment methods of students is also demanding digitalization in it. Peoples are showing interest on digitalized assessment system depends in bloom taxonomy. In search of digitalization many kinds of methods are being used such as semantic features, lexical features, syntactic features. If we look into other perspective, some of their initiative were based in specific domain, but in Bloom's taxonomy there are some difficulties on classifying questions.

As we said before, the main purpose of our project is to present a method which can make the assessment balanced and high-quality with the help off bloom's taxonomy, which satisfies different levels of comprehension.

### 2.2 Related Work

- Automatic applying Bloom's taxonomy to classify and analysis the cognition level of English question items [1]: This is kind of a similar works to us. But there are some drawbacks in this system. Since in that research there are no use of Recall, Precision or F1 Score calculation then the accuracy of the research methodology is not up to the mark. In terms of accuracy, we have worked more and we have calculated all the F1 scores for every calculation.



### **2.3 Research Summary**

As we are working with blooms taxonomy we learned and inspect it and some activities which shows us a clear image what we have to solve. To get the better outcome and result, in this research used other researchers work, also mathematical delineation of others works. Our research tells that there is a pivotal need to create a solid and trustable test, which pleased various levels of comprehension. We also came to know that we can take the research for future development We are fully sure that this system has the best correctness in any type of test. Then again, there are some draw back also and some challenging things and specific performance measures. We will discuss it broadly here.

### **2.4 Scope of the Problem**

The problem that will pop up in future will be covered most of them by the scope of the problem. The assessment of examination is important in educational institutions because examine is one of the most common ways to assess student achievement in a particular field. If the questions paper analysis methods are improved, the education will. So, the questions paper analysis methods used by Educational institutes in their examinations need to be continuously examined and improved. The analysis of the existing question papers is the small step towards improving the quality of testing. That is why we need solid and quality full test, which persuade different classes of comprehension. If we continue our research, we can make this sector more improved and updated

In our project we used dataset containing 6 types of question. As our data is very rich it is therefore a good way to do some more research, and to discover some pattern in the set of data.

## 2.5 Challenges

We are working with a complicated problem which is not easy to solve, many secondary problems also pop up which is also have to be solved. We needed a variety of questions and we checked to see if the details are good for work. Data collecting and question picking were difficult to do here. It was a daunting task to do.

There were some questions which were not for our work. So, we have to cleaned those up. Cleaning data is not easy with a large number of details. Another critical task was to integrate blossom tax exploration with machine learning & python.

A major challenge for this project is the percentage of accuracy of the information provided. A good level of accuracy can represent a good result, so it is a very important task to calculate the accuracy.

## CHAPTER 3

### Research Methodology

#### 3.1 Introduction

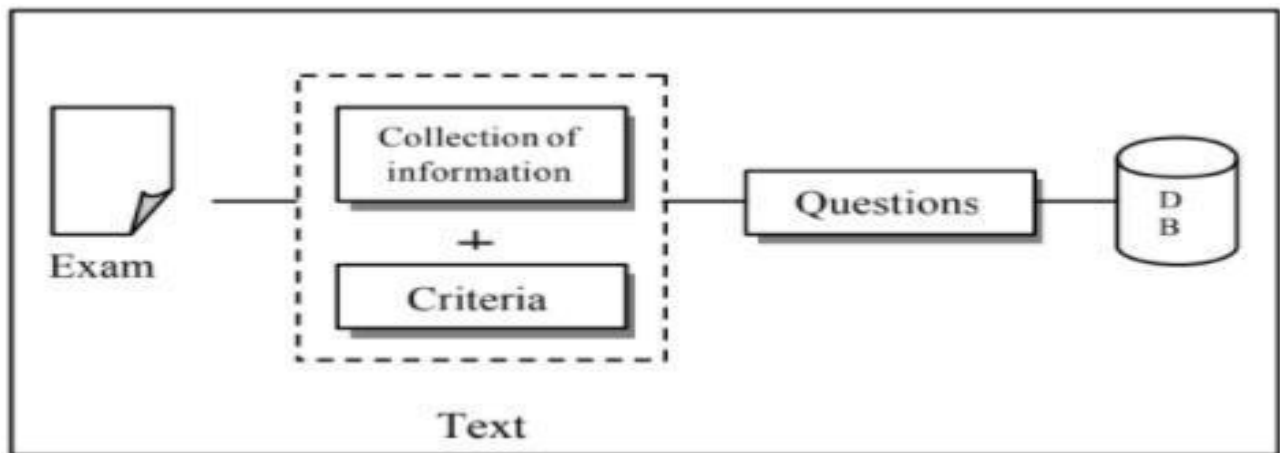
In this chapter we will describe about our detailed process and approaches of our project also data sets to solve a specific problem. After researching all the current activities and methods we found our own way on how to get what we want.

#### 3.2 Research Subject and Instrumentation

**Domain:** There are three learning areas. These are the domains of learning to think (think), communicate (social / emotional / emotional), and psychomotor (physical / kinesthetic) domain, and each of these has a taxonomy associated with it. Taxonomy is just a term for division. Then again, our approach only works in English. There are several reasons for choosing English as our first language. All tools, packages, algorithms and data sets are available more than any other language in English. It even increases the chance of bringing positive results to the problem. That is why, our preferred language is English.

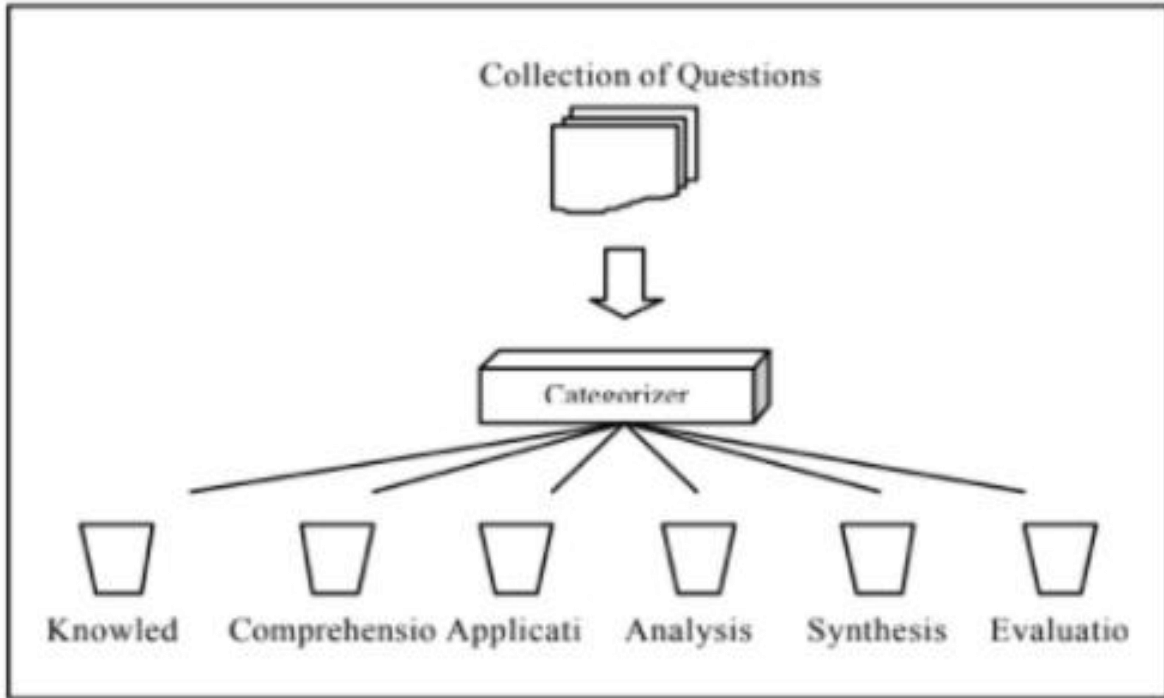
**Instrumentation:** we need to go through other steps to bring about the best result. There are various steps, algorithms used in our method. Data processing and analysis have many algorithms used, the ones mentioned briefly-

**1. Text Extraction:** Text extraction means extracting data from a general sentence. Such as, getting some real keywords and gist of the text from the user input which is a general question. In this process, we have extracted the data from exam questions and created a collection of information then made a criterion out of it to create a question collection as a whole and stored them in our text data base to use as our data set for the desired machine learning model. The figure 3.1 given below shows the steps of every process,



**Figure 3.1: Text Extraction Process**

**2. Text Categorization:** Text categorization means, separating or categorizing the text data into our six bloom taxonomy levels. Since, we are mainly working on the Bloom taxonomy text categorization. Basically, in this categorizer we have put all of our extracted data as we have discussed on Text Extraction para, the data base of questions data is put into this categorizer to categorize the questions into the six different levels. Such as, Knowledge, Comprehension, Application, Analysis, Synthesis, Evaluation. So, the main task of this categorizer is to categorize the questions into six different bloom taxonomy levels. The figure 3.2 given below demonstrate the whole workflow of this categorizer.



**Figure 3.2: Text Categorization Process**

### **3.3 Data Collection**

To collect data, we had to go through a hard process for collecting our desired data for our machine learning model. Since, we were working on the real-life questions which are being used in exams those data were a bit challenging to find. Then we tried our best to collect data from our various university question banks and open-source data providers who are copyright free. So, we had to

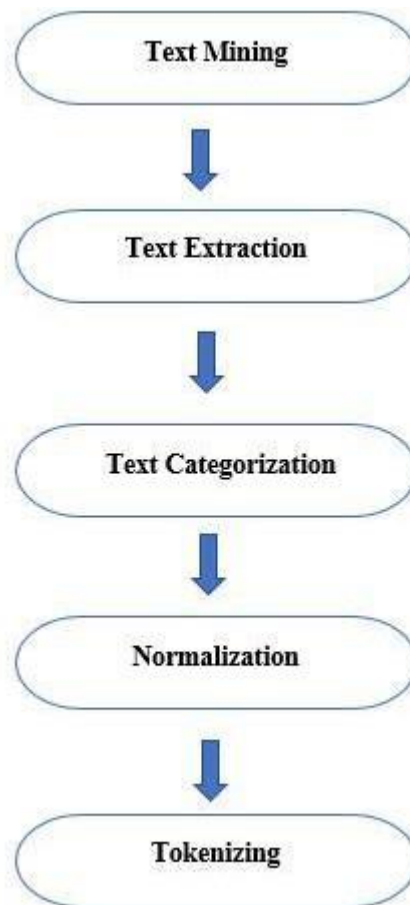
search various open-source data and collect them manually to train the machine learning model. Since, we were working on bloom taxonomy classification, so we had to make sure that the data classifies in all six different levels to bring out the best result out of it. That's why we tried so hard to collect data perfectly.

**Data Source:** The database is collected from Kaggle's open-source data source provider site. There is total 700+ approximate question to train the model and those questions are categorized in six different levels. So, every level has on an average 120+ questions. The questions dataset is labeled and categorized into six Blooms Taxonomy categories.



### 3.1 Data Pre-Processing

Data pre-processing is basically the previous steps of Data Processing. Data processing or cleaning is the most important part to train the Machine Learning Model. We needed a clean data to bring the best result from the model. Usually, the data we get are full of punctuations and unwanted data and Natural language data. But we need to change the data into a cleaned data which are stop words and punctuation free. To make this type of cleaned data we need to pre-process the collected data.



**Figure 3.4: Data Pre-Processing Procedure**



very first step to clean the data, we need to remove unwanted data, such as Punctuation marks, Stop words, Number, Non-English words etc. If we do not remove this part from the data then training

data will not be able to make the model predict best result from the given input. For this reason, we had to remove all of the unwanted data.

For example, If the question 'Define OOP.' Which is the level knowledge level question, and the question 'In your own words, definition of the Object-Oriented Programming' is the level of understanding.

After removing all the unwanted data and punctuations from the data, we need to tokenize the words from the dataframe of the cleaned data to make sure that, everything works perfectly. Tokens will be made by breaking the sentence into pieces by white spaces. These tokens will make the data set a bit more processed and cleaned to train the model properly.

After tokenizing, the step to pre-process data is POS tagging. Pos tagging means, tag every word as their relative parts of speech and make the data set more processed. POS tagging is also an important part to make the dataset cleaned and results oriented.

The final step of consideration is the process of removing the prefix and suffix from the sentences to restore the name to its original pair. Such as, waiting, waiting, and waiting after graduation will wait.

## 3.2 Data Processing

Machines cannot comprehend raw text data. Devices can only understand real numbers such as 0 or 1. In particular, mathematical techniques such as machine learning can calculate the real numbers only. Therefore, we need to convert our real-life text data into real life numbers.

There are different ways to convert text into their corresponding numbers. Models such as, **Bag of Words**, **Word Embedding** are two of the most widely used models.

In this project, we have used the first one. Which is Bag of Words model to convert our pre-processed text data into numbers.

To use the Bag of Words model we had to use **Scikit Learn**, a popular python library to convert the text into words and by the help of Scikit Learn we can use the Bag of Words model.

Scikit Learn can be used as Sklearn and it has a vector which is called as CountVectorizer() section from the library **sklearn.feature\_extraction.text**.

To use this vectorizer and library there are some important parameters need to be passed to the category builder. The first one is the **max\_feature** parameter, set to 1500. Because when we convert words into numbers using a word bag, all the texts can have minimum 10 thousand of words for each text which is huge. And there are many redundancies in the words. So, to have a generous and enough amount of data we had to set the max\_feature to 1500.

Another parameter is **min\_df** and which is need to be set to 5. This works as the minimum number of documents that should contain this feature. We therefore only include those words found in at least 5 texts.

As like as, with **max\_df**, the value is set at 0.7. The value of max\_df works as a percentage. The percentage can of words will be taken from the data. 0.7 means 70% of the text will be taken form the document for the data processing.

Finally, we need to remove the stop words from the text data. To remove stop words we move the **stopwords** from the **nlk.corpus** python library to the **stop\_wordsparameter**. Here, the function called **fit\_transform()** which is a function of the CountVectorizer section converts the text into numerical text.

The word of bags method is a very good method to change the text into numbers but it has one drawback. Which is It does calculate that the word may also have a high frequency in other texts.

Here comes the solution. **TFIDF**- The TF stands for "Term Frequency" while the IDF stands for "Inverse Document Frequency".

TFIDF solves this problem easily. It increases the frequency of every conflicting words automatically so that it doesn't get missed.

To apply the TF-IDF we need to calculate Term Frequency and the inverse document frequency. Formula to calculate this two are following,

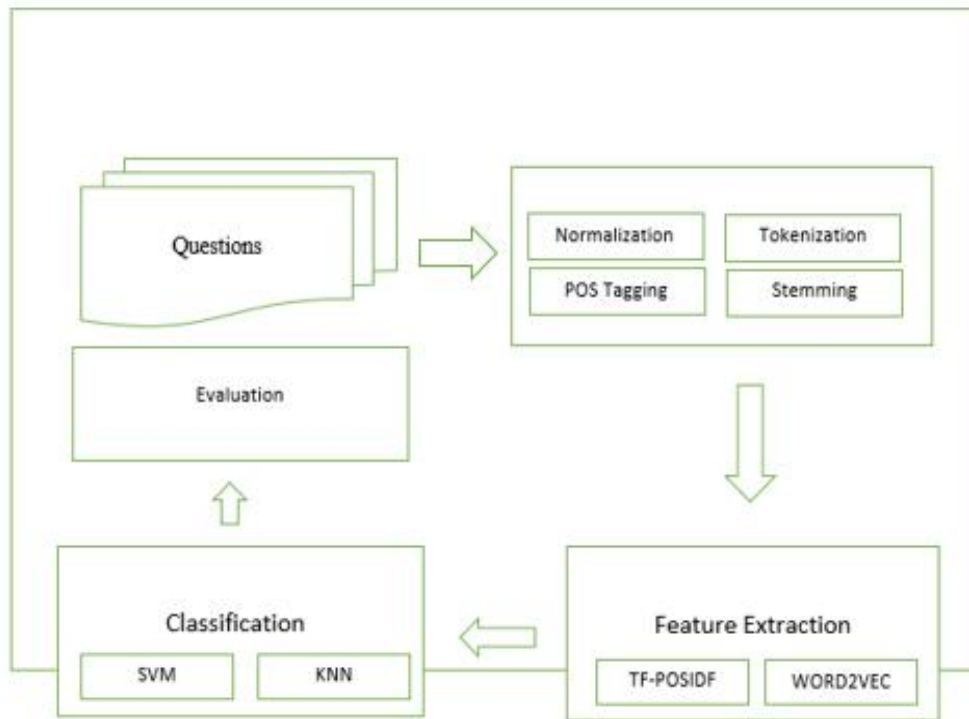
**Term frequency = (Number of Occurrences of a word in the document) / (Number of Total words in the document)**

**IDF(word) = Log((Total number of documents) / (Number of documents containing the word))**

**Code to convert the value into TFIDF:**

```
from sklearn.feature_extraction.text import TfidfTransformer  
tfidf_converter = TfidfTransformer()  
  
X = tfidf_converter.fit_transform(X).toarray()  
  
print(X) ##this will print the TF-IDF value
```

**3.3 Research Procedure:** In this process, we have used several procedures to reach the final step. There are various steps to be performed to get the actual result from the research. The full scenario can be viewed as a whole on the fig 3.6 given below.



**Figure 3.6: Whole process of finding research outcome.**

**Questions:** This step means, the collection of questions data we have made by collecting from different sources. This question collection denotes a database to be used to train the machine learning model which will make the model to predict the expected output. But before that we need to process the data, which is the following step.

**Data Processing:** Here in the fig, we can see a whole section of Normalization, Tokenization, POS Tagging, Stemming. These are the process to process the data for training the model.

**Feature Extraction:** Here in this section, it denotes we had to change the text data into numeric values so that machine can understand that properly. To do so, we used Word2Vec and TF-IDF which I have explained earlier how this two works together as a whole.

**Classification:** Here comes the mail classification part, where we have used the algorithm to classify the data into six different levels using two machine learning algorithms which are **SVM** and **KNN**. I will describe about the algorithm's later.

**Evaluation:** This steps mainly holds the evaluated result from the all of those process we have followed all over the research.

### 3.4 Applying Algorithm

In this research, to classify the question in six Bloom’s Taxonomy Level, we used mainly two Algorithms. Which are **KNN – Nearest Neighbor** and **SVM- Support Vector Machine**.

**LR-Logistic Regression** was used to classify make the classification even better. So, we can count this one also but we didn’t use this algorithm fully.

#### 3.7.1 KNN-Nearest Neighbors

The Nearest Neighbors KNN algorithm is a widely used machine learning algorithm to solve classification problem. Hence, we were working on a

classification problem, which gets used to classify the question into six different levels according to Blooms Taxonomy. The distance functions need to be calculated to do so. The equation solves the classification problem.

**Distance functions**

Euclidean	$\sqrt{\sum_{i=1}^k (x_i - y_i)^2}$
Manhattan	$\sum_{i=1}^k  x_i - y_i $
Minkowski	$\left( \sum_{i=1}^k ( x_i - y_i ^q) \right)^{1/q}$

#### 3.7.2 Logistic Regression

Logistic regression is basically a statistical method to analysis logistic regression. We needed to calculated the regression for our classification models. The equation of logistic regression is given below,

$$P(c|x) = \frac{e^{\sum_{i=1}^n f_i(c,x)w_i}}{\sum_{c'} e^{\sum_{i=1}^n f_i(c',x)w_i}} \quad [11]$$

### 3.7.3 Support Vector Machine

Support Vector Machine (SVM) is a machine learning algorithm based on supervised learning.

This algorithm is used for both editing or deceleration challenges.

Assignment of N data points from the training set questions  $\{x_i, y_i\} \ i = 1, \dots, N$ , where  $x_i$  is the input elements of the  $i$ -th (e.g. pattern), and  $y_i$  is the class label of the  $i$ -th question. The SVM kernel equation line can be written as follows

$$y(x) = \text{sign} \left[ \sum_{i=1}^n \alpha_i y_i \theta(x, x_i) + b \right] \quad [12]$$

where  $n$  is the number of support vectors,  $x_i$  is the pattern of  $i$ -th question,  $y_i$  is the class label of the  $i$ -th question, and  $\theta(x, x_i)$  is linear kernel function, which can be written as:

$$\theta(x, x_i) = x_i^T x \quad [13]$$

### 3.5 Implementation Requirement

Software and Hardware requirement in details to run this model properly:

#### Software Requirements:

##### Operating System

- Windows - Windows 10
- 
- Linux - Ubuntu 19.04



## Required Environments

- Anaconda
- Python

## Packages

- TF-IDF
- Stanford Core-nlp
- Tensor Flow
- Pandas
- Scikit Learn
- Vector

## Hardware Requirements (minimum):

**Storage:** At least 20 GB of Hard Drive space.

**Memory:** Minimum 6Gb of physical memory (RAM).

**Processor:** CPU with minimum 3 cores and 3.0 Ghz clock speed

## **CHAPTER 4**

### **Experimental Result and Discussion**

#### **4.1 Introduction**

This chapter expresses the experimental results. Results we have got by using machine algorithm and various packages.

#### **4.2 Experimental Result**

As we told earlier, our problem was to analyze different types of questions. we want to learn a machine what type of question it is. For that we go through different type of methodology like text mining, text extraction, Text Categorization etc. Then we applied our algorithm and analyzed the questions.

#### 4.2.1 Result Table of TF-IDF and W2V of our collected Data:

CL(Cognitive Level)	Recall	TF-IDF Precision	F1 Score	Recall	TF-POS-IDF Precision	F1 Score	Recall	W2V-TF-POS-IDF Precision	F1 Score
Knowledge	0.926	0.795	0.845	0.907	0.719	0.840	0.939	0.806	0.853
Comprehension	0.736	0.834	0.808	0.832	0.815	0.824	0.070	0.901	0.843

Application	0.664	0.822	0.739	0.827	0.871	0.842	0.861	0.844	0.858
Analysis	0.875	0.686	0.762	0.901	0.831	0.861	0.922	0.811	0.869
Synthesis	0.683	0.791	0.733	0.721	0.786	0.759	0.783	0.811	0.793
Evaluation	0.632	0.860	0.721	0.752	0.918	0.822	0.724	0.941	0.818
Average Weight	0.768	0.782	0.768	0.831	0.842	0.831	0.856	0.862	0.855

**Table: 4.1**

Based on the results shown in Table: 4.1, it can be seen the Bloom's comprehension levels using the converted TF-POS-IDF feature, as performance has increased from all aspects. The effects of W2V-TF-POS-IDF-proportional variation effects exceed the modified TF-POS-IDF factor.

**4.2.2 Result Table of SVM with our collected Data:**

CL(Cognitive Level)	Recall	TF-IDF Precision	F1 Score	Recall	TF-POS-IDF Precision	F1 Score	Recall	W2V-TF-POS-IDF Precision	F1 Score
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Knowledge	0.831	0.888	0.850	0.823	0.914	0.834	0.875	0.970	0.930
Comprehension	0.863	0.788	0.834	0.917	0.887	0.937	0.847	0.896	0.810
Application	0.177	0.328	0.221	0.454	0.696	0.341	0.329	0.723	0.410
Analysis	0.757	0.692	0.635	0.840	0.636	0.685	0.942	0.843	0.881
Synthesis	0.920	0.711	0.732	0.930	0.717	0.836	0.920	0.815	0.851
Evaluation	0.645	0.813	0.719	0.760	0.927	0.831	0.849	0.863	0.829
Average Weight	0.712	0.702	0.678	0.769	0.812	0.746	0.824	0.850	0.813

**Table: 4.2**

Tables: 4.2 shows the SVM algorithm result on our algorithm.

### **4.3 Descriptive Analysis**

The result data table shown above table 4.1 and 4.2 shows the performance metrics of our machine learning model on our collected data. Since we have used TF-IDF and SVM. We have shown the result including Recall, Precision and F1 Score calculated using those algorithms on our collected data.

### **4.4 Discussion**

The results calculated using our machine learning models shows the accuracy of our machine learning model using different types of collected data and bloom's taxonomy classification. Our machine learning model can classify every question into different cognitive model using Bloom's Taxonomy. This result has been calculated solely upon the collected data and the results and accuracy can be gotten higher using more training data as well.

## **CHAPTER 5**

### **Development**

#### **5.1 Summary**

From this machine learning model, we have made a system. In this system it has a strong UI. If we put questions here, it can classify those questions and tell us what was the qualification of that question.

#### **5.2 Web interface**

There are 3 domains of learning

1. Affective
2. Psychomotor
3. Cognitive

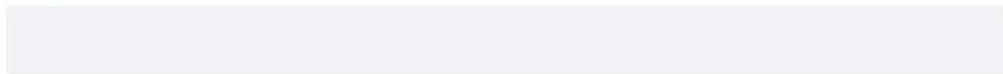
From three domains of learning, the cognitive domain requires the development of cognitive skills and knowledge. The procedural patterns, recognition of specific facts, and concepts that serve in the development of rational skills and abilities include in it.

Six crucial categories of cognitive processes are available here, the simplest ones are in the front following the complex ones.

## Exam Question Classification based on Bloom Taxonomy

Classification Classes: analysis, application, comprehension, evaluation, knowledge, synthesis

Question:



**Figure5.1 User Interface**

1. **Knowledge:** Draws out factual answer, testing recall & recognition of specific facts. State, Recall, Tell List and Name.



# Exam Question Classification based on Bloom Taxonomy

Classification Classes: analysis, application, comprehension, evaluation, knowledge, synthesis

Question:

What is OOP?

Prediction: knowledge

**Figure 5.2: Level Detection (Knowledge)**

2. **Comprehension:** Students must be able to rephrase information using their own statements and translate knowledge into new context and interpret graphs, tables, charts and cartoons.

Question verbs: Explain, predict, interpret, infer, summarize, convert, give an example of x.

## Exam Question Classification based on Bloom Taxonomy

Classification Classes: analysis, application, comprehension, evaluation, knowledge, synthesis

Question:

Explain SVM|

Prediction: comprehension

**Figure 5.3: Level Detection (Comprehension)**

**3. Application:** Students are required to identify the relevant information and rules to arrive at a solution and solve problems using known algorithms. Question verbs: How could x be used to y? How would you show, make use of, modify, demonstrate, solve, or apply x to conditions y

## Exam Question Classification based on Bloom Taxonomy

Classification Classes: analysis, application, comprehension, evaluation, knowledge, synthesis

Question:

Apply the theorem

Prediction: application

**Figure 5.4: Level Detection (Application)**

**4. Analysis:** The analysis level requires that students separate an idea into its parts or elements and demonstrate an understanding of the relationship of the parts to the whole.

Question verbs: Differentiate, compare / contrast, distinguish x from y, how does x affect or relate to y?

## Exam Question Classification based on Bloom Taxonomy

Classification Classes: analysis, application, comprehension, evaluation, knowledge, synthesis

Question:

Differentiate between SVM and NLP

Prediction: analysis

**Figure 5.5: Level Detection (Analysis)**

**5. Synthesis:** Questions on synthesis level permit students to devise ways to design experiments and test hypotheses. Students may be required to write a paper and a report in which ideas are synthesized or problems are solved.

Question verbs: Design, construct, develop, formulate.

## Exam Question Classification based on Bloom Taxonomy

Classification Classes: analysis, application, comprehension, evaluation, knowledge, synthesis

Question:

Design SMTP

Prediction: synthesis

**Figure 5.6: Level Detection (Synthesis)**

**Evuation:** Questions at this level require students to make judgements about the value or merits of an idea, purpose, solution to a problem, procedure, method or product. This level requires students to use the other five levels of the taxonomy to varying degrees.

Question verbs: Justify, evaluate, judge x according to given criteria. Which option would be better / preferable to party y?

## Exam Question Classification based on Bloom Taxonomy

Classification Classes: analysis, application, comprehension, evaluation, knowledge, synthesis

Question:

Evaluate confusion metrics

Prediction: evaluation

**Figure 5.7: Level Detection (Evaluation)**

### 5.3 App implementation

In our app implementation we have used streamlit. It is an open-source library works on Python that makes us help to create and share customized web apps for machine learning and data science. As streamlit can make a UI so easily so we used that to create an UI so that user can enter their question easily in the Text filed and get the desired result.



## CHAPTER 6

### Conclusion and Future Scope

#### 6.1 Conclusion

In this project report we have described about the implementation of Bloom's Taxonomy concept as a recommendation in building valuable and solid assessment question paper. Our created system can read and classify those questions and then designate them into various level of class depended on Bloom's Taxonomy. Here after the text mining implemented, all kind off paper of question will be classified into different class of problems and difficulties. What we will get the outcome by our created system, we can use it as recommendation by the assessment question maker to make or set the assessment paper correspondingly. Finally, with the help of Bloom's Taxonomy a question maker can make a quality full assessment paper and can assess the learners in proper way and can know the condition of any student.

In this report we tried to present the methodology of our work, how we did our all the work and its procedure from first to last. We tried our very best to solve the proposed problem and complete the project as expected. As the journey was not easy, we have faced some sort of difficulties, many of them was quite difficult to manage. The field we have worked with is a huge field to learn and that was machine learning and Data mining but for our supervisor who helped us a lot we managed to cope up in all circumstance. As we have done the project as a team, we tried to do everything as a team and make the project visible and happening.

## 6.2 Future Scope

The current project is an example of a basic application to demonstrate the vision and prove the usefulness of automated system using map development and algorithm to simplify human performance and eliminate errors in the paper production process.

To continue expand its operations, the following can be done:

(1) The system to be rebuilt

in a web-based application using PHP, Javascript and SQL database to become interactive, safe and offer the opportunity to show past questionnaires online student references and online questions;

(2) The task of scanning an input and converting it into text is keep multiple questions at a time;

(3) Combined spelling and system check to eliminate anything human input errors;

(4) Look for any repeated questions to avoid duplication;

(5) More language support;

(6) Compliance with MQA;

(7) Automatic paper input is based on conditions provided;

(8) Option to change paper format by Instructor without reference to Admin;

(9) Many output format options such as MS Excel.



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## **Appendix: A**

### **Model Script**

The methodology of research that we have used in this project was execute as a python script. In our project we needed a model and we used python script for it. By calculation we able to know that this model script which is python script is very much convenient to work with it in this project. In spite of all the hard work there are some limitations here but we will overcome it in future.

## **Appendix: B**

### **Open Source Repository**

The open source code of this project is being hold by this repository. We haven't published our research yet, so, the source code of our project is not public yet. It will be available soon.

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