**PROJECT 1 – OCR**

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* Python version: **3.10**
* Open CV version: **4.5.5**
* Before feature extraction, thresholding and extraction of bounded box images are done on the provided characters and the extracted letters from ‘test\_img’(as mentioned under detection).
* In **extraction**, I have used 2 feature detection technique –
  + Zoning
    - Each bounded box image is resized to 20x20 pixel size
    - Each bounded box image is then divided in 25 zones.
    - Total number of black pixels are counted for each zone and stored in a list (signature array).
  + Ratio of height and width of the bounded box
    - Each character’s height and width ratio are calculated and stored for recognition.
* In **detection**, I have used 4 connected components labelling approach.
  + For each pixel, I am comparing the left and top pixels and assigning the smallest value as the label of that corresponding pixel in the first pass.
  + Additionally, I am combining (similar to set union) the list of the left pixel list with the top pixel’s list as these lists (list inside list) would be later used in the second pass.
  + In the second pass, for each assigned label, I am checking if the assigned label exists in any lists as mentioned in the above point. If yes, I am getting all the minimum value from those lists and replacing the assigned label with the new minimum label.
  + I am also creating the bounding box around each unique label, and storing each label’s image as a separate image in the feature folder.
* In **recognition**,
  + For each unique label, I am fetching the corresponding bounding box image and extracting their feature (signature array) using zoning and height/width ratio.
  + For each character from PART-I,
    - Computing the sum square distance (SSD) between the label’s signature array and current character’s signature array.
  + Get minimum value of the SSD.
  + If it less than some threshold value (i.e-1500),
    - If the label’s ratio is similar to character’s ratio (label’s ratio/char’s ratio: [0.5,2])
      * **MATCH**
    - Else
      * **UNKNOWN**
  + Else, **UNKNOWN**

**RESULTS -**

