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## "AI-Powered Question Paper Generation With NLP: Streamlining Assessment In Education"

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**Abstract:** In the field of education, the development and generation of question papers play a crucial role in assessing students' knowledge and understanding of various subjects. Traditional methods of question paper generation are often time-consuming and may not fully optimize the assessment process. This paper introduces an innovative approach to question paper generation, leveraging the power of Artificial Intelligence (AI) and Natural Language Processing (NLP) techniques. Our research focuses on the utilization of AI algorithms and NLP models to automate and enhance the question paper generation process. We propose a system that can intelligently extract key concepts and learning objectives from educational materials, textbooks, and curriculum guidelines. These extracted insights are then used to create a diverse set of questions, spanning different levels of difficulty and cognitive skills, ensuring a comprehensive assessment of students' knowledge. The AI-enhanced question paper generation system is designed to adapt to different educational levels and subjects, making it a versatile tool for educators and institutions. The system also offers the flexibility to customize question papers based on specific preferences and requirements.

**Index Terms** - Artificial Intelligence, Natural Language Processing, Natural language tool kit, Blooms Taxonomy Algorithm, Supervised Learning, Random Algorithm.

### I. INTRODUCTION

AI and NLP technologies have revolutionized education and assessment, particularly in the creation of customized and dynamic question papers. Traditional styles are time-consuming and limit question diversity. AI-enhanced question paper generation uses AI's cognitive capacities to understand educational content and NLP ways to produce questions aligned with course objects and difficulty situations. Benefits include different question types and rigidity to course conditions, icing fair and effective assessments. This technology enhances inflexibility, enabling preceptors to produce acclimatized question papers for colorful subjects and difficulty situations, fostering substantiated literacy gests .It also finds operations in competitive

examinations, professional assessments, and nonstop literacy programs, not limited to traditional classrooms. In this digital period, AI and NLP-powered question paper generation signifies a significant advancement, promoting further effective and protean assessment practices, eventually perfecting education and the overall literacy experience.

The evolution of traditional and existing Question Paper Generation systems and the need for an automated system is unravelled in Section we have proposed our revised system of Automated Question Paper Generation.describes the real-time implementation and results of the system. Further, concludes the paper and comments on the key points of the system.

## A. *Paper-based vs Paperless Systems* Table I Paper-based vs Paperless Systems

Table I Paper-based vs Paperless Systems

Paper-based System	Paperless System
Human process	Automated process
Low Security	Higher Security; Encryption
Patterns or repetitions may occur	Totally random and unbiased process
Slow as human labor involved	Faster due to computer based automation

## B. *Automation*

Automation means to replace the manual operations with computer procedures and other machines. Automation is aimed at increasing productivity, manufacturing prowess. It also reduces costs, labour and eliminates human error [2].

## C. *Types of Automation*

Automation helps to increase productivity and reduces costs in industries. Automation plays a crucial role in manufacturing industries. Automation can be of different types: -

- Information technology (IT)
- Computer-aided manufacturing (CAM)
- Numerically controlled (NC) equipment
- Robots
- Flexible manufacturing systems (FMS)
- Computer integrated manufacturing (CIM)

## D. *Information Communication Technology (ICT)*

ICT refers to technologies that use telecommunication to facilitate transmission of information. Internet and wireless networks can be thought of as medium for ICT. ICT has presented new communication resources over the years [2].

## E. *ICT in Automation*

ICT are capable of sustaining powerful automation as they provide an unparalleled infrastructure [2]. ICT plays important role in automation because of following reasons -:

- ICT allows user to access resources from any location at any time and improves the System Performance [2].
- ICT facilitates access to remote resources and allows effective utilization of the resources [2].
- Communication channels are efficiently optimized [2].
- ICT enhances the quality of education which proves vital [2].

## LITERATURE REVIEW :

1. Sabin Kafle, our study encompassed various aspects of neural question answering, including database-driven neural network architectures for question answering (QA). QA necessitates the comprehension of questions expressed in natural languages and the relevant information content to

provide a response. In this paper, we examine a neural network and QA system. This system aids in finding answers using neural networks. To address a limitation of this system, we have developed our own system for generating automated question papers, which can be beneficial for educational institutions and NGOs conducting exams.

2. In the work presented by Xingboxie [15], natural language processing (NLP) techniques are leveraged to construct an automated question answering system based on a philosophical approach. This system extracts keywords by analyzing user queries and transforms the intent of the queries into essential ontology-based elements. This automated question answering system supports querying in NLP and has various applications in different domains.

3. Wang bo [24] highlights the significance of automated question answering systems in the field of natural language processing and their pivotal role in education. This paper introduces a module for an ontology-based automated question answering system. In scenarios where students and educators are unable to communicate face-to-face, such as online learning, this application of an automated question answering framework proves to be valuable.

## EXISTING SOLUTION :

AI-powered question paper generation system developed by Hewlett Packard Enterprise (HPE). This system utilizes natural language processing (NLP) and artificial intelligence (AI) techniques to generate question papers for various subjects. HPE's system uses NLP to analyze existing question papers and extract patterns and structures from the data. Based on this analysis, the system then generates new questions that are similar in style, difficulty, and topic to the original questions. The AI component of the system evaluates the quality of the generated questions, ensuring they are accurate, relevant, and meet the desired learning objectives. By automating the question paper generation process, HPE's system aims to reduce the workload of teachers and provide them with a tool that can quickly generate high-quality question papers for different subject areas. This not only saves time but also ensures a diverse and well-structured set of questions for students to practice and assess their knowledge

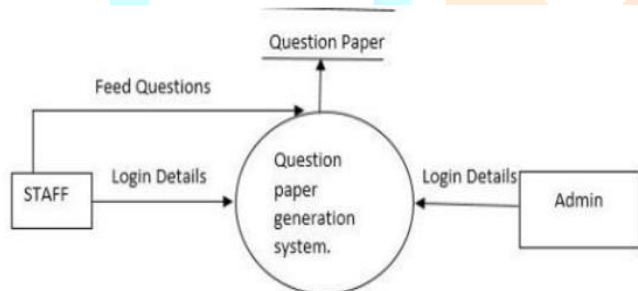
## PROPOSED SOLUTION :

Our visionary solution represents a groundbreaking leap forward in the field of educational assessment, fundamentally transforming the way we create exam papers and significantly enhancing the tools available for subject revision. Accessible via a secure Examination Controller Login, it empowers

educators and college administrators with a robust educational platform. Educators are given the unique opportunity to actively contribute by either submitting topics or uploading question banks. Our innovative model then intelligently generates questions while seamlessly integrating high-quality content from reputable sources. This approach guarantees comprehensive assessments without the risk of repetition. Additionally, teachers can categorize questions by difficulty to tailor assessments to their specific needs. Security is our top priority, and the platform boasts robust encryption protocols to ensure data safety and exclusive access for authorized users. For students, the platform offers a wide array of question types that facilitate dynamic and effective revision. Moreover, it features an intelligent chatbot companion designed to aid in topic memorization, making learning more engaging and efficient. This holistic approach not only streamlines the assessment process but also raises the bar for academic outcomes. It cultivates an environment of educational excellence, where teachers and students alike are empowered to achieve their full potential.

#### MODEL :

i)



ii)



#### **Data flow diagram for AI – powered question paper generation**

**Segmentation** : Segmentation involves unyoking a textbook into individual rulings. This is generally done using punctuation marks like ages, interjection marks, and question marks as judgment boundaries.

**Word Tokenization** : Word tokenization is the process of breaking a judgment or textbook into individual words or commemoratives. For illustration, the judgment " I love natural language processing" would be tokenized into(" I"," love"," natural"," language"," processing").

**Predicting Parts of Speech** : Parts of speech( POS) trailing involves assigning a grammatical order( similar as noun, verb, adjective,etc.) to each commemorative in a judgment . For illustration, in the judgment " The cat sleeps," the word" cat" is tagged as a noun, and" sleeps" is tagged as a verb.

**Tokenization** : Tokenization can be performed at colorful situations, includingsub-word tokenization for tasks like machine restatement or BERT embeddings. This splits words into lower units or subwords.

**Reliance parsing** : points to determine the grammatical connections between words in a judgment . It creates a tree structure that shows how words are connected and which words depend on others. For illustration, in the judgment " The cat sleeps," the word" cat" is the subject, and" sleeps" is the main verb.

**Lemmatization** : Lemmatization is the process of reducing words to their base or root form. For illustration, the lemma of" running" is" run," and the lemma of" better" is" good."

**Question Creation Generating** : questions from a given textbook or statement can be done using colorful ways, similar as paraphrasing, syntactic metamorphoses, or rule- grounded approaches. For case, from the statement" She likes pizza," you could induce the question" What does she like?"

#### **IMPLEMENTATION AND RESULTS**

The Automated Question Paper Generation System is implemented in Java. The fully working system stores courses, questions and patterns of question papers. It then applies the algorithm on the stored question set and prints the question paper in pdf format.

##### **A. Presumptions of the System**

The system has been developed considering the following presumptions: -

- All courses provide a well-defined course content which would be taught or left for self-study.
- Each course has its specific code.

c) All questions belonging to a particular course lie in some question type/category.

d) The institute can have any number of courses and streams.

**B. Proposed Algorithm**

For N questions available in database

Step 1: Create a List „L“ of N elements

Step 2: Generate a random number „n“ such that  $1 \leq n < N$

Step 3: If  $n \in L$

Go to Step 2

else Store n in the List L

Step 4: Select a question from database corresponding to n, whose flag==true

Step 5: For the question, set flag=false

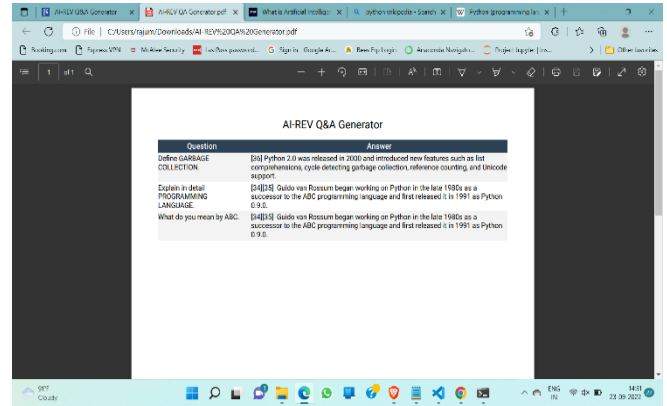
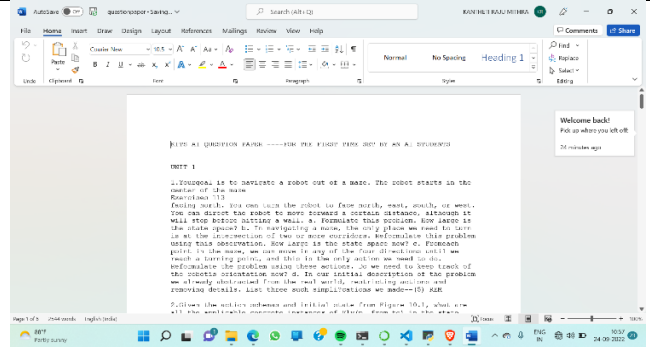
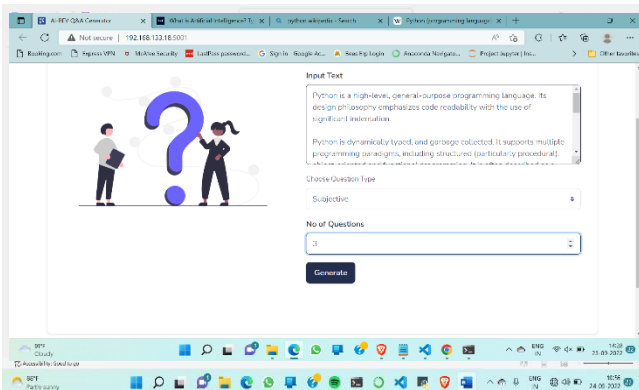
**C. Results**

We assume that there are total 10 questions in an Examination Paper (all inclusive). We have tested the Paper

Generation for various inputs using both algorithms. The inputs are the number of questions of each course. We have calculated the number of papers generated before a question is repeated for the existing algorithm and the proposed algorithm in the worst case scenario. Based on our experimental analysis, we get the following results. Table III Working of Algorithms for Various Inputs

Input	Number of papers generated	before a question is repeated
Number of Questions	Existing Algorithm	Proposed Algorithm
20	1	2
40	2	4
80	2	8
100	5	10

**PERFORMANCE EVALUATION :**



**Conclusion and Future Scope :**

The automatic question generator built on AI and NLP that described sounds like a comprehensive and versatile system for generating various types of questions. This system offers features for producing multiple-choice questions (MCQs), Boolean type questions, and fill-in-the-blank questions. The application's primary goal is to aid students in self-analyzing their knowledge in a subject. By generating question papers automatically, it provides students with an opportunity to test their understanding and assess their knowledge. The generated question papers can be accessed through a Controller of Examination login on the student side. These papers consist of questions along with their answers, serving as assessment tools for practice tests and quick revision. In addition to its educational applications, this system can also be useful for generating question papers for competitive exams. By generating questions and enabling students to practice them, it helps in preparing for such exams. Further extensions to the project could involve incorporating paraphrasing questions, descriptive questions, and question paper generation for different types of questions, expanding the system's range and usefulness. Additionally, the system could include automated answer copy-checking systems to verify answers and provide instant results to students. If needed, a chatbot can assist in providing more information about the model and its functionalities.

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