

# Machine Learning and its Applications

Swapnil Masurekar, Abhishek Sharma, Mentors: Rutuja, Suprabha

## ABSTRACT

1. **OCR** involves a CNN approach, to correctly identify English handwritten characters with 96% accuracy
2. **Automated reply system for Piazza** sends the reply and labels the mail using Gmail-API
3. **Image Captioning with Face Recognition** captions image with the name of the person

## Software Used

1. Anaconda: A scientific distribution for Data Science
2. Spyder IDE, Jupyter Notebook (Python v3.6)
3. *Python Libraries:*

### Optical Character Recognition:

Scikit-Learn v0.19.1, Keras v2.1.5, Tensorflow v1.8.0, Pandas v0.22.0, OpenCV v3.4.1

### Automated Reply System:

Natural Language Toolkit v3.2.5, Gmail API Python

### Image Captioning with Face Recognition:

Tensorflow-GPU v1.1.0, PIL v5.1.0

## Optical Character Recognition

### Features:

1. Dotted Character Recognition
2. Handwritten character Recognition
3. Sentence Recognition
4. Correct Recognition irrespective of thickness

THIS IS A SENTENCE

(x=284, y=1) ~ R:255 G:255 B:255

Results from Convolutional Neural Network: =====> THIS IS A SENTENCE

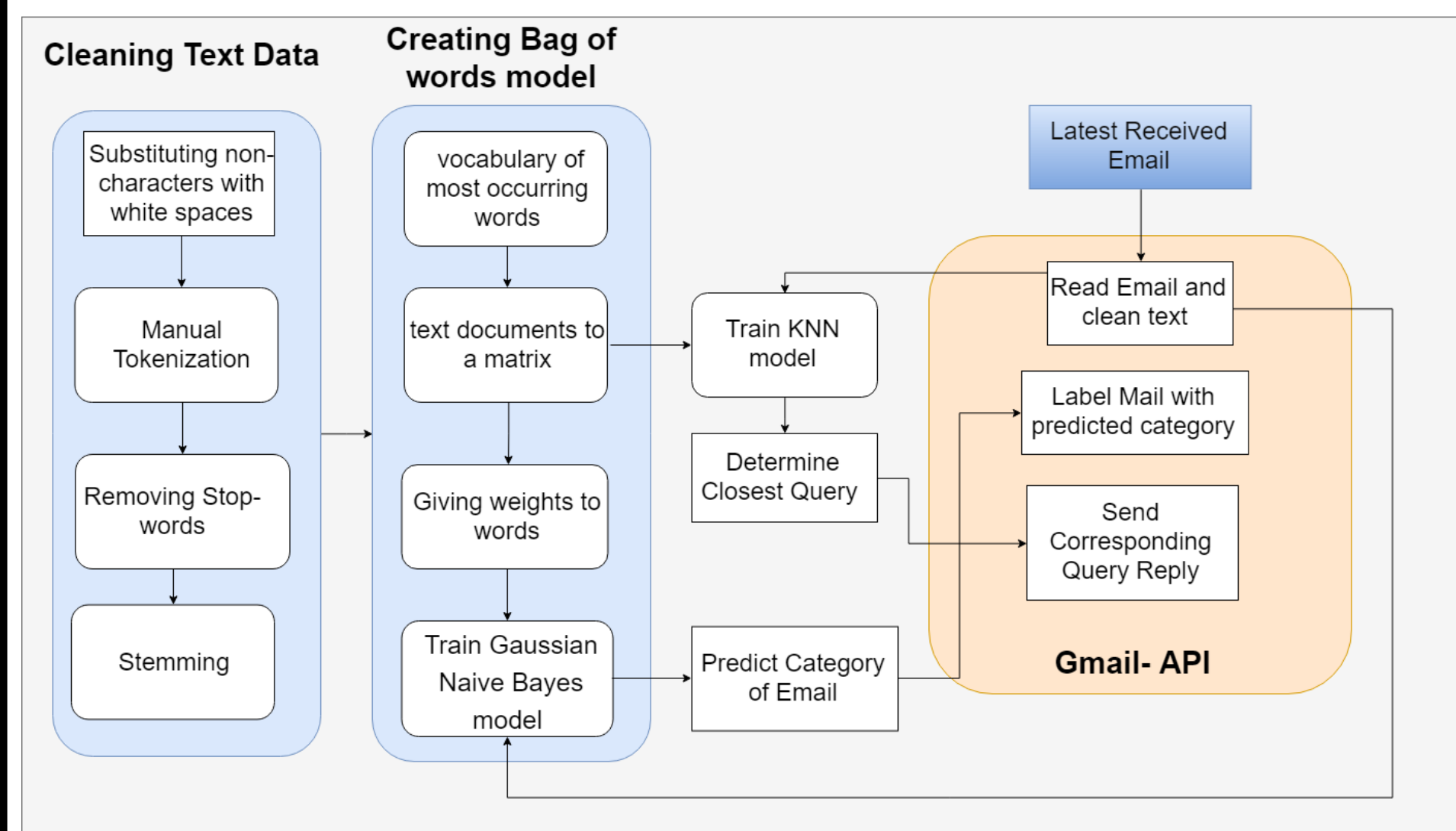
CDEFHJ 2 4 5

(x=312, y=62) ~ R:255 G:255 B:255

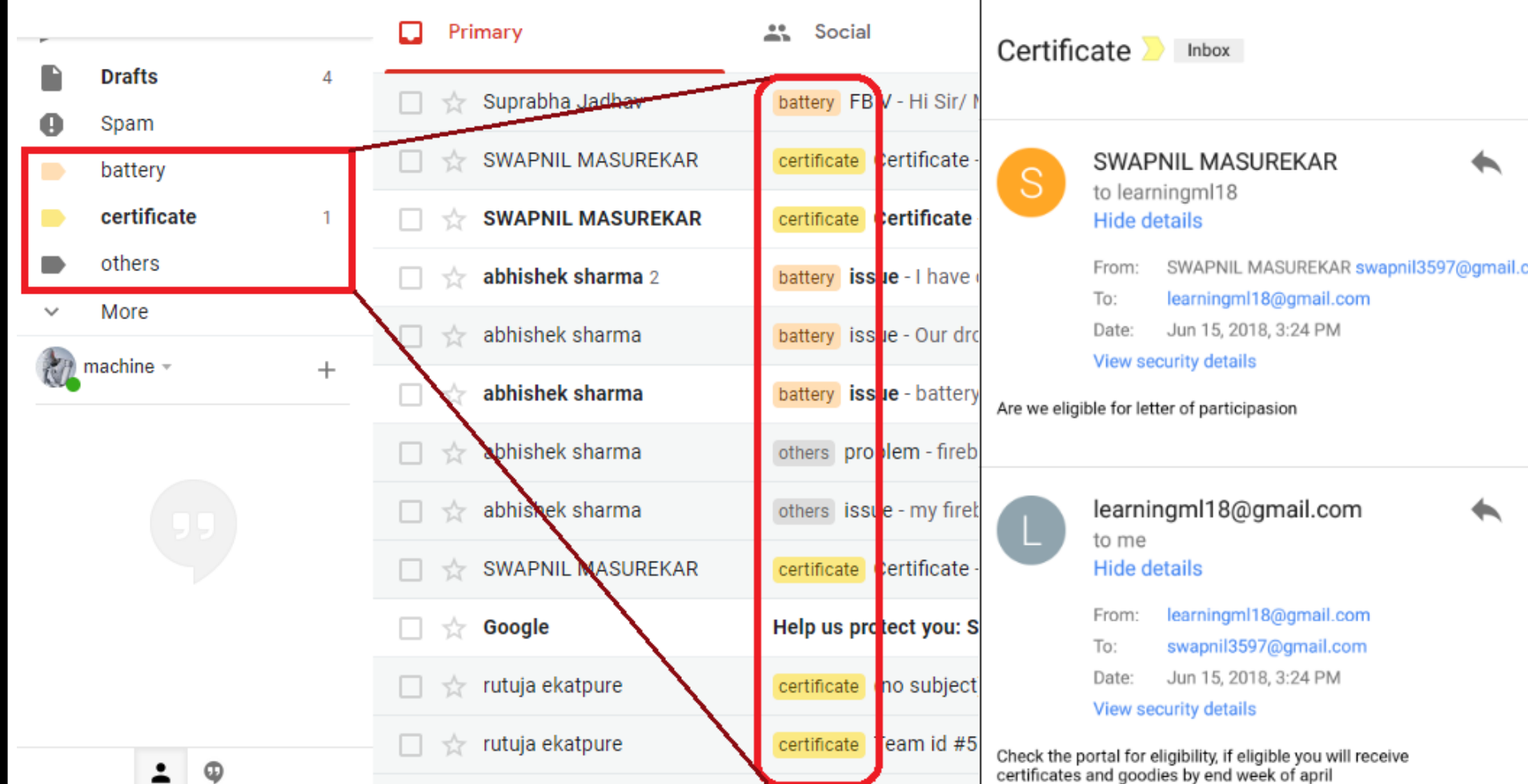
Results from Convolutional Neural Network: =====> CDEFHJ

Results from Convolutional Neural Network: =====> 245

## Automated Reply System



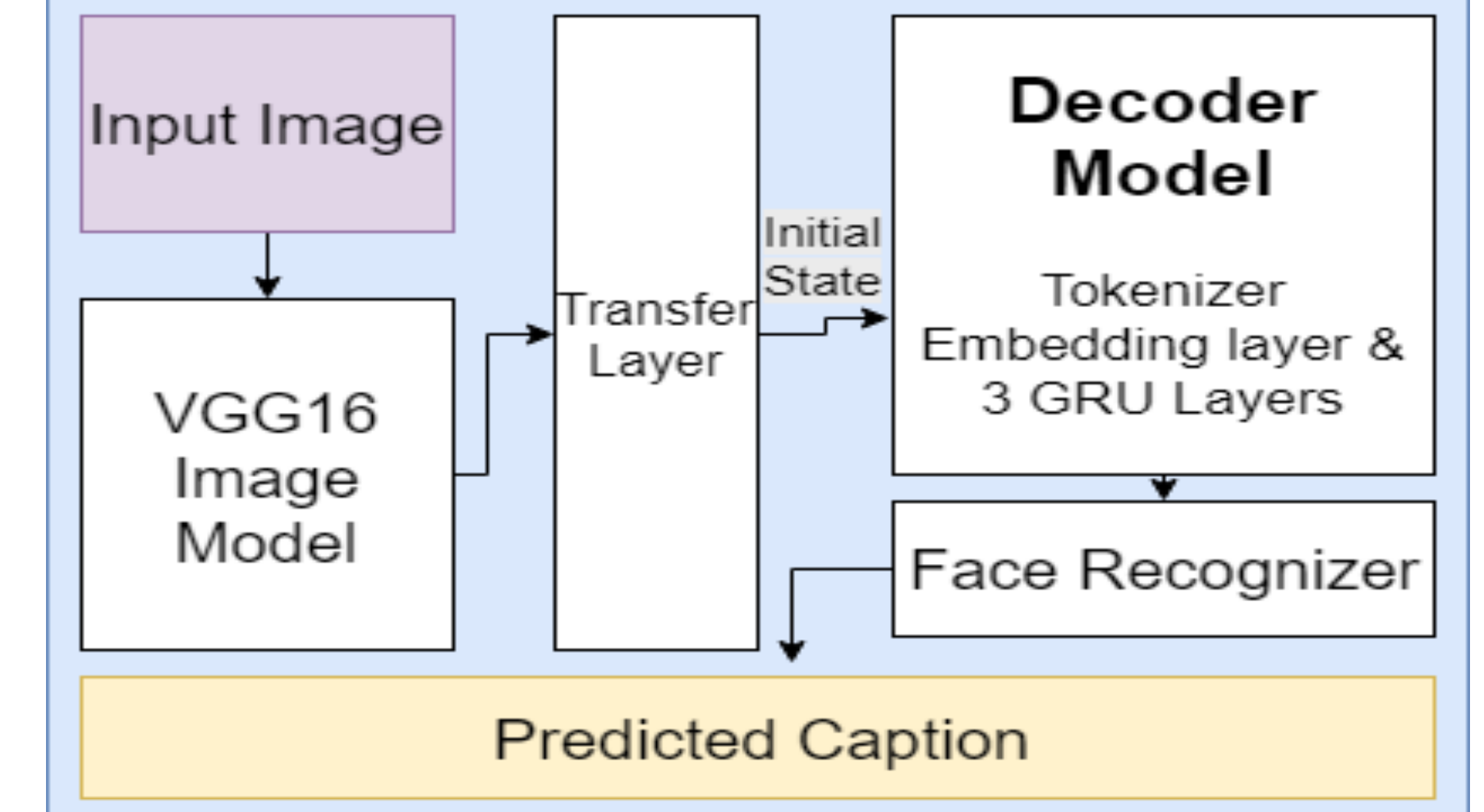
During e-YRC help-desk and piazza receive lot of queries regarding certificate, battery, etc. Many queries are similar and are subject to same replies, so our code finds the **most similar** queries amongst the queries already present and send the corresponding reply and correctly label the email for better user efficiency



## Features

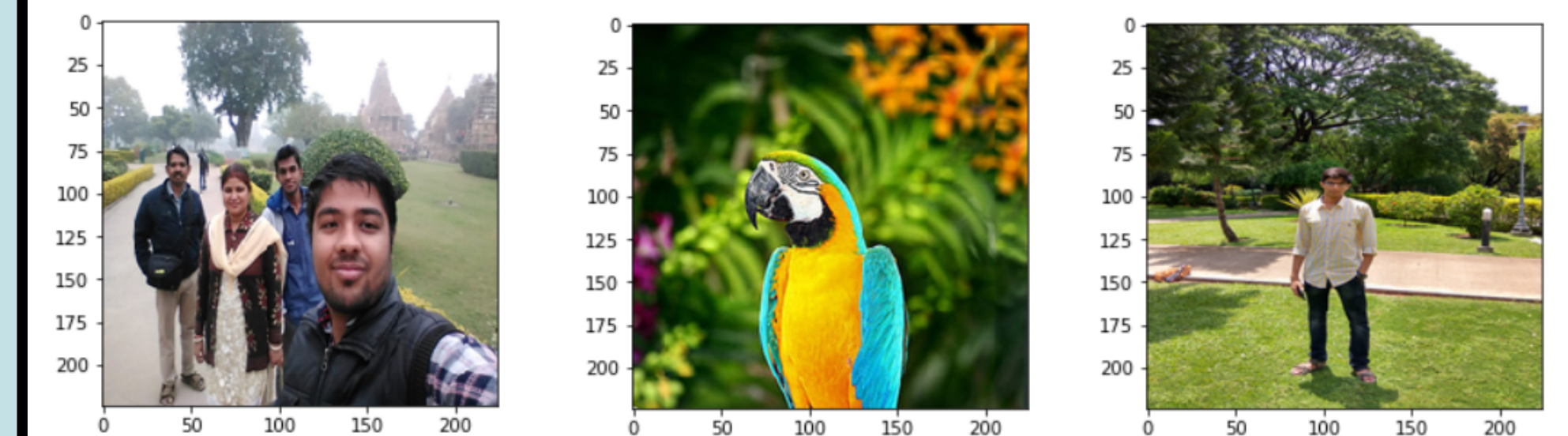
1. Automatic e-Mail labelling
2. Automated Reply to e-Mail query using Gmail API

## Image Captioning with Face Recognition



### System Description:

1. VGG16 model is used as an image summarizer
2. The o/p of summarizer is mapped to initial states of GRU using transfer layer
3. The decoder model (RNN) trained on COCO dataset.



Predicted caption: Abhishek and a woman are standing  
Predicted caption: a bird sitting on a tree branch with a blurry background  
Predicted caption: Swapnil is standing in a field

## FUTURE WORK

### Optical Character Recognition:

This can be further expanded over paragraph reading and recognition of characters with different colors of varied contrast.

### Automated Reply System:

Due to ever increasing dataset, later word Embedding can be done and RNN model can be trained to improve the system's semantic accuracy.

### Image Captioning with Face Recognition:

Computation speed can be improved by modifying the decoder so it also returns the states of the GRU-unit and make changes in caption generation such that it only inputs and outputs 1 int-token in each iteration