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Verifying bank cheque using Deep learning and Image Processing

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Abstract: This paper presents the implementation of verifying bank cheque using deep learning and image processing. The model presents a intelligent cheque verification system which is designed to automate the validation of cheque details using deep learning techniques. And this model is built using Python Flask for web interface, and YOLOv8 (version 8) for detection region of interest, and Microsoft's TrOCR model for hand written text recognition. And the application includes admin login, adding account, managing customer details, and real-time cheque verification. The system increases the security and reduces manual effort in cheque verification process. And offers an efficient and reliable solution for banks and financial institutions.

Keywords: YOLOv8, Deep learning, cheque verification, TrOCR(optical character recognition signature verification, flask.

I. INTRODUCTION

The verification bank cheque is a crucial role in financial security. By playing important role in preventing fraud and ensuring secure financial transactions. Traditional methods of manual verification lead to time consuming, and there will be human errors. However, the integration of deep learning and image processing technique into cheque verification process has become necessity to enhance security, speed and accuracy.

The model is integrated with intelligent and YOLOv8 model for hand written text recognition and TrOCR (transformer optical character recognition) which is used for hand written and text extraction. In addition to text

extraction, it uses SSIM (Structural Similarity Index) to recognize the similarity of the signature. To provide a user-friendly interface it has flask web application which helps easy access and user-friendly for the access manager to verify the cheques in real-time. And it has a MySQL dataset where all the customers data will be stored accordingly and it helps to match the data from the data set the provide accurate verification of real-time cheques.

II. SYSTEM DESIGN AND ARCHITECTURE

The model has two parts in which one is database

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part and another one is input part. In database part the bank manager or institute need to save all the customers data in the data set which is MySQL dataset. And it should contain particular email, account number, mobile number, account holder name, address, and legal amount. This data needs to be stored in data set and it is displayed in web application in the view account interface. And in another part of model, it is input part where cheque image will be the input and where the cheque will be mapped with the data set by extracting the details from the cheque image.

III METHODOLOGY

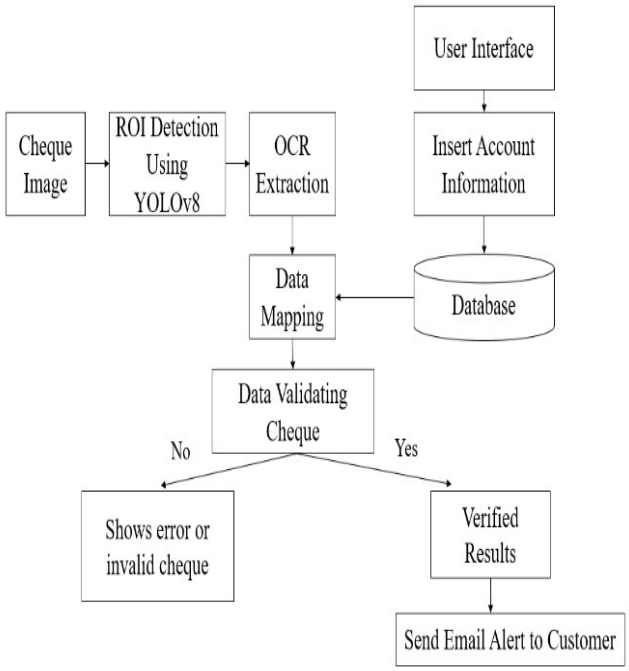

Fig1: Block diagram of Verifying bank cheque using deep learning and image processing

Figure 1 illustrates the block diagram of the proposed verifying bank cheque using deep learning and image processing. It visually represents the flow of data and interaction between the different functional modules. Starting from the left, the inputs as cheque image. This input is processed and where ROI (Region of Interest) using YOLOv8 model which extracts all the details from the cheque like account number, cheque number, written amount, signature. And in the right, it has a web interface for users where all the data of account holder need to stored and which is stored in MySQL database. After all this the model matches the cheque extracted details with the data set and if the data set details and the cheque details matches the cheque is considered as valid. If not, the cheque will be considered as invalid.

The verifying bank cheque system is structed with several main algorithms that works together to extract the region of interest. At the input level, the access manager has to give a input as cheque image. The cheque image is used to extract the printed text and hand written text. And the TrOCR algorithm is used to extract the readable characters from the cheque image. And YOLOv8 model is used to extract the region of interest (ROI). And SSIM (Structural Similarity Index Model) is used for accurate extraction written and understandable text from the detected cheque image.

And it also provides the similarity between the detected signature and the signature which is stored in the data set.

After all the verification and cleaned text which is extracted from the cheque and dataset will be mapped and if it is valid the matched result will be shown in the terminal. The central processing unit integrates all these inputs and controls the appropriate output functions. The system is programmed using Python and utilizes various open-source libraries including Tesseract for OCR, and transformers is used for training and interface, ski image used for image processing, flask for web application. The outputs are provided as the matched details from the cheque and the dataset and an email alert will be sent the customer after all the details are verified and if any fraud occurs the customer may can contact to the particular bank and avoid the loss of financial transactions.

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IV IMPLEMENTATION

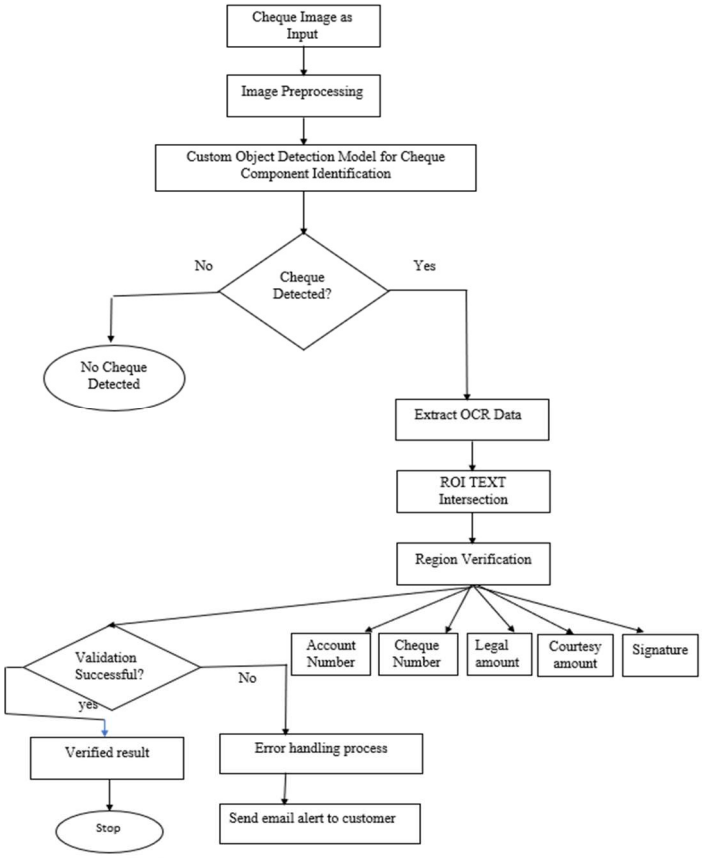

Fig 2: Verifying bank cheque using deep learning and image processing workflow

The Figure 2 presents the operational flow of the Verifying bank cheque using deep learning and image processing, demonstrating how it processes the cheque image as input. The process begins with system initialization, during which all libraries will be activated accordingly.

Where the image of cheque will be processed and the models are used for identifications and to extract the details from the cheque. And if the cheque is detected the process will be continued if not the cheque will be invalid. And after cheque detection TrOCR is used to extract handwritten and text from the cheque. And ROI TEXT intersection which is used for region verification.

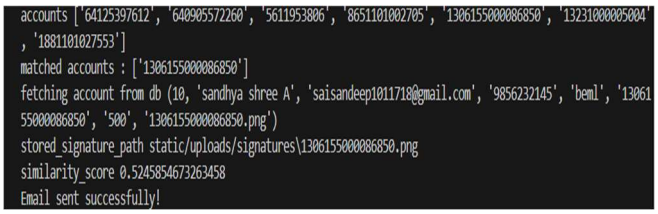

Fig 3: extraction and matching of data from the cheque and dataset

The Fig 3 shows the regions are account number, cheque number, legal amount, courtesy amount, signature. And it also verifies whether the cheque is valid and after all this validation process is done the verified result will be matched with the data set and shown in the output terminal. And if the signature matches with the threshold value which is given in the code will be matched and verified with a python signature comparison toll. Which occurs after the extraction of data from the cheque. And it verifies the similarity between real-time cheque image and the stored signature of the image.

Fig 4: signature similarity

Fig 4 shows the similarity of the signatures And after all this process is done if the similarity of the signature is above the threshold value which is given as 0.3(30%) then the given cheque is considered as valid and it is good for the transaction. If the threshold value is below 0.3 then the cheque will be considered as invalid or fraud cheque. And this model sends two different types of mains according to similarity matching between the signature threshold values. If the similarity between the cheque is above 0.3 then it sends an email according to command give in the code like your (account number), amount in the cheque, cheque number, the particular bank name and the details of the account holder and a helpline number to contact the bank. If the signature similarity is below the

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threshold value, then the email will be different and it will send as your cheque for the request to debit the amount of has been rejected.

V RESULTS

The Fig 3 shows the region of interest which is extracted from the cheque. They are cheque number, account number, written amount, and signature. And this extracted signatures and other data will be matched with the data which is stored previously in the MySQL dataset and if the data is matching then the cheque transaction will be takes place if it doesn't match then the give input cheque is invalid and email will be send to the account holder as the content given according to threshold value matching.

Fig 4 shows the similarity between the cheque signature which is input to the model and the another will be stored image of signature which is present in the data set. And in the given fig it is having 0.52 threshold value it has achieved so the given input cheque is valid it can process the transaction the required amount the account. And the admin can add, delete, deposit amount in the account and they can modify the account details according to the request of customer.

The main of this model is to provide a secure and accurate bank cheque verification system to reduce the time consumption and with the help of techniques like deep learning and image processing it can achieve the more accurate and secure transaction in real-time.

VI CONCLUSION

In the proposed This verifying bank cheque using deep learning and image processing this model helps the financial institutions and banks. With the help of easy user interface, dataset to store data and intelligent techniques to verify the cheque and email alert to make aware about the fraud transactions from the banks. Our model shows good accuracy rather than other models, making fewer mistakes and responding faster. The system uses proven technologies like TrOCR, YOLOv8 model, to ensure reliable performance. It's simple, portable, and designed for real-world use, making banking and financial institutes to save time and accurate transactions in real-time.

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