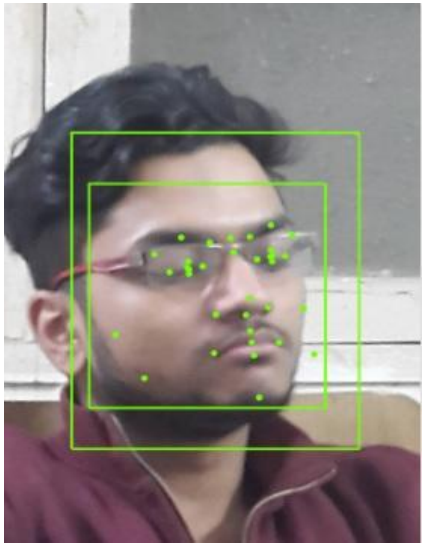
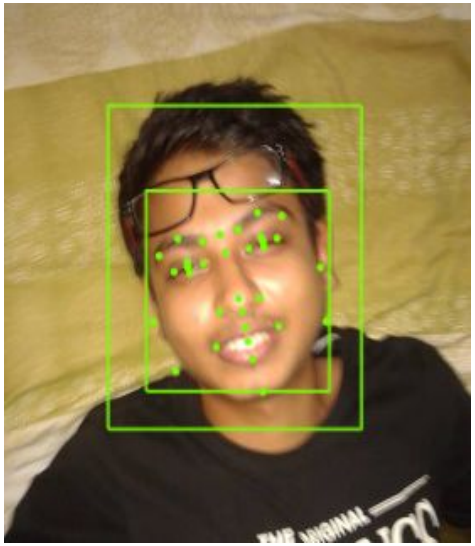
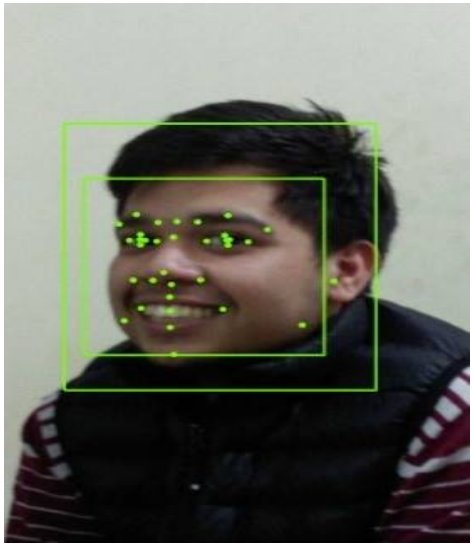
Human Emotion Recognition from Static Images
CS771 Project

Problem Statement

- Our project is aimed at recognizing human emotions from static images
- We have approached it as a supervised classification problem to compare different existing standard techniques like SVM, Naive Bayes and KNN and compare their performance against Convolutional Neural Networks.
- Seven basic emotion classification categories are Happy, Surprise, Sadness, Anger, Disgust, Fear and Neutral

Prior Work

- We reviewed papers where similar kind of problems had been dealt with on different datasets using methods like SVM, Naive Bayes

- It compared the SVM accuracy on POFA dataset and showed that accuracy of 88.1% achievable using linear kernel for C-SVC formulation

- The studies reported accuracies upto 80% in person dependent results and 63% in person independent results in case of Naive Bayes Classifier

Techniques Used

Dataset: SFEW 2.0 (from Static Facial Expression Recognition sub challenge)

Feature Generation: Google Cloud Vision API

Convolutional Neural Networks

Classification: Support Vector Machines

Naive Bayes

K- Nearest Neighbour

Improving Accuracy: Principal Component Analysis

Experimental Results

Accuracy using SVM: Linear Kernel: 39-40 percent (C=3.0)

Polynomial Kernel: 30-31 percent (C=3.0)

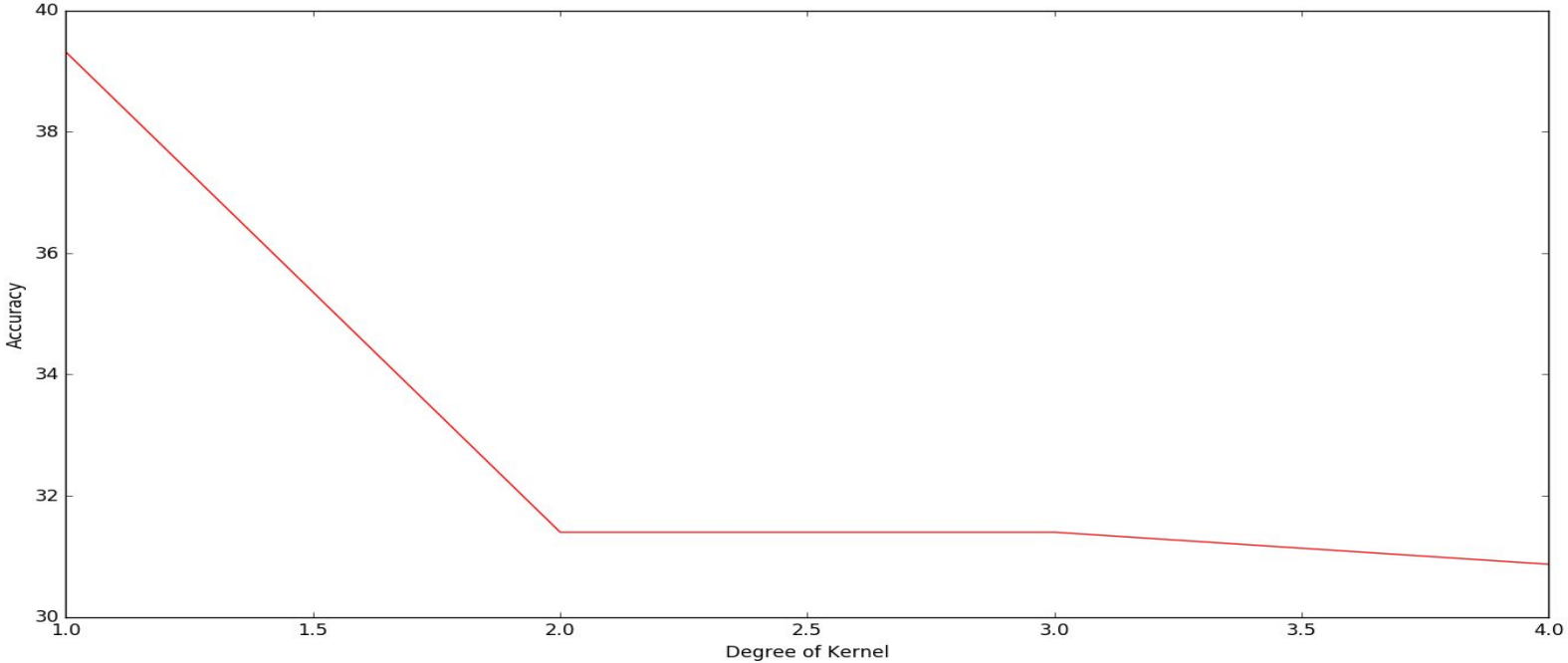
RBF Kernel: 23 percent (C=3.0)

- For any value of C, Linear Kernel always had highest accuracy
- C=3.0 gives best accuracy for Linear Kernel and RBF Kernel

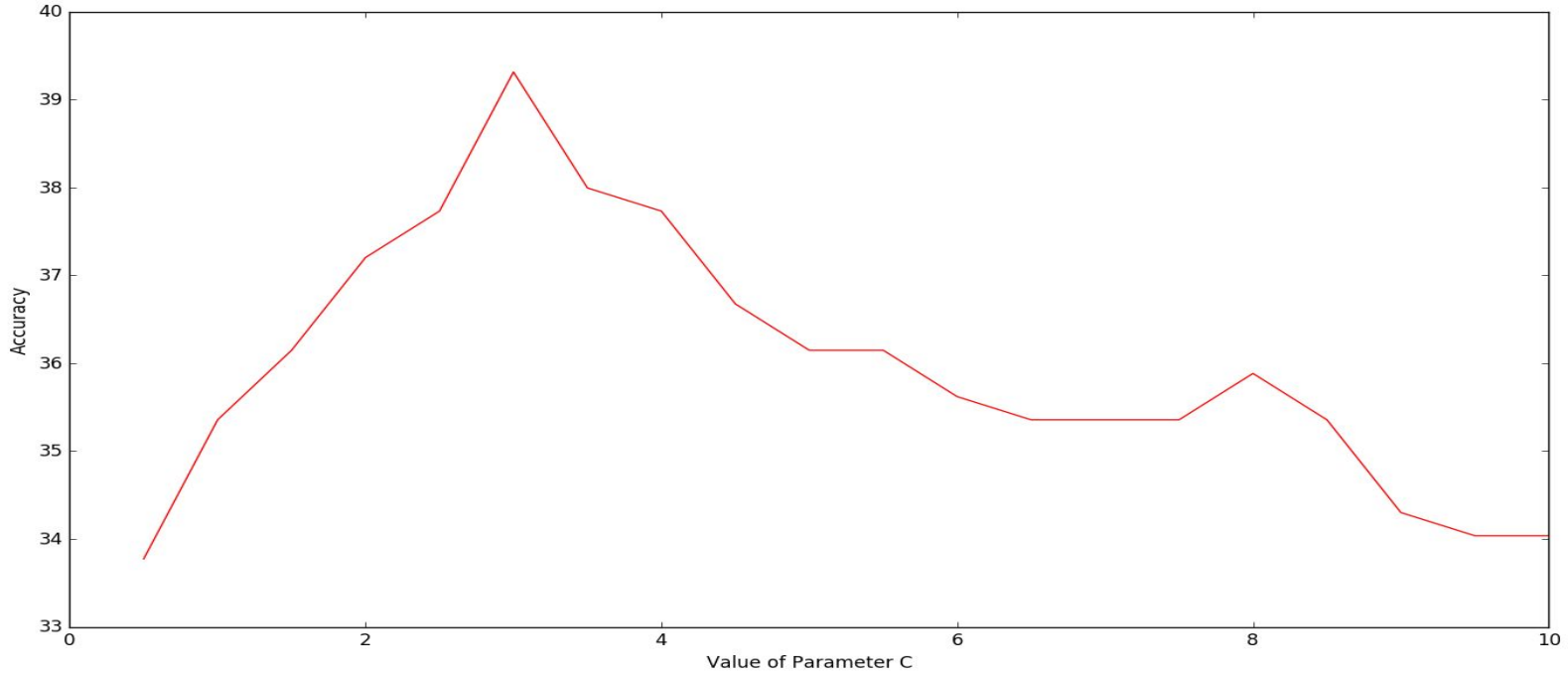
Accuracy using Naive Bayes: 16 percent

Accuracy using K-NN: 25 percent (K=6)

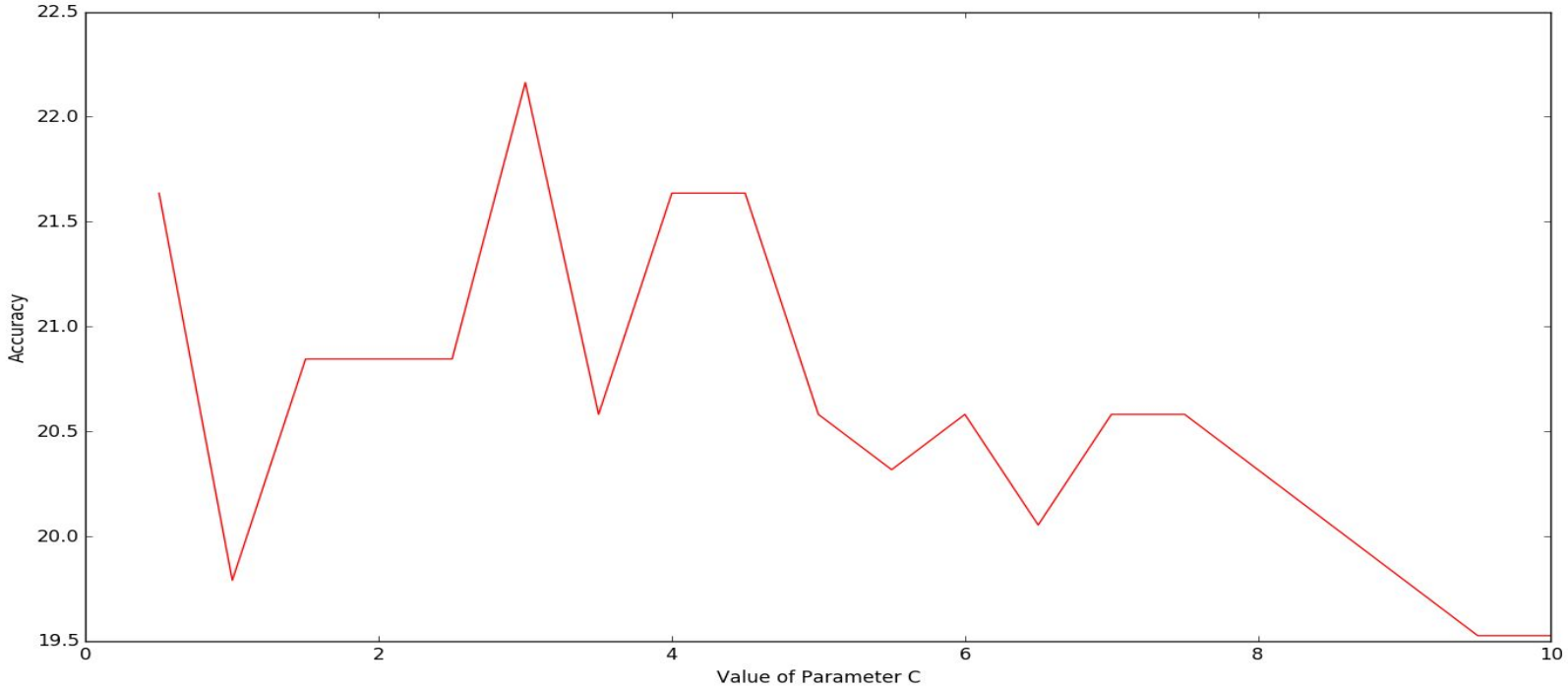
Accuracy vs Degree of Kernel



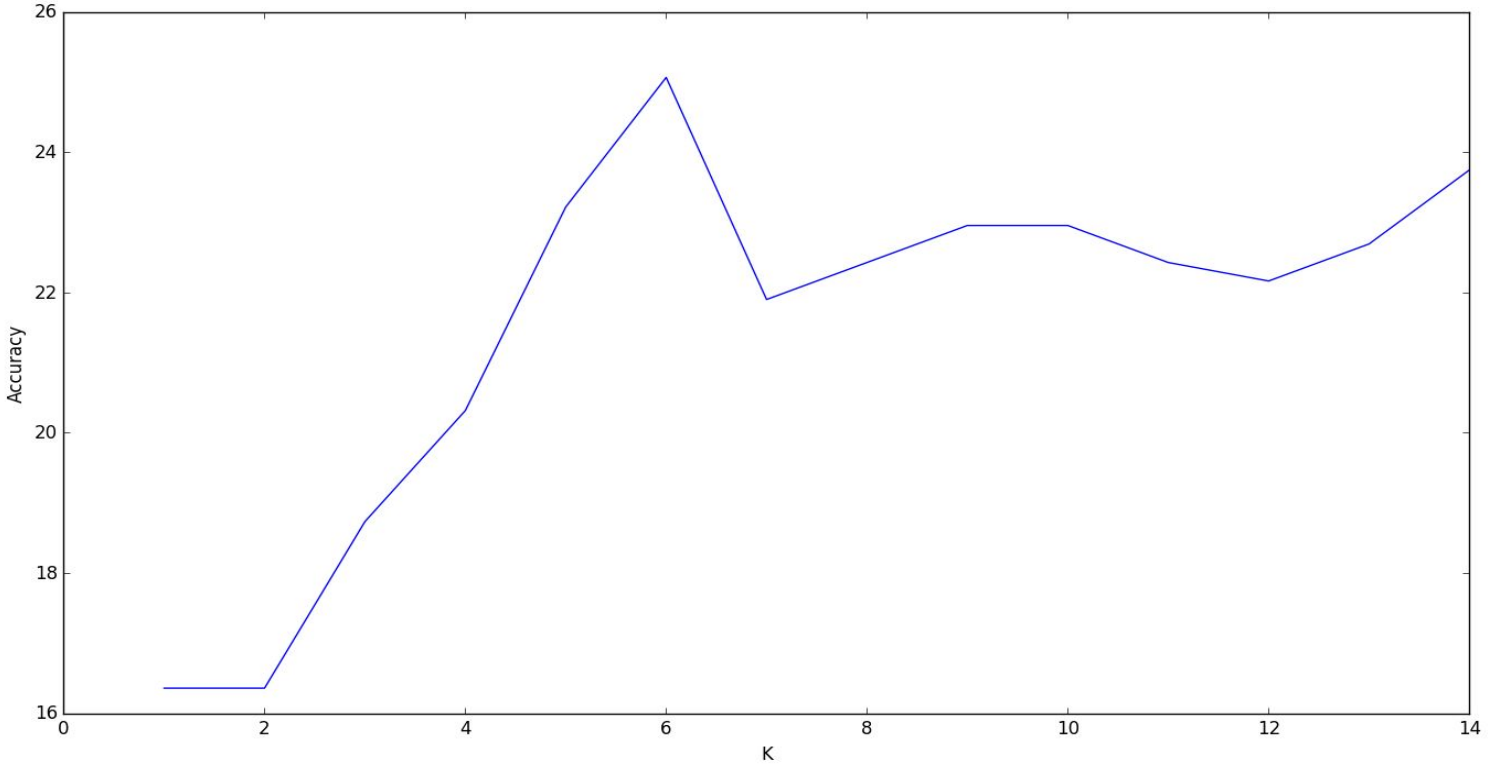
Accuracy vs Parameter C in Linear Kernel



Accuracy vs Parameter C in RBF Kernel

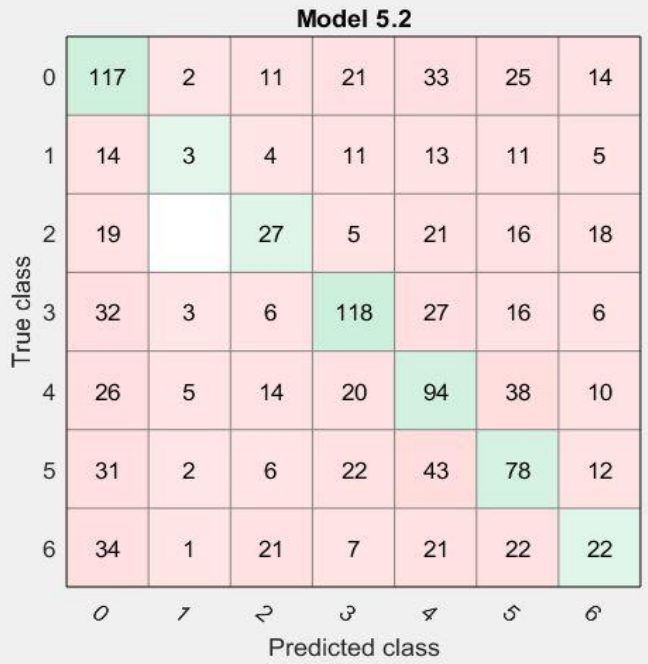


Accuracy vs Number of Nearest Neighbour

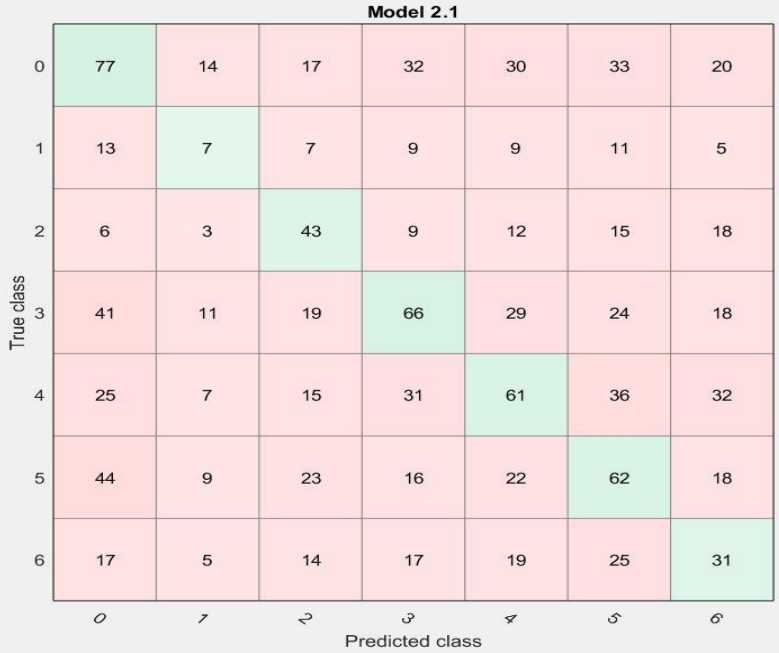


Confusion Matrix

SVM

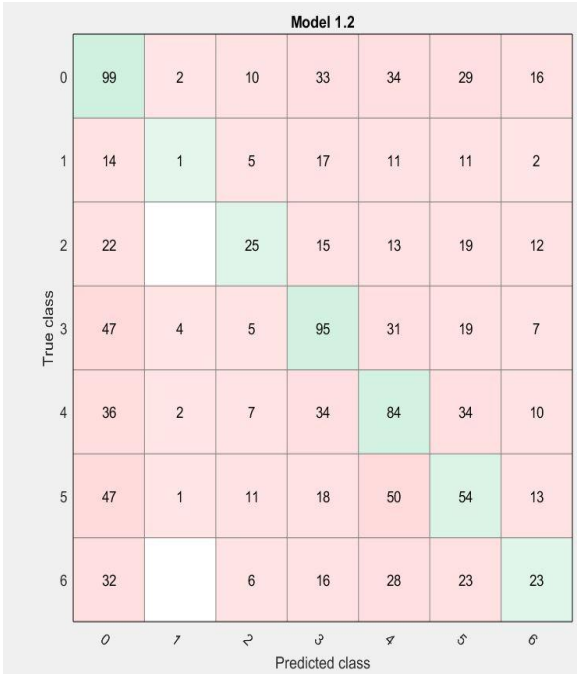


K-NN

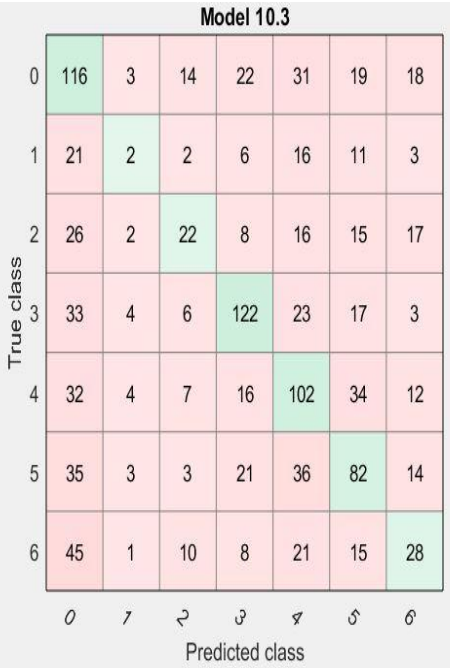


Results

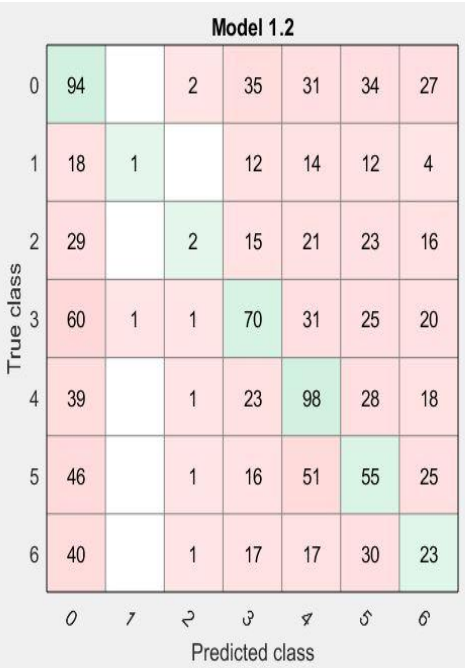
Bagged Trees(33.8)



Linear Discriminant Analysis(42.1)



Decision Trees (31)



Lessons Learnt

Challenges associated with selecting a proper dataset and extracting features from a dataset

We need to extract better features as there is large training error for all different classifiers

During literature survey and also from experimental results, we realised that Convolutional Neural Networks generate features that can provide better accuracy using SVM and Naive Bayes.

Acknowledgement

We are really grateful to Prof Piyush Rai for providing us with this opportunity to explore machine learning. This project has been a really good learning experience in many aspects from working on non ML things like finding suitable dataset, extracting features using API's, writing scripts to clean the features obtained and then towards the ML stuff like implementing SVM and Naive Bayes and improving the accuracy through various methods.

We all are thankful to you all for coming here to listen to us.