AUTOMATIC ANSWER EVALUATION USING DEEP LEARNING ALGORITHMS

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Abstract

As we go towards automation, a system for automatically evaluating descriptive responses is now required. Manual evaluation is time- and labor-intensive. Currently, our automated methods for descriptive, one-sentence, and objective responses are less accurate. The automatic scoring of answer scripts has shown to be useful in our experiments, and frequently the scores are assigned match the marks that are personally assessed. The development of an automated answer evaluation system based on machine learning is the aim of this study. The system will count the words and letters in the text that were retrieved from the pre-processed data in order to evaluate the response. The next step is to implement Natural Language Processing (NLP) to sanitize the retrieved text. Automated answer assessment is a crucial component. So, as we go towards automation, we need a framework for automatically evaluating descriptive answers. Manual evaluation requires a lot of time and effort. For objective-type, one-sentence, and descriptive answers, we currently have automated systems with lower accuracy. In our trials, the automatic scoring of answer scripts has shown to be beneficial, and frequently, the scores assigned coincide with the marks that are manually assessed. In this study, we aim to develop an automated system based on machine learning. The pre-processed data will be used to retrieve text from which the system will count the words and characters in order to evaluate the response. Natural Language Processing (NLP) must then be implemented in order to clean the retrieved text. An essential component is the automatic answer evaluation.

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1. Introduction

The process of recognising individual letters and words in a digital image is known as optical character recognition. The text can be recognised by applying a classification algorithm to each character in order to break it down into a single word. The process of text recognition relies on an algorithm that groups similar words together. The outcome is compared to the text that should be displayed in that exact area of the image. Optical character recognition (OCR) is the electronic or mechanical process of converting images of typed, handwritten, or printed text into machine-encoded text, such as from a scanned document, a photo of a document, a scene photo (such as the text on signs and billboards in a landscape photo), or from subtitle text superimposed on an image (for example: from a television broadcast). widespread adoption as a data standard For businesses, optical character recognition (OCR) technology is a time-saving and efficient means of extracting text from scanned documents and images and transforming it into a form that can be read, edited, and searched by computers.The process of optical character recognition (OCR) allows for the translation of scanned or printed text images as well as handwritten text into editable text for further processing. With this technique, computers can read written language with ease. It's like if your brain and eyes worked together. The eye is capable of extracting text from images, but the brain is responsible for processing and interpreting what it sees. It was not without its challenges that the creation of an automated OCR system met with resistance. That's why Tesseract is available as a dynamic link library (DLL), which can be simply integrated into other programmes so they may take advantage of its features. In the following, you'll learn about Tesseract's background and its features. Examinations, either subjective or objective in nature, are commonly used by educational and non-educational institutions to assess a student's performance. Many are doing their jobs remotely because of the current pandemic. Present conditions make it difficult to manually evaluate subjective responses. There are currently a plethora of systems able to assess multiple-choice or objective-type questions. These methods are assessed by the machines once a set of responses has been provided. Yet, this is only beneficial on exams that are competitive or objective in nature. The universities would collapse without the descriptive test. The moderator will be able to gauge the student's level of understanding based on the detail provided in their response. It takes a lot of time and effort to manually evaluate subjective responses. Also, one must focus intensely on the task at hand. How an answer is scored depends on the moderator, the student, and the context of the question. The pupil's performance suffers as a consequence of this. As an application of machine learning, evaluating student responses automatically using deep learning algorithms is being explored as a means of streamlining the grading of homework and exams. It is particularly suited for jobs like natural language processing and picture recognition because deep learning algorithms, a form of machine learning algorithm, can understand complex patterns and correlations in data. Automated grading systems can utilise deep learning algorithms to evaluate student work and provide grades.

Literature Review

Now more than ever, with the world increasingly mechanised, the response evaluation system must be automated. Crown Prince Sinha and Associates, As at this time only multiple choice questions can be graded online, the checker has a hard time judging the quality of the student's theory solution. Each student's response is individually graded and ranked by the instructor. The current method involves more work and people to analyse the result. Machine learning is used in the evaluation process for this journal. The focus of this journal is on reducing manual work and saving time. Since this is a manual process, evaluating the results takes significantly more time and effort. Nevertheless, it is doable if the manual system is used.Recognizing people in digital photographs presents a formidable barrier. But, we need all the data in digital format for record keeping so that we can perform different processing techniques. By Sanjay Singla, et al. The content is written in so many different ways and uses so many different typefaces that it is quite difficult to keep track of who is who. We have developed a novel approach to character recognition from digitised images by fusing the Nearest Neighbor technique with the concept of Artificial Neural Networks. The steps of the classifying process are as follows. Unicode is generated by neurons in three layers: an input layer comprised of segmented characters, a hidden layer comprised of neurons learned by the training network, and an output layer comprised of neurons that are themselves trained. Character recognition is a means of id'ing. Editing text that was originally written by hand or printed by hand using a machine. The term "optical character recognition" refers to the process of searching and indexing written text, as demonstrated by B.Vani et al. In order to illustrate and demonstrate the actual failures and imaging errors in recognition, the current OCR performance uses illustrative examples. Using an artificial neural network as the backbone, this paper aims to give an OCR application interface for achieving a high recognition accuracy rate. The proposed algorithm for character recognition employs neural networks, which significantly improves the accuracy of the process. The proposed method is implemented and

evaluated using a separate character database made up of English letters, numbers, and keyboard special characters.Using the keyboard to enter data into a computer is by far the most used approach, despite being the slowest and most laborious one. By Jashneet Singh Monga1 and colleagues, The concept of using a computer to do the same function as a human reader has been studied for three decades already. Optical character recognition (OCR) is the mechanical or electrical process of converting scanned images that typically include text such as printed, handwritten, or typed material. It's a way to take paper documents and make them digitally searchable and usable in computerised workflows. To facilitate text mining, text-to-speech, and machine translation, it encodes the pictures as machine-readable text. In this work, we present a simple, efficient, and cheap technique of creating OCR that may be used for reading any In the fields of pattern recognition and image processing, handwriting recognition has been one of the most active and complex research areas. In "E. Srinivasan et al., Bank checks, braille printers, and the ability to turn any handwritten document into structured text are just a few of its many applications. In this study, a multilayer feed-forward neural network is utilised to try and recognise handwritten characters for English alphabets without feature extraction. There are a total of 26 alphabets present in the character data sets. Fifty distinct character data sets are used to teach the network. The trained network is then used for classification and recognition. In the proposed method, each character is scaled down to 30x20 pixels and employed in training immediately. As a result, the new size for each character is 600.

2. Methodology

A. Input

The dataset contains the images in the form of '.jpg' or '.png'In this step, we have to read or load the input image by using the read () function. The input image is used to detect or recognize the text. In our process, we used the tkinter file dialogue box for selecting the input image.

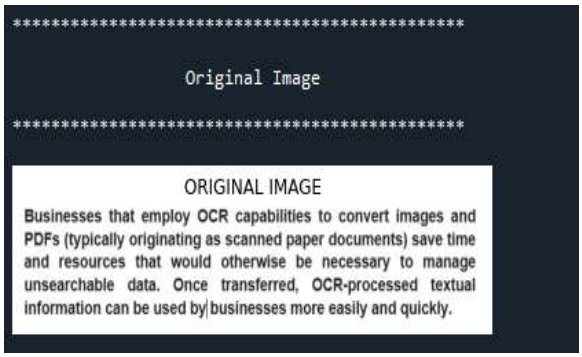

Fig 1

B. Preprocessing

The image must be resized and turned into grayscale as part of our procedure. To resize a picture, use the resize () method on it and pass the image's width and height as a two-integer tuple argument. The function does not change the original image; rather, it returns a new Image with the updated dimensions. Using Python's matplotlib library and the conversion formula, we can also convert an image to grayscale.

Fig 2

C. Feature Extraction

Variation and Norm, In essence, deviations are a measurement of how widely distributed the data are in the data collection. The average of the squared departures from the mean is the variance.

You may compute the mean or average of a given list of numbers using the mean () function. The parameter-passed data set's mean is returned. The data sum divided by the number of data points yields the arithmetic mean.

D. Text Recognition

As part of our procedure, we must use the py-tesseract to recognize the text. An optical character recognition (OCR) tool for Python is called Python-tesseract. In other words in Python.

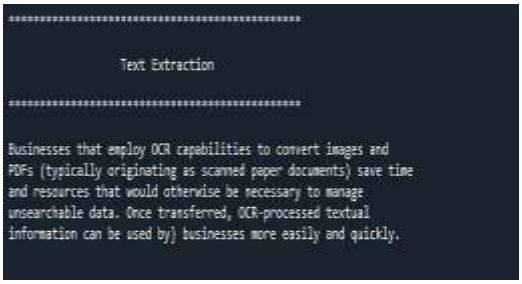

Fig 3

E. Nlp Techniques:

Natural language processing (NLP) is a branch of machine learning that focuses on enabling computers to process, interpret, and even generate human language. There are typically multiple stages involved in cleaning (or pre-processing) the data, including Taking out the punctuation: To enhance readability, punctuation can provide more grammatical context to a statement. Tokenization is the process of dividing a string of characters into smaller units, typically words or phrases. It adds order to text that was previously disorganised. like "Plata o Plomo" becomes "Plata," "o," and "Plomo." The process of stemming is helpful for determining the root of a word. The padding: Any raw text data will have sentences of varied lengths. Yet, inputs to neural networks must be uniform in size. This is why padding is employed..

F. Data Splitting

In order for machine learning to learn, data are required. In addition to the data required for training, test data are also required to evaluate the efficiency and efficacy of the algorithm. Around 70% of the input dataset was used for testing, while the remaining 30% was used for training. In order to use a cross-validator, it is common practice to split the available data in half. Using one subset of the data, a predictive model is built; its accuracy is then evaluated using a second subset. Data mining analysis hinges on splitting the data into a training set and a test set for the algorithm to use.

G. Classification

A deep learning algorithm, such as an Artificial Neural Network, must be incorporated into our process (ANN). As a subset of supervised machine learning, Artificial Neural Networks (ANN) require both input and output to be included in the dataset. Our entire objective is to locate a connection between these inputs and their corresponding outputs. For both regression and classification tasks, ANN is a viable tool.

H. Evaluate The Answer

In this step, we can evaluate the answers from the extracted text based on the length of answers and the length of words. We can put the marks from o to 10 based on the length of answers and the length of words.

I. Performance Metrics & ANN

The Final Outcome will be created on the basis of the overall classification and prediction. The efficacy of this approach is measured in a variety of ways, including Accuracy is the measure of how well a classifier does its job. Correctly predicting the class label is a measure of a predictor's accuracy, which is defined as the degree to which a given predictor can correctly predict the value of an attribute for incoming data. The formula for calculating the average cost is AC = TP + TN / TP + TN + FP + FN

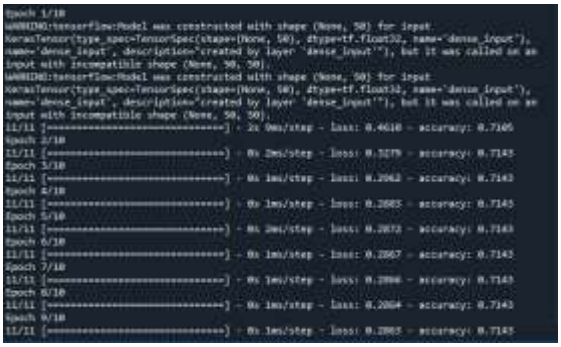

Fig 4. ANN Analze

Proposed System

In the proposed system, the image dataset was taken as input. Then, we have to device the pre-processing step. In this step, we have to resize the original image and convert the image into grayscale. After that, we have to extract the text from the pre-processed image by using mean standard deviation. After that, we have to extract the text from the input image by using the py-tesseract and the extracted text will be stored in text format. Then, we have to implement Natural Language Processing for cleaning the extracted text. Then, we can calculate the number of words and several letters from extracted text. After that, we have to implement the deep learning algorithm such as Artificial Neural Network (ANN). The trial results demonstration that some performance metrics such as accuracy and evaluation marks based on the number of words and several letters

Advantages

- It displays the text format
- The accuracy is high.
- To evaluate the answers.

Fig 5. Gray Scale Conversion

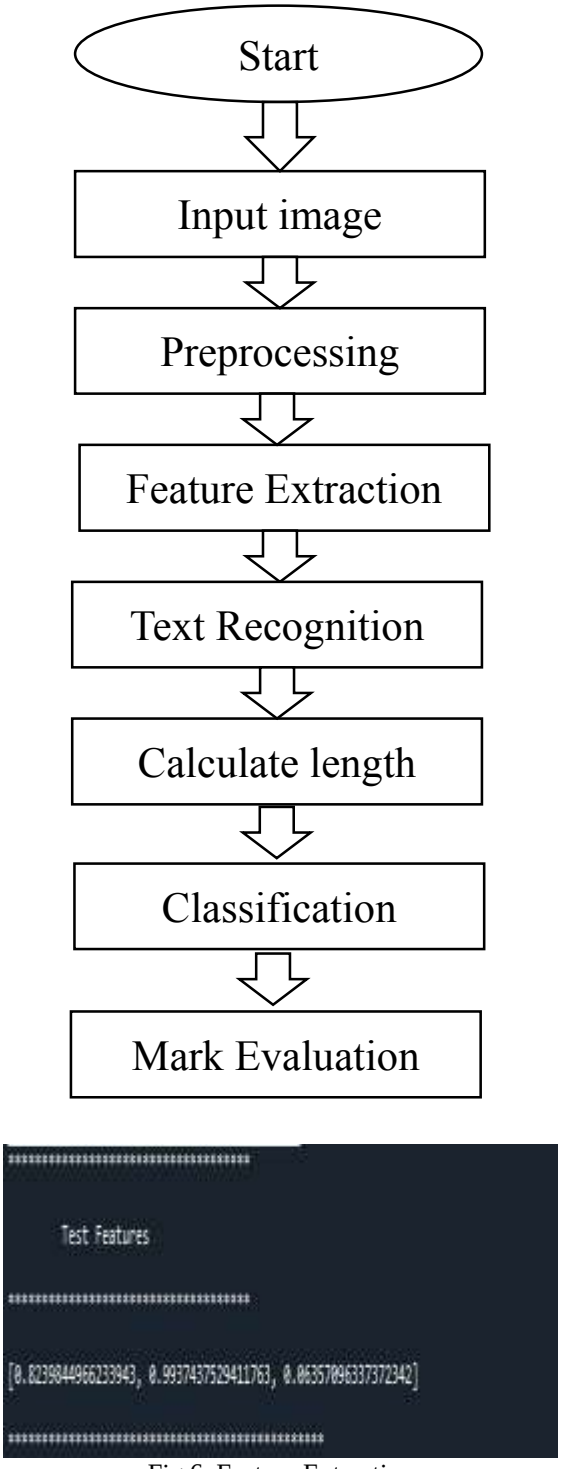

Fig 6. Feature Extraction

3. Result

It is standard practise to administer a battery of examinations to all students in any educational institution to see how well they are doing. After looking into the matter, we discovered that there are numerous methods for rating objective answers but very few for rating descriptive ones. Whenever a professor is evaluating a descriptive response, they have a few key terms in mind that help them gauge how accurate the response is. Our system scans the sheet, uses optical character recognition to pull out relevant keywords, and then uses cosine similarity to compare those keywords to the ones the user supplies. Our system will then show you how your answers stack up based on this comparison.

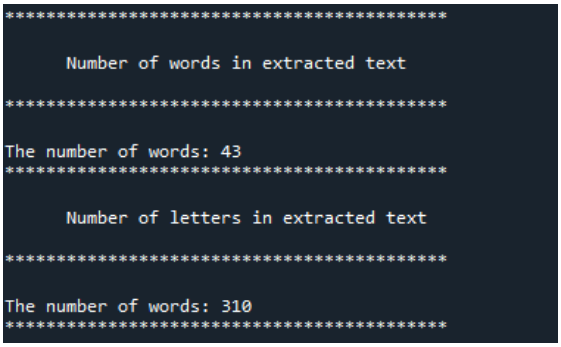

Fig 7. Words Extract Text

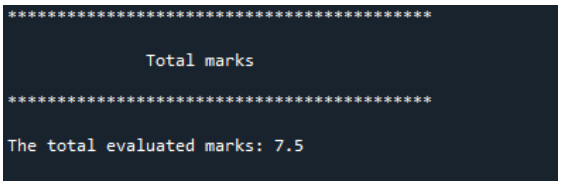

Fig 8. Evaluated Marks

4. Conclusion

Finally, automatic answer evaluation using machine learning techniques has shown significant promise in improving the accuracy and efficiency of educational assessments. These systems have the potential to revolutionize the way we evaluate student responses, thanks to the increasing availability of large datasets and advances in machine learning algorithms. However, several challenges remain, including the need for more diverse and representative datasets, the development of more sophisticated natural language processing algorithms, and the creation of more comprehensive evaluation metrics. Nonetheless, with further research and development, The use of such systems has the potential to greatly enhance the usefulness of educational assessments and, by extension, the quality of learning outcomes for students. The image dataset was likely stolen from a data store, as we have concluded. We deployed natural language processing (NLP) methods and classification (i.e. deep learning) algorithms. After that, we have deep learning algorithms such (ANN). In the end, the algorithm's efficacy is revealed, and the response is graded on a scale from 0 to 10 based on the number of letters and the number of words..

Future Enhancement

Incorporating contextual information: Currently, most automated answer evaluation systems evaluate answers based solely on the text provided, without considering the context or background knowledge. Incorporating contextual information could improve the accuracy and relevance of the grading process. Incorporating multi-modal inputs: In addition to text, incorporating other forms of input such as images or audio could enable a more comprehensive evaluation of student responses, especially in fields such as art, music, or language.

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