iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 13 **Issue:** IV **Month of publication:** April 2025

DOI: https://doi.org/10.22214/ijraset.2025.69282

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 13 Issue IV Apr 2025- Available at www.ijraset.com

Automatic Question Generation System Using Natural Language Processing

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Abstract. This project introduces an innovative approach to advance the field of automatic question generation using natural language processing (NLP), with a specific focus on Bloom's Taxonomy. With the increasing availability of resources and online learning platforms there is a need for efficient methods to create diverse and contextually relevant questions. The main goal of this project is to develop a system that can automatically generate questions using Natural Language Processing (NLP) techniques aligned with first three cognitive levels of Bloom's Taxonomy: remembering, understanding, and applying. This project will make a contribution to the field of NLP by providing a framework for automatic question generation. The project follows stages; preprocessing the input text identifying concepts and information creating question rules and generating different versions of questions based on these rules. This project utilizes NLP techniques such as Named Entity Recognition (NER) Part of Speech tagging (POS), syntatic analysis and Discourse analysis. The overarching goal is to provide educators, content creators, and learners with an efficient and intelligent tool for generating questions that enhance comprehension and critical thinking. By automating this process, the project seeks to save time and effort while improving the overall learning and assessment experience.

Keywords: Automatic Question Generation, Bloom's Taxonomy, Natural Language Processing, Quality Assessment, Learning Assessment, Comprehension, NER, POS tagging.

I. INTRODUCTION

Automatic Question Generation (AQG) using Natural Language Processing (NLP). AQG is an emerging field that leverages advanced NLP techniques to automatically generate questions from given text or data. This innovative technology has the potential to revolutionize various sectors by enhancing educational tools, automating content creation, and improving user interaction in customer service. This system requires the input of a target topic and will generate questions whose answers will be found in the paragraph itself. This project seeks to save time and effort taken to generate relevant and diverse questions while improving the overall learning and assessment experience.

II. LITERATURE SURVEY

In 2021, Danny C. L. [1] – ICALT Conference The authors proposed an Automatic Question Generation (AQG) system intended for repeated testing to enhance student learning outcomes. The model utilized historical student interaction data to iteratively generate questions tailored for reinforcing learning and tracking progress. Their approach also integrated adaptive assessment principles to personalize difficulty levels, making it beneficial in e-learning platforms.

In 2021, Shivali Joshi [2] – IJISRT This work presented a system that generates questions from text content using Natural Language Processing (NLP) techniques. The system aligns question generation with Bloom's Taxonomy, ensuring a pedagogical framework in categorizing the cognitive complexity of questions. It focuses on deriving questions from input paragraphs, applying POS tagging, parsing, and selecting appropriate question words for generation.

In 2019, Kalpana B. Khandale [3] – IOSR-JCE Though not directly about AQG, this paper compared POS taggers for identifying word similarities. The work is relevant to AQG as POS tagging is essential in syntactic analysis for extracting valid answer spans and formulating grammatically correct questions. The authors emphasize the importance of accurate linguistic preprocessing for downstream NLP tasks.

In 2025, Ghuge Archana [8] – JIER While this paper centers on AI and IoT applications in retail marketing, the

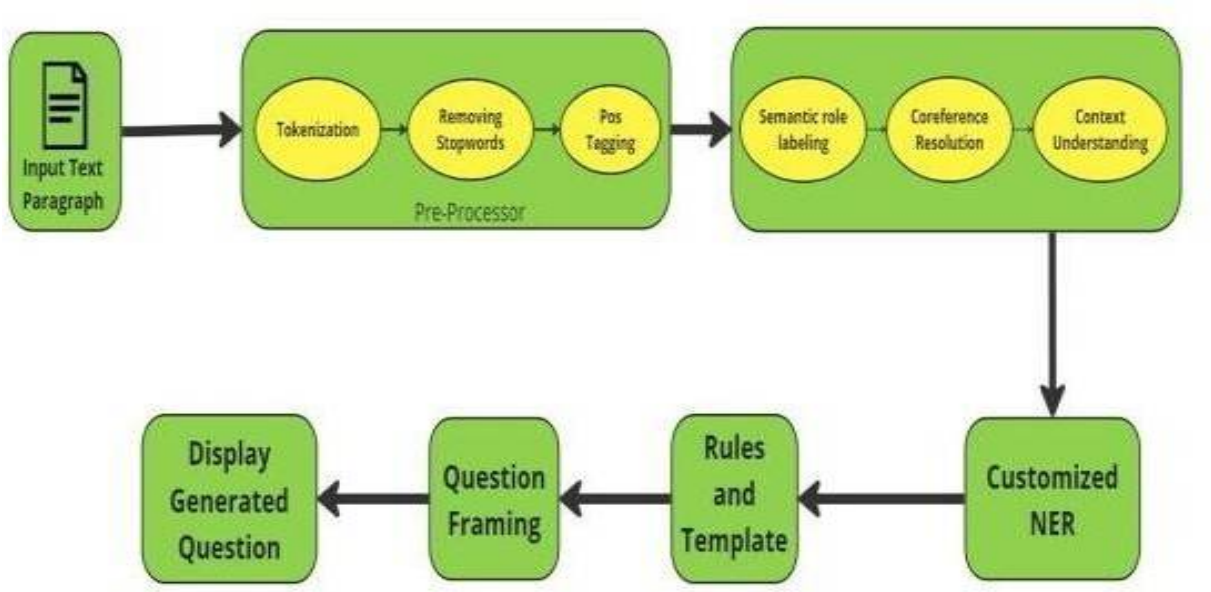
innovation aspect and use of AI techniques like personalization and recommendation systems relate tangentially to adaptive question generation. Techniques from retail personalization can inspire adaptive e-learning systems that tailor assessments based on user behavior and learning patterns.

III. PROPOSED SYSTEM

A. *Problem Statement:*

Traditional methods of manual question generation are time-consuming and inefficient. The proposed system automates this process using NLP techniques to create questions tailored to educational needs.

B. *Block Diagram:*



1) *Module-1 (Customized NER):* Extracts important named entities (e.g., persons, locations, objects).Applies predefined rules to generate questions based on Bloom's Taxonomy.
2) *Module-2 (Rule-Based Templates):* Discourse-based templates: Identifies discourse markers (e.g., because, since) to create why/how questions. On-discourse templates: Converts assertive statements into interrogative questions.NER-based templates: Uses POS tagging to generate who/what/where questions.

IV. OBJECTIVES

The primary objectives of this project are as follows:

- To automate the process of generating high-quality questions from a given text.
- To create questions from various domains of knowledge.
- To improve overall learning and assessment experience.
- To ensure diversity in the types of questions generated.
- To extract key information from content for question formulation.
- To reduce the time spent creating questions manually.

V. SYSTEM ARCHITECTURE

The architecture of the proposed system is designed to ensure efficiency, reliability, and user engagement. It consists of several components:

A. *Client-Side Application*

Built with Flutter, the client-side application will offer a responsive and interactive user interface. Flutter's framework allows for cross-platform compatibility, ensuring that the application functions seamlessly on both Android and iOS devices.

B. Backend Services

The backend will handle requests from users input text. Utilizing services will ensure that questions are easily accessible.

C.Database Management

A secure php/XAMPP database will be employed to access the questions from the user input text, saved. This setup will facilitate efficient data retrieval and management.

D.Questions Recognition Module

The Questions recognition component will be integrated using machine learning algorithms, allowing for accurate detection of distress phrases even in noisy environments. This is crucial for ensuring that the application responds reliably to user input text.

VI. IMPLEMENTATION

The implementation phase encompasses several critical steps to bring the application to life:

A. Development Environment Setup

Initial steps involve setting up the Flutter development environment and integrating necessary packages for questions generation functionalities. This includes configuring libraries that can handle different input and generate questions related to that input.

Figure 1: Home Page

B. User Interface Design

The user interface will be designed with a focus on sim- plicity and ease of use. A minimalist design approach will ensure that users can quickly access features with- out unnecessary distractions during emergencies.

C. User Sign Up and Login

Sign up the new user by entering there credentials into the sign up page. If the user is already have account

then he/she directly log in by entering username and password into the login page.

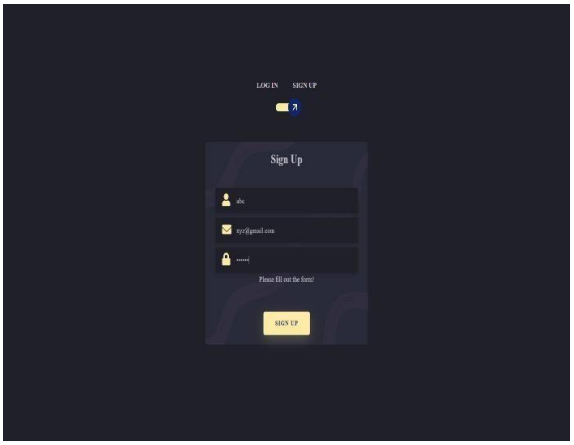


Figure 2: Sign up /login page

D. Enter the Input Text

User will enter the input text into the text box for which he/she trying to generate the questions. Generates Bloom's Taxonomy-based questions. Provides multiple question formats.

Figure 3: Taking input

VII. RESULTS AND DISCUSSIONS

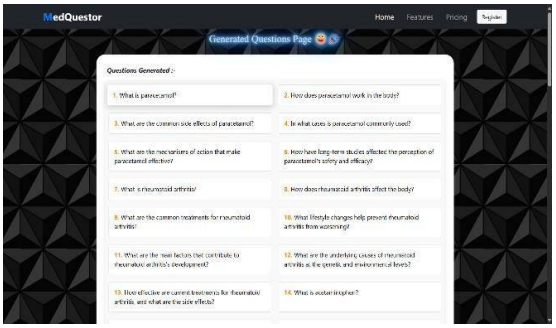


Figure4: Generating Output

Questions are generated based on users input by performing the different algorithm on it

VIII. CONCLUSION

In conclusion, the Automated Question Generation (AQG) project offers significant benefits by streamlining the process of creating educational assessments, quizzes, and practice materials. It saves time for educators, enhances personalized learning, and provides instant feedback to learners. While AQG systems are highly effective in generating diverse question types quickly, they still require refinement to improve creativity and contextual understanding. By integrating advanced natural language processing techniques and leveraging user feedback, AQG systems can continue to evolve, playing a vital role in modern education, training, and assessment environments.

ACKNOWLEDGMENT

The implementation and documentation of this project would not be succeeded without the kind support from individuals. First of all, we would like to express our special gratitude to Ms. Archana ugale who always gives us valuable advice and kind assistance to complete this project. Last but not least, we would like to thank the Faculty of Information Technology, Savitribai Phule Pune University for giving us the great knowledge. Finally, we would like to give our appreciation to our parents who support us since the beginning till the end of this project.

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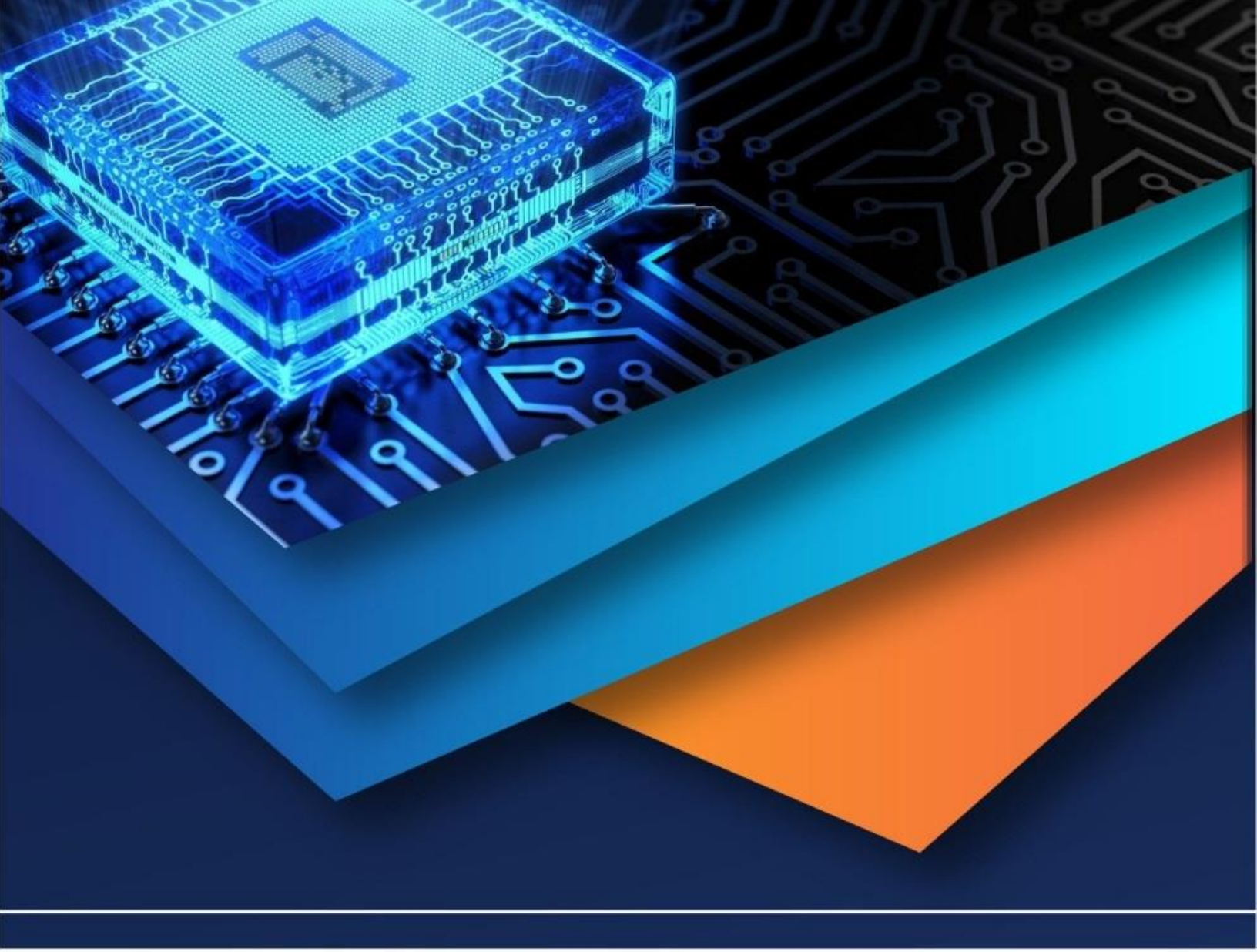

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