INTERNATIONAL JOURNAL FOR INNOVATIVE RESEARCH IN MULTIDISCIPLINARY FIELD
ISSN(O): 2455-0620 [Impact Factor: 7.581]
Monthly, Peer-Reviewed, Refereed, Indexed Journal with IC Value : 86.87
Volume - 9, Issue - 7, July - 2023 Publication Date: 15/07/2023

DOIs:10.2015/IJIRMF/202307012 --:-- Research Paper / Article / Review

An Intelligent Automated Examination Evaluation System using Natural Language Processing Techniques

[1] Dr. P. Deepan, [2] K. Sowmya, [3] Dr. J. Ramesh babu

[1]Associate Professor, Department of Computer Science and Engineering, St. Peter's Engineering College, Maisammaguda, Medchal, Hyderabad, Telangana, India

[2]Student, Department of Computer Science and Engineering , St. Peter's Engineering College, Maisammaguda, Medchal, Hyderabad, Telangana, India

[3]Associate Professor, Department of Computer Science and Engineering, St. Peter's Engineering College, Maisammaguda, Medchal, Hyderabad, Telangana, India

Email: deepanp87@gmail.com, kommurisowmya28@gmail.com, ramesh.jonnala@gmail.com

Abstract: *In the world of online examinations, numerous examination portals have been deployed across multiple servers to facilitate various types of tests. These portals cater to entrance examinations, national and international Olympiads, as well as placement assessments. However, a prevalent trend among these platforms is their focus on multiple-choice questions and answers. While the majority of existing online examination portals focus on multiple-choice questions, this project introduces a rare technology: a descriptive online examination system. Unlike its counterparts, this system leverages Natural Language Processing (NLP) to assess and score descriptive answers.*

By processing answer strings, the system assigns accurate marks based on various operations performed on the text. Developed using Python with the Django web framework for the back-end, NLTK for NLP capabilities, SQLite version 3 for the database, and HTML5, CSS3, Bootstrap, and JavaScript for the front-end, this system aims to revolutionize online examinations by expanding their scope beyond multiple-choice questions. The proposed solution collects data from a descriptive online examination system, analyses it, and employs a designed model to ensure precise evaluation and scoring of answers.

Key Words: *NTTLK, CSS, online examination, evaluation, Natural Language Processing, Django.*

1. INTRODUCTION:

The traditional testing system heavily relies on manual labour, encompassing activities like printing, transporting forms to testing centres, proctoring exams, and the laborious task of manually checking answer sheets. However, this manual approach presents numerous challenges and inefficiencies that disrupt the workflow of examiners, waste valuable resources, and can even lead to substantial losses.

One significant issue associated with manual processes is the disruption caused by handling physical exam materials. From the printing stage to the transportation of forms, there is a risk of paper leaks, which can compromise the integrity of the exams. Moreover, instances of lost answer sheets further contribute to the unreliability of the system and create additional administrative burdens. In addition, the manual review process is prone to human errors influenced by factors such as bias, reviewer mood, and goal attainment. These subjective elements can introduce inconsistencies and undermine the fairness and objectivity of the examination system. Such shortcomings make it evident that offline testing systems are neither cost-effective nor time-efficient in today's fast-paced world.

To address these challenges, a paradigm shift is necessary. The proposed model aims to elevate online testing systems to a new level by leveraging technological advancements and automation. By transitioning from physical to digital exam materials, the model eliminates the need for manual handling and reduces the risk of paper leaks and lost answer sheets. Furthermore, the introduction of automated grading mechanisms eliminates subjective biases and ensures more objective and accurate evaluation of student responses. The benefits of the proposed model are multifaceted. It streamlines the examination process, improves efficiency, and minimizes administrative disruptions. Moreover, it

enhances the security and integrity of exams, instilling confidence in the system. By leveraging online platforms and automation, the model offers a cost-effective and time-efficient alternative to offline testing systems.

In conclusion, the limitations of the current manual testing system highlight the need for a transformative approach. The proposed model aims to overcome the challenges associated with manual labour, inefficiencies, and human errors by embracing online testing systems that are secure, reliable, and technologically advanced. This paradigm shift has the potential to revolutionize the examination process and enhance the overall experience for both examiners and examinees.

1.1 PROBLEM STATEMENT:

The current offline test system has a major drawback that prevents it from being widely replaced. Although online test systems have gained popularity, they are predominantly designed for multiple-choice questions, making them inadequate for exams that include descriptive or simulation-based questions. To successfully replace the offline system, a new approach must not only be superior but also demonstrate a significant improvement in quality that organizations are willing to adopt.

Existing grading systems, while effective for evaluating responses, lack the necessary scope and analysis capabilities to assess descriptive answers comprehensively. Even the most renowned systems merely store correct options in a database and match them exactly, resulting in limited evaluation. This limitation hinders the potential for meaningful and insightful analysis.

Addressing this challenge, a novel solution is needed that can effectively evaluate and grade descriptive answers, providing organizations with a comprehensive and accurate assessment of students' knowledge and skills.

1.2 MOTIVATION:

The current global scenario highlights the inefficiency of traditional examination systems, where exams for employment, universities, and schools are conducted manually and results are declared after a significant time delay. This out dated approach is no longer viable in today's fast-paced world. Automation is the future, and it is imperative to modernize the testing system.

The existing manual processes, from printing and transporting paper to the testing center, to proctoring and the labour-intensive task of checking answer sheets, not only disrupt the workflow for examiners but also lead to resource wastage. It is high time to embrace automation and leverage technological advancements to streamline and improve the examination process.

By adopting an automated examination system, we can eliminate manual labour, reduce time delays, and ensure efficient utilization of resources. This will enhance the overall experience for both examiners and examinees, leading to faster and more accurate results. Embracing automation is essential to stay aligned with the evolving demands of the modern world.

2. LITERATURE REVIEW:

The primary objective of implementing intelligent computer technology in examination systems is to minimize human effort. In this literature survey, we will explore significant research conducted on existing techniques and algorithms in natural language processing (NLP) as well as verification systems that are currently in use. This research serves as a foundation for developing an algorithm for an innovative descriptive online examination system.

Several stu dies have focused on NLP techniques for analysing and evaluating descriptive answers. By leveraging linguistic rules and statistical approaches, researchers have made advancements in keyword extraction, key phrase identification, and text classification. These techniques enable automated grading and provide a more objective evaluation of responses.

Furthermore, existing verification systems play a crucial role in ensuring the integrity and security of online examinations. Research has addressed challenges such as identity verification, cheating detection, and remote proctoring. Innovative solutions incorporating technologies like biometrics, computer vision, and machine learning have been explored to enhance the reliability and authenticity of the examination process. Building upon this existing research, our proposed algorithm for the explanatory online examination system incorporates NLP concepts and verification mechanisms. By employing advanced algorithms, data analysis techniques, and machine learning models, the system aims to accurately grade descriptive answers and maintain the integrity of the examination environment.

In conclusion, the literature survey highlights the significance of existing research in NLP and verification systems for designing an explanatory online examination system. By leveraging these advancements, our algorithm aims to reduce human effort, improve evaluation accuracy, and enhance the overall examination experience.

Design and implementation of domestic News Collection System based on Python site [1]. The study by Haixia Lv presents the design and implementation of a news collection system that aims to provide users with concise and clear pages of domestic financial news. The system utilizes Python and a scraper framework along with the Django system to crawl and process news content from specific websites. The framework offers timely and efficient access to relevant news, avoiding unnecessary information and advertisements. The practical value of the system lies in its ability to provide users with convenient access to news that they are interested in and care about.

"An automatic classifier for exam questions in Engineering: Process based on Bloom's Taxonomy [2]," K. Jayakodi, M. Bhandara, and I. Perera present a study conducted at the IEEE International Conference on Teaching, Assessment, and Learning for Engineering (TALE) in 2015. They propose an automated classifier that categorizes Engineering exam questions according to the cognitive levels defined by Bloom's taxonomy. The research provides a systematic approach for question classification, aiding educators in creating well-balanced assessments and ensuring fair evaluation in Engineering examinations.

In paper titled "Keyword Extraction using Data Mining [3]," Bhavneet Kaur and Dr. Sushma Jain explore the process of extracting valuable information from databases and transforming it into meaningful context. The research focuses on text pre-processing, lexical analysis, and applying algorithms to extract keywords. By employing data mining techniques, the authors aim to generate relevant and useful results. This approach contributes to improving information retrieval and analysis, enabling more efficient handling of large datasets. The findings provide insights into effective keyword extraction methodologies, facilitating better organization and utilization of textual data.

The research conducted by T. Treenantharath and P. Sutheebanjard [4] focuses on thin client computing in Ubuntu operating systems. Their study involves the implementation of a Linux terminal server called Moodle for conducting online exams. The system eliminates the need for internet connectivity, hard drives, and cables during exams. By utilizing the Moodle server, exams can be securely conducted in examination halls. This approach simplifies the exam setup process and ensures a reliable and secure environment for conducting online exams without additional hardware requirements.

Stuart Rose, Dave Engel, and Nick Cramer's work in[5] explore the application of automatic keyword extraction algorithms on diverse documents such as news articles. They analyze and compare the results obtained using different approaches. G. Zhang and H. Ke's work in [6] focuses on a paperless examination system that specifically targets SQL programming questions. The system comprises modules for faculty, students, and administration, facilitating efficient management and assessment of SQL programming exams.

M. Revathy and M. L. Madhavu's research in [7] focuses on NLP-based feature extraction, feature selection, and community generation. They explore methods to extract relevant features from text data, select the most informative features, and generate communities based on these features.

The research conducted by R. P. Futrelle, J. Satterley, and T. McCormack in [8] focuses on NLP-NG, a new NLP system based on grammar. The primary objective of this system is to provide users with relevant information and incorporate additional elements to identify their queries more effectively.

In [9] N. Ishikawa, K. Umemoto, Y. Watanabe, Y. Okada, R. Nishimura and M. Murata had worked upon the users who had logged into a commercial site using multiple accounts.W Jie and W. Li-Qing work in [10] deals with research in NLP. In the proposed paper they worked on an algorithm to extract multi-feature keyword. In [11] HQ Gheni, AM Hussein and W Kadhim worked upon creating new keywords from the given titles and abstract.

Wang Kun in paper [12] [13] had implemented the design of The Online Exam portal by the help of .NET. The technology .Net is used data collection, connection of database, unlocking the files. In [14], Aditi Sharan and Siddiqi focus on keyword extraction, feature selection, and key phrase extraction from textual data. The study employs two primary approaches, namely a linguistic rule-based approach and a statistical approach. These methodologies enable the extraction of relevant keywords and key phrases, as well as the selection of informative features, enhancing the understanding and analysis of textual content.

3. PROPOSED SYSTEM :

In this chapter, we will discuss and analyse the developing process of Audit Control including software requirement specification (SRS) and comparison between existing and proposed system functional and non-functional requirements are included in SRS part to give complete description and overview of system requirements before the developing process is carried out. Besides that, existing vs. proposed provides a view of how the proposed system will be more efficient than the already existing one.

The proposed model takes online testing systems to a new level by allowing candidates to write descriptive responses and self-assess them. Graded responses are stored in the database and can be viewed at any time. Certain

student profiles are also retained to improve student assessment. NLP or natural language processing plays a big role when talking about the technology used to create models that evaluate such descriptive responses.

Current exam systems only work well with multiple-choice questions, which have a limited number of choices. However, this exam system fails on types of questions that require descriptive answers. Exams that are descriptive in nature are only administered offline, so grading every student's response can be tedious. This kind of review system is very inefficient and the evaluation takes a lot of time. The proposed architecture of the automated examination evaluation system is shown in Figure 1.

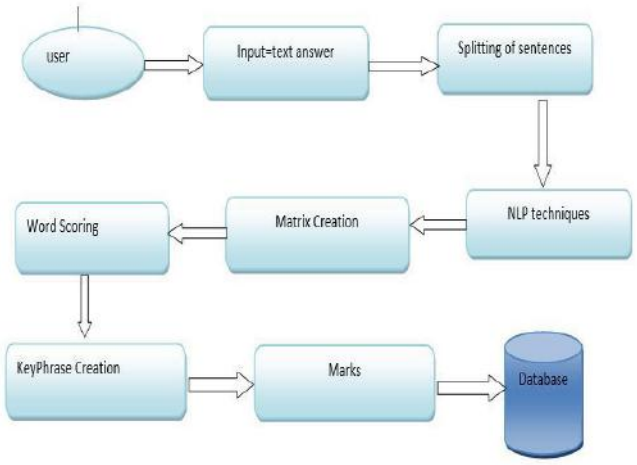

Fig 1: Architecture diagram

3.1 ARCHITECTURE:

Rake Algorithm:

RAKE (Rapid Automatic Keyword Extraction) is a well-known keyword extraction method that finds the most relevant words or phrases in a piece of text using a set of stop words and phrase delimiters. Rake nltk is an expanded version of RAKE that's supported by NLTK. The process of Rapid Automatic Keyword Extraction involves several key steps:

Algorithm steps:

1. The input text content is split into sentences using a delimiter, typically a dot. This segmentation allows for better analysis of individual phrases within the text.

2. A matrix of word co-occurrences is created, capturing the relationships between words in the text. This matrix serves as the basis for scoring the importance of each word.

3. Word scoring is performed to determine the significance of each word. The score can be calculated in different ways, such as considering the word's degree in the co-occurrence matrix, its frequency in the text, or the degree divided by its frequency. This scoring process helps identify the most relevant keywords and phrases.

4. Key phrases can be generated by combining keywords that appear in close proximity to each other. This allows for the extraction of meaningful phrases that convey important information.

5. To select the final keywords or key phrases, a threshold-based approach is employed. Only the top T scores, where T represents the desired number of extractions, are chosen as the most significant keywords or key phrases.

4. IMPLEMENTATION AND EXPERIMENTAL RESULT :

The following is the Home page of Examination System

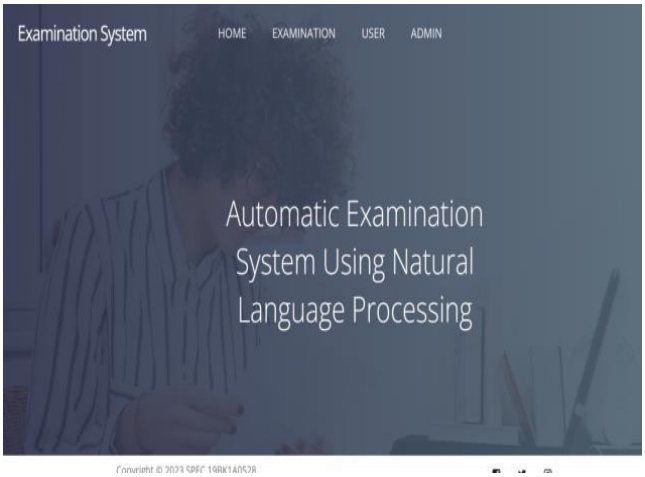

Fig. 2 Homepage

User module results:

After a user logs into the session, they will have the option to choose a specific exam, as shown in Figure 4. Once the student selects an exam, they can proceed to the test page where they will be able to write and submit their answers. Upon clicking the "Test Result" button, the student will automatically receive their result based on their performance. These concepts involve utilizing Natural Language Toolkit (NLTK) and Natural Language Processing (NLP) techniques to calculate and generate the student's score. The login portal and home page of user of automated examination evaluation system is shown in Figure 3 and Figure 4, respectively.

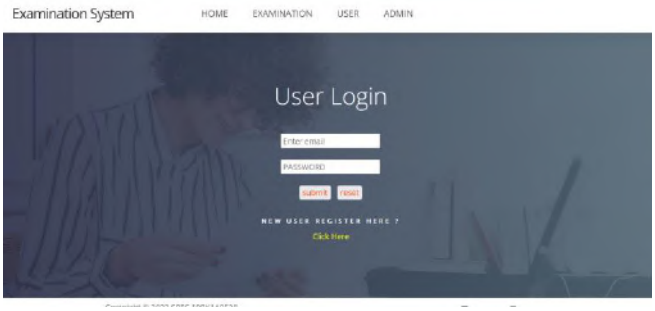

Fig. 3 User Login

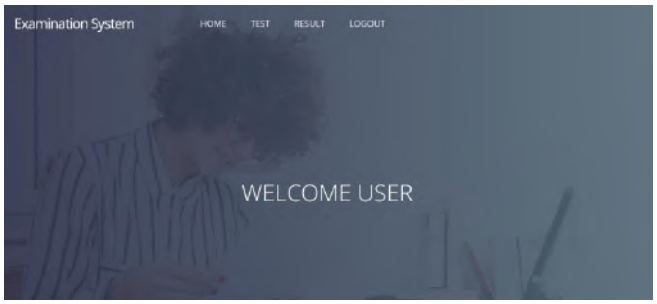

Fig. 4 User Homepage

Faculty module results:

Once a faculty member logs into their account, they will have access to various options, as depicted in Figure 6. These options include viewing the list of users and setting the question paper. To enable automatic correction using the Rake Algorithm, the faculty will also prepare the answer key. Additionally, the faculty has the option to view the test page, where users who have completed the exam will be listed, and the faculty can release the results .The login page and home page of Faculty of automated Examination system is shown in Figure 5 and Figure 6, respectively.

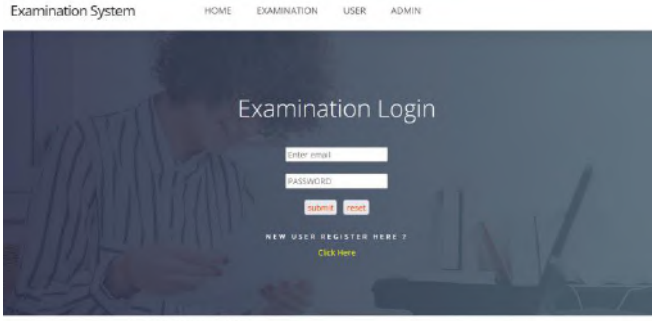

Fig. 5 Faculty Login

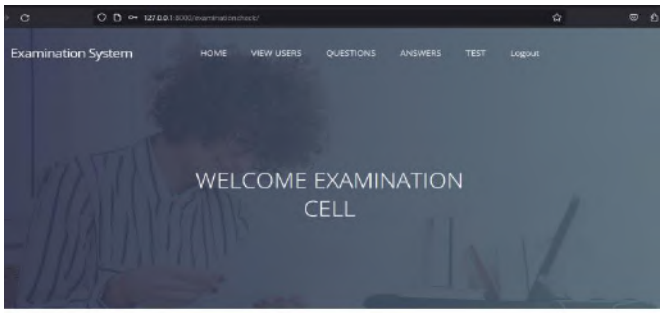

Fig. 6 Faculty Homepage

The examination system conducts exams on specific technologies. It begins by storing all the questions related to a particular technology in a database. Additionally, it stores the corresponding answers for each question in the database. The below Figure 7 represents the Result page of user of Examination System.

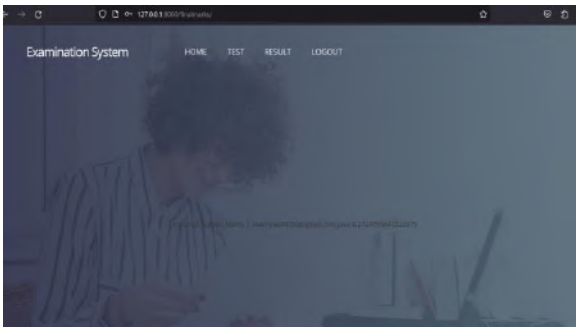

Fig. 7 Result page

During the exam, the system checks the student's answers against the stored answers in the database. . Using Natural Language Toolkit (NLTK) and Natural Language Processing (NLP) concepts, the system analyses and evaluates the student's answers. This analysis allows for the generation of results based on the performance of the students. By conducting regular tests and employing this algorithm, the system can track the progression of grades obtained by different students. It provides analytical reports highlighting the subjects in which students may need to focus more due to weaker performance.

Furthermore, with the available data, predictive machine learning models can be implemented. These models can help forecast the grades students may achieve in the future, offering insights into their academic progress. This can be especially valuable in identifying if students are taking courses primarily intended for internships or if they are required for internship-related purposes.

Admin module results:

The admin page serves as a central hub for managing the examination system. It includes sub-portals as view users, Examination questions, Examination answers, examination users, and test results. The view users sub-portal provides an overview of registered users. The Examination questions sub-portal allows managing and maintaining the question database. The Examination answers sub-portal handles the storage and management of correct answers. The examination users sub-portal tracks participants in specific exams. Lastly, the user test results sub-portal displays the

performance outcomes of individual participants. Together, these sub-portals provide comprehensive control and oversight for efficient administration of the examination system. The Admin Login Page and Home page of Automated Examination evaluation system is shown in Figure 8 and Figure 9, respectively.

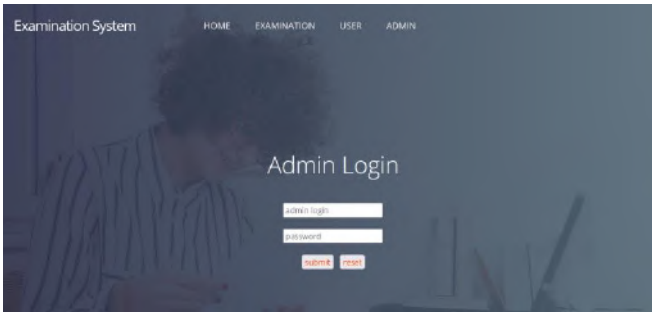

Fig. 8 Admin Login

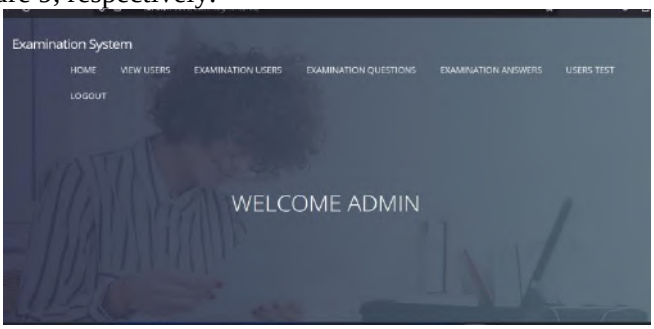

Fig. 9 admin home page

5. CONCLUSION :

It can be seen by conducting tests using such an algorithm at regular intervals that one can determine the trend in the marks obtained by different students and we can give them an analysed report on the different subjects they need to focus on for which they are weak. With the existing data, we can also implement a predictive machine learning model on the data so that it can predict the marks that the students will score in the future. It is observed that students mainly study those subjects that are placement oriented or which are required for placement purposes only.

While mostly student's neglect the subjects of their core domain. Deep knowledge in the domain is required as it is of no use to study if you do not have core domain knowledge. So it can help students get quality knowledge as everything will be digital and there will be no cumbersome process of conducting a pen-paper test. Also, answers are evaluated at that moment itself and the student can see the solutions and can correct the mistakes or errors committed while appearing for the exam.

REFERENCES:

1. Haixia Lv College of Computer Science and Technology Shandong University of Finance and Economics Jinan China xzdjl@126.com,"Design and Implementation of Domestic News Collection System Based on Python", June 16,2020 at 05:45:11 UTC from IEEE Xplore
2. K. Jayakodi, M. Bhandara and I. Perera "An automatic classifier for exam questions in Engineering: A process for Bloom's taxonomy", IEEE International Conference on Teaching, Assessment, and Learning for Engineering (TALE), (2015)
3. B. Kaur, and S. Jain "Keyword extraction using machine learning approaches", IEEE 3rd International Conference on Advances in Computing, Communication & Automation (ICACCA) (Fall), (2017)
4. T. Treenantharath and P. Sutheebanjard "Secure Online Exams on Thin Client" , IEEE 11th International Conference on ICT and Knowledge Engineering, (2013)
5. Stuart Rose , Dave Engel , Nick Cramer "Automatic Keyword Extraction from Individual Documents"
6. G. Zhang, and H. Ke "Design of Paperless Examination System for Principles of Database Systems", IEEE International Conference on Research Challenges in Computer Science, (2009)
7. M. Revathy, and M. L. Madhavu "Efficient author community generation on Nlp based relevance feature detection", IEEE International Conference on Circuit ,Power and Computing Technologies (ICCPCT), (2017)
8. R. P. Futrelle, J. Satterley, and T. McCormack "NLP-NG — A new NLP system for biomedical text analysis", IEEE International Conference on Bioinformatics and Biomedicine Workshop, (2009)
9. N. Ishikawa, K. Umemoto, Y. Watanabe, Y. Okada, R. Nishimura and M. Murata "Detection of users suspected of using multiple user accounts and manipulating evaluations in a community site", IEEE Proceedings of the 6th International Conference on Natural Language Processing and Knowledge Engineering, (2010)
10. W Jie and W. Li-Qing, "Research on Multi-Feature Keyword Extraction Algorithm[J]", Computer Systems & Applications, 2018
11. HQ Gheni, AM Hussein and W Kadhim, "Suggesting new words to extract keywords from title and abstract[J]", International Journal of Electrical and Computer Engineering, vol. 9, no. 5, 2019.
12. Wang Kun, "The Design and Implementation of Online Examination System Based on. NET [D]", Shandong University, 2013.
13. Man Yong, "The Design and Implementation of Online Examing System [D]", Hunan University, 2012.
14. Sifatullah Siddiqi and Aditi Sharan, "Keyword and key phrase extraction techniques: a literature review", International Journal of Computer Applications, vol. 109, no. 2, 2015.
15. R. Gupta, S. Choudhary, A. Sharma, and S. Kumar, "Automatic Question Paper Generation System using Natural Language Processing Techniques," International Journal of Advanced Computer Science and Applications, vol. 9, no. 10, 2018.