B.Tech Capstone Project Synopsis 2021-22

1. **Project Title:** Identification of human sentiments using AI with help of personalized human handwriting

Mention Any One Of The Following Domains

Group 1. AI, ML, Data Science, Cognitive Computing & NLP

Mention Any One Of The Application Domains

The Application domains to be focused are:
1. Healthcare

Mention Any One Of The Following Research Themes

The research Themes are:
4. Sustainability

2. Industry Supported / In-house: *In-house*

3. Team Members names:

Snehalraj Chugh - 1032181182
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Abhishek Chebolu - 1032180316

4. Project Description :

We want to develop a personal module to assist and better analyse an individual through their handwriting using artificial intelligence, than what has been done so far which is quite generic and limiting. We are combining four domains, .i.e, Deep Learning, Computer Vision, NLP and Psychology for our research

1. *Our focus is to invent new methods for letter segmentations in a sentence*
2. *Creation of customized personal database for every different handwriting (classified entity)*
3. *Psychological Analysis of an individual upon the style of writing (stores, size, angle of letters)*
4. *A module will be integrated to help deaf and blind people understand emotions and the feeling behind the hand-written message at the time it was written.*
5. *The machine can understand the cancelled-out/scribbled words by itself as to analyse the page more human-like.*
6. *We will be particularly analysing the finding for every sentence which are:-*
    a. *Analysing the person's nature/personality*
    b. *Understanding emotions at the time of writing*
    c. *Sentiment analysis of sentence*

5. Literature survey in tabular format [year of publication, author names, journal/conference, gaps, etc]:-

Sr no.	***Paper Name***	***Consortium***	***Author***	***Highlights of the paper***	***Uses***	***Research Gaps***
1	*Comparative Analysis of Text Extraction from Color Images using Tesseract and OpenCV*	IEEE	*AS Revathi; Nishi A Modi*	Analyses the effect of unprocessed images and preprocessed images on the performance of tesseract	Text Extraction Image Preprocessing	Complicated or cursive handwriting
2	*Image to Multilingual Text Conversion for*	IEEE	*Muhammad Ajmal; Farooq Ahmad; Martinez-Enriquez A.M.;*	It translates text just by capturing an image with the user's smartphone camera and translation instantly appears on the	Multilingual Text Conversion Character Recognition	Generalized approach

	Literacy Education		*Mudasser Naseer; Aslam Muhammad; Mohsin Ashraf*	user's mobile screen in the language selected by the user.		
3	*Real time license plate detection using OpenCV and tesseract*	IEEE	*Rahul R. Palekar; Sushant U. Parab; Dhrumil P. Parikh; Vijaya N. Kamble*	The CV2 OpenCV library using Python language is used for image processing and Tessaract is used for text extraction from the processed image.	License Plate detection	Generalized approach
4	*Text-Based Handwritten Recognition Through an Image Using Recurrent Neural Network*	Springer	*D. Kalyani, P. Vijay Kumar*	The main objective of this paper is to propose the design of an expert knowledge-based neural network system for handwritten recognition that can effectively recognize the text from the given input image using a recurrent neural network approach.	Word segmentation	Character level segmentation
5	*Image Character Recognition using Convolutional Neural Networks*	IEEE	*Adith Narayan, Raja Muthalagu*	This paper studies the use of CNN in detecting and recognizing handwritten text images with higher accuracy. The CNN model is tested on English handwritten characters and validated on its performance. The model performs feature extraction from images through multiple layers. These are later used for training the model and thereby recognizing characters.	Character Recognition	Cursive handwriting
6	*Optical Character Recognition using Tesseract and Classification*	IEEE	*Saurabh Dome, Asha P Sathe*	the paper presents the design and procedure of the OCR WebApp, which consists of three sections that are: Image-to-Text, Real-time OCR (using webcam), and Handwritten Text Recognition. In this project, OCR uses Tesseract as an engine to display the text to the user and HTR uses a Deep learning model to classify the letters and display them to the user.	Character Recognition	Generalized approach

7	*Optical Character Recognition for English Handwritten Text Using Recurrent Neural Network*	IEEE	*R. Parthiban; R. Ezhilarasi; D. Saravanan*	The framework introduces a Recurrent neural network for recognizing English handwritten text.	Letter classification	Cursive handwriting
8	*Multilingual Text & Handwritten Digit Recognition and Conversion of Regional languages into Universal Language Using Neural Networks*	IEEE	*B. Vidhale, G. Khekare, C. Dhule, P. Chandankhede, A. Titarmare and M. Tayade*	In this research work, a purely handwritten digit recognition using machine learning model as well as character recognition matlab model is used. A translator using MATLAB to beat the barrier of various languages is designed. The projected style is also used for English, Marathi and Guajarati text to speech conversion into English language.	Text recognition and translator	Generalized approach
9	*Analysis on Preprocessing Techniques for Offline Handwritten Recognition*	Springer	*Krupashankari S. Sandyal and Y. C. Kiran*	The paper emphasizes on various techniques for pre-processing an image that aids in the further process of Image recognition.	Image preprocessing	Character level segmentation
10	*An Efficient Digit Recognition System with an Improved Preprocessing Technique*	Springer	*P. S. Latha Kalyampudi,P. Srinivasa Rao,D. Swapna*	In this paper the experimentation is done on the classification of different hand written english numbers with preprocessing of the image obtained from which digits are to be extracted.	Image preprocessing	Implements word-level segmentation instead of character segmentation
11	*Path Detection for Self-Driving Carts by using Canny Edge Detection Algorithm*	IEEE	*Sumir Srivastava, Sumita Gupta*	In this research paper, an improved and optimized lane detection method is proposed by using the OpenCV's canny edge detection algorithm. A quick and robust method that can easily detect lanes in a live video feed or a pre-recorded video stream.	Line detection	Character level segmentation
12	*Deep Hough Transform for Semantic Line*	IEEE	*Kai Zhao, Qi Han, Chang-Bin Zhang, Jun Xu,*	They focus on a fundamental task of detecting meaningful line		Without Image preprocessing

	Detection		*Ming-Ming Cheng*	structures, a.k.a., semantic line, in natural scenes.		tesseract performed only with 51% acc
13	*Improved Lane Line Detection Algorithm Based on Hough Transform*	Springer	*Fang Zheng, Sheng Luo, Kang Song, Chang-Wei Yan, and Mu-Chou Wang*	They propose an algorithm directly identifying lane line in Hough space. The image is conducted with Hough transform, and the points conforming to the parallel characteristics, length and angle characteristics, and intercept characteristics of lane line are selected in Hough space.	Line detection	Character recognition of natural scene had limited success
14	*A Method of Workpiece Coherent Line Detection Based on Progressive Probabilistic Hough Transform*	ACM	*Ziyao Wang, Dali Yang, Qiang Tong*	This paper discusses an Improved PPHT method which performs edge detection combine with original PPHT algorithm to find lines of workpiece object. After discarding noise lines, this method divide the detected lines into several groups by finding collinear candidates.	Line detection	Cursive handwriting
15	*Natural scene text detection based on YOLO V2 network model*	IOP	*Dong Haifeng, Han Siqi1*	The main works in the paper include the following: prepare the datasets; we train the YOLO v2 with the optimum parameters, carry out the regression analysis of the coordinate parameters and categories of bounding boxes, obtain the detection result; according to different detection models.	Object detection	Character level segmentation

6. Literature Gap in detail

- ***Cursive Writing-*** *With the different types of handwriting & ways to write in English, one of the most difficult arena is cursive writing.*
- ***Forgery-*** *Issues with different people writing in the same way giving out false predictions.*
- ***Generalised Approach-*** *Approaches available have made generic perspective towards the population regarding handwriting analysis*
- ***Homogenous Database-*** *Different datasets have stored the entities used in the same set together, which creates difficulty in analysis.*
- ***Pseudo Sentiment-*** *Predictions over incorrect emotions.*
- ***Accuracy-*** *Neural Networks have alot of possibility for new things to come up in algorithms and achieve 100% accuracy with less dataset given to train.*
- ***Cross-Relationship-*** *The behaviour of one entity in relation to other entity is not stored with analysis.*
- ***Loss/Excluded features-*** *Other features used in bridging the gap between blind, deaf and disabled people are left out.*

7. Feasibility study (comparisons of existing systems)

The feasibility of predicting the performance through the stability is observing similar tendencies when the users are sorted by the stability measures. To avoid noisy behaviour in the stability curves, they were smoothed with a moving average. The feasibility to predict the performance is assessed by comparison between the performance and the stability of the users.

8. Project Scope(functionalities to be implemented):

The main aim of this research was to develop a system that will help in the classification and recognition of Handwriting characters and digits and then used in various applications. Recognition of characters and digits is vital in today's digitized world, especially in organizations that deal with Handwriting documents that they need to analyze using computer systems.

Systems that are used for classification and recognition of handwriting help organizations and individuals to solve complex tasks by understanding the writers perspective as well as their emotion while writing down the text. The current system used neural networks to process and read handwriting characters and digits. The system benefited from Convolution Neural Networks (CNN) with the help of training data that allowed easy recognition of characters and digits. Like the human visual system, CNN allowed the system to be more sensitive to different features of objects.

That way, it was easy to classify and recognize different Handwriting characters, text and digits based on the training data stored in the system's database. The phases of handwriting recognition included image acquisition, digitization, preprocessing, segmentation, feature extraction, and recognition. The final system satisfied the specified requirements of accuracy as well as recognition. The work of the current research can be extended for character recognition in other languages. It can be used to convert books, newspapers, handwritten notes, and newspapers into digital text format using machine learning models used by the current research.

9. Navigation through the Designs (High Level Design: i/p , process block , o/p)

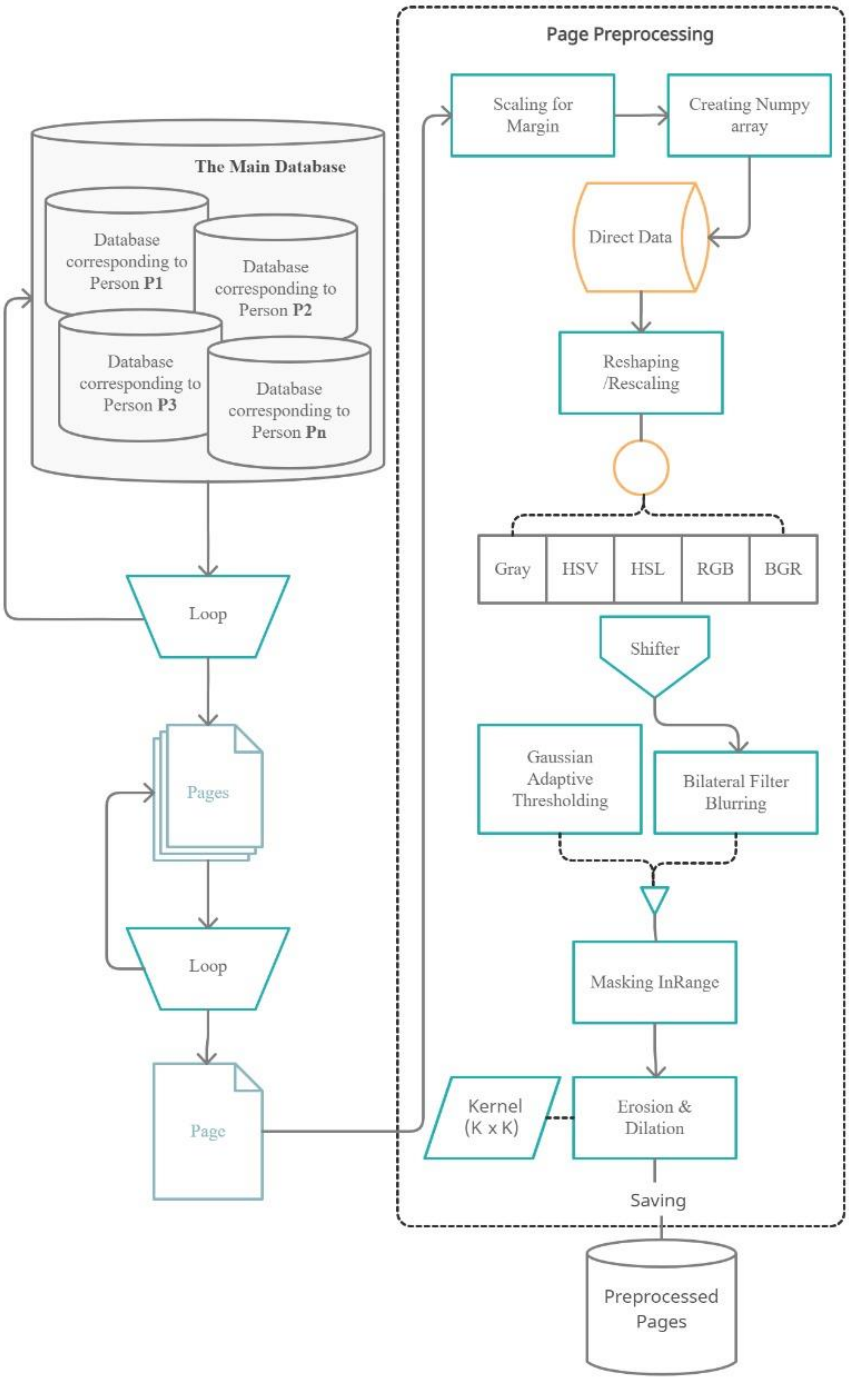

Figure 1: Main database looping and preprocessing of the pages

10. Low Level Design : (individual modules of the process block,and their i/p, o/p)

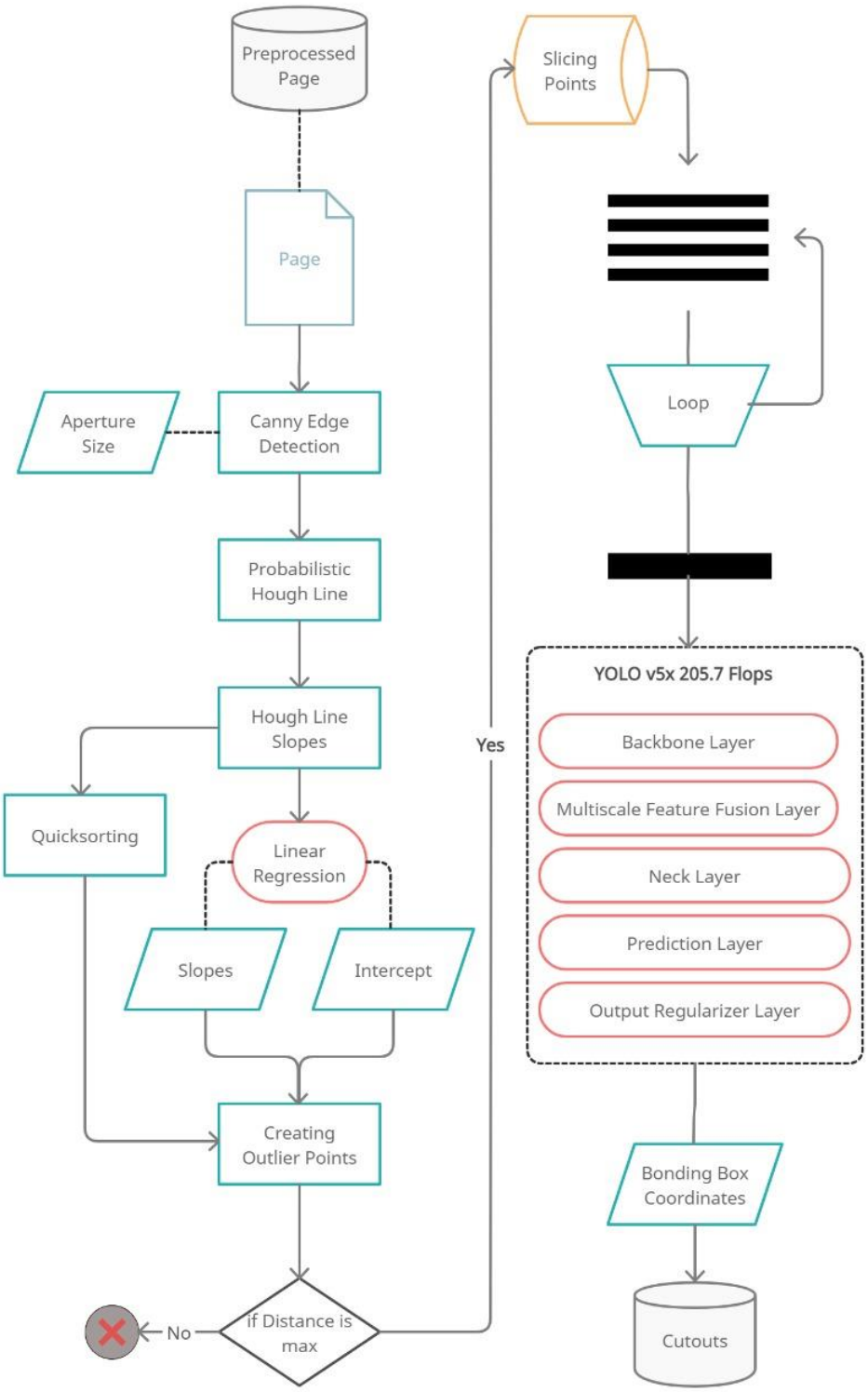

Figure 2: Preprocessed Pages for edge detection and character extraction using YOLO v5x FLOPS

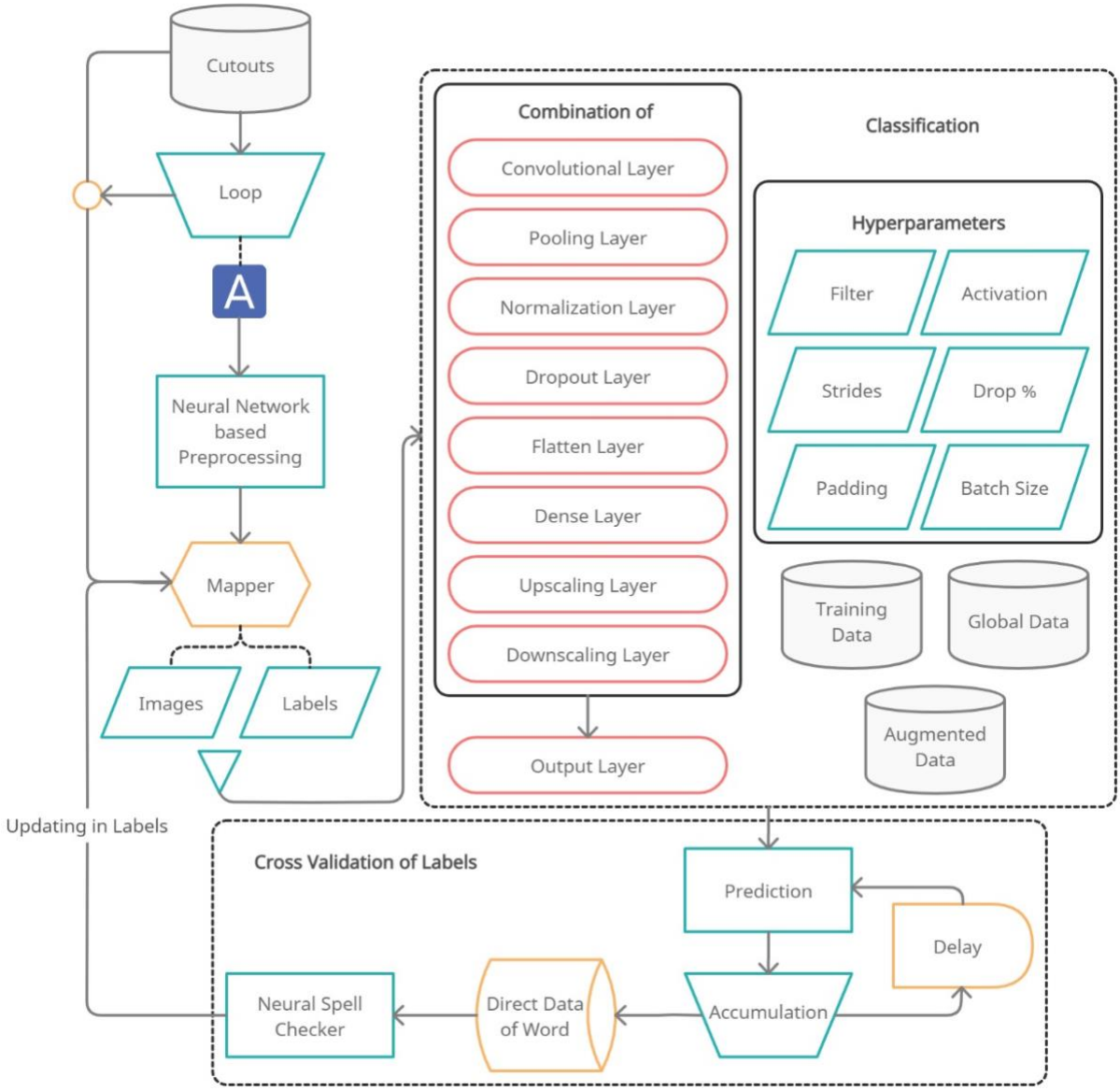

Figure 3: Preprocessing of bounding box images extracted in last stage and classification of the characters

11. Hardware Requirements:

- *Windows/MAC laptop*
- *NVIDIA GPU*

12. Software Requirements:

- *Python 3*
- *Tensorflow*

13. Technologies used:

- *NLP*
- *Neural Network*
- *OpenCV*

14. Future Enhancements:

The main objective of this research is to design an expert system for Handwriting character recognition using neural network approach. Other objectives include:

- To address the issue of accuracy in Handwriting character recognition systems by developing a system that will use efficient and novel technology for recognizing Handwriting characters and words from image media.

- To investigate and demonstrate the usefulness of neural network technology in development of efficient Handwriting character recognition systems.

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