Challenging Experiment

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***Abstract*—This report is aimed at explaining the methodology used in the given challenging experiment. In simple words, yolov3 was used to get the bounding boxes for faces in dataset and then yolov8 was trained and used for emotion recognition**

I. Introduction

The task is to predict and classify the emotion of the face in the given image dataset. This document runs through the methodology used to accomplish the task..

II. Dataset Description

The data consisted of images from Tamil memes, which contained various celebrities with various facial expressions based on emotions. The csv files provided contained the details that provided the emotion of each image, basically labels. The bounding box coordinated around the face was not provided, but was asked in the competition. Here's a glimpse of a csv file:

[3]:

	Image_Name	Emotion_1
0	YB_1_2.jpg	SURPRISE
1	YB_1_16.jpg	SURPRISE
2	YB_1_37.jpg	SURPRISE
3	YB_1_38.jpg	SURPRISE
4	YB_1_45.jpg	SURPRISE
..	...	...
350	YB_1_493.jpg	SAD
351	YB_1_502.jpg	SAD
352	YB_1_504.jpg	SAD
353	YB_1_507.jpg	SAD
354	YB_1_514.jpeg	SAD

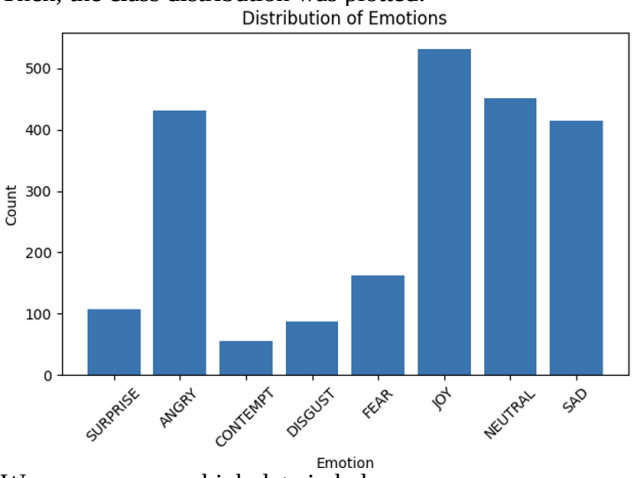
Here's a glimpse of images:

[6]:
```
# Display the image
img = mpimg.imread('/kaggle/input/face-emotion-recognition-1/
↪Single_Faces_Images/Single_Faces_Images/1.yogibabufacememes/YB_1_105.jpg')
plt.imshow(img)
plt.show()
```

Now, the labels from the csv files were mapped to each image. Now, these are the emotions that have to be classified:

[7]: ['SURPRISE', 'ANGRY', 'CONTEMPT', 'DISGUST', 'FEAR', 'JOY', 'NEUTRAL', 'SAD']

Then, the class distribution was plotted:



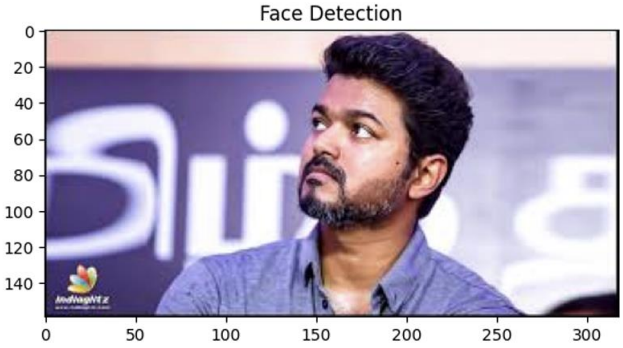
We can see a very high data imbalance.

III. Dataset Preparation:

A. *OBTAINING BOUNDING BOXES:*

As bounding boxes were not given, they had to be obtained manually. An automated annotation method was used.

In the initial attempt, OpenCV's HAAR face cascade classifier was used to get bounding boxes. It worked well for faces that looked straight into the camera but not for Faces that were tilted, and hence it skipped majority of images:



In second attempt, Pre-Trained yoloV3 face detection model was used for the same purpose. It returned impressive results. So , an algorithm was made such that it would take an image, find the face bounding boxes, get its corresponding emotion from csv and save this combined annotation in the yolo annotation format:

"Class x y w h" in a txt file with same name as image.

IV. Model Training

Initial attempt to train model on Faster- RCNN ResNet50 gave way less training an validation accuracy. Other transfer learning methods with various architecture gave no different results.

Then, yoloV5 was given a try. We had images as well as its corresponding coordinates. The results were better but not promising.

So, next training attempt with yolov5 xl model, resulted in overfitting. The results were worse. No detection at all with the test set.

Re-trained using yolov5 Medium sized model, got no results at all.

Final attempt was made using yoloV8, which gave really good results.

V. Conclusion

The Model was then saved and was tested for inference on a different notebook. An alogrithm was made to traverse all test images and extract the predicted class and bounding box coordinates and append it to a pandas dataframe, which was later saved into a csv file for uploading on kaggle.

Detected 1 boxes.

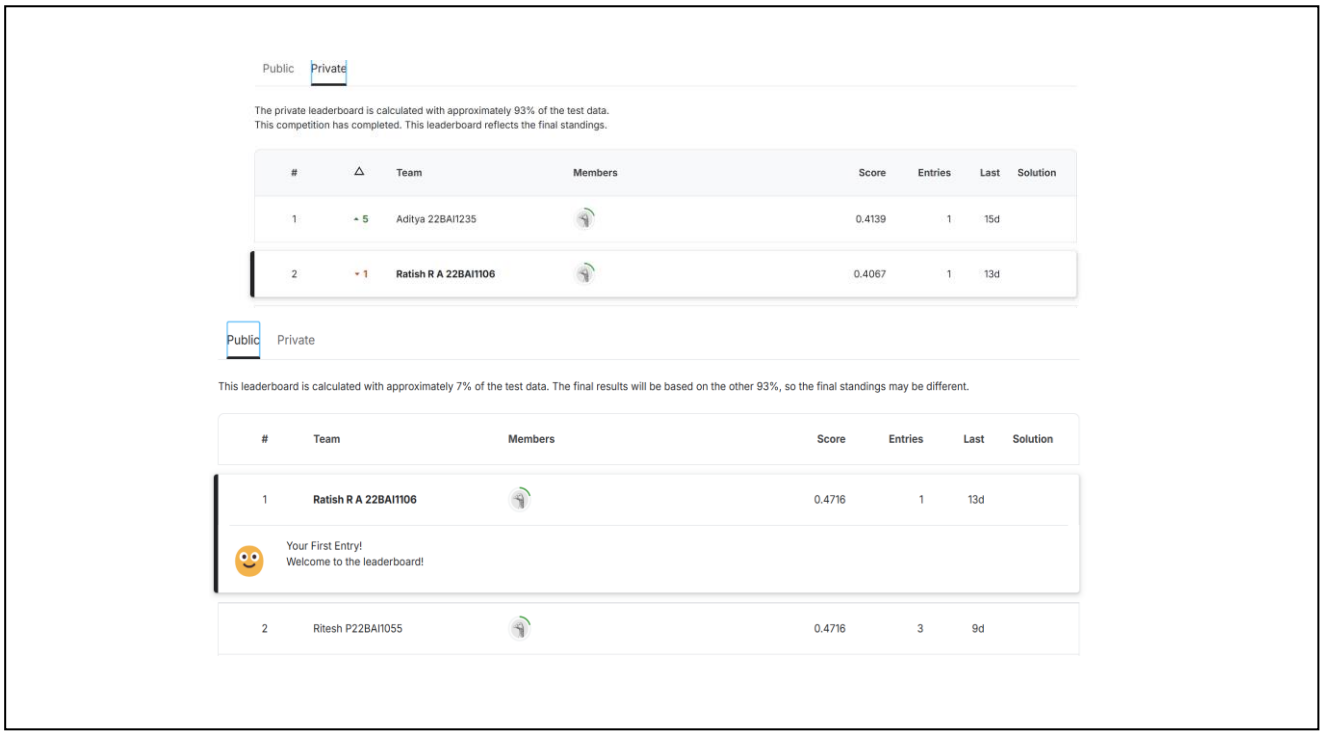
	Class_Name	Confidence	x	y	w	h
0	ANGRY	0.693762	12	3	157	254

	Class_Name	Confidence	x	y	w	h
0	JOY	0.930261	3	0	221	223

Detected 1 boxes.

	Class_Name	Confidence	x	y	w	h
0	NEUTRAL	0.519907	0	14	224	168

For 7% test Data, Kaggle public Score was: 0.4716 **For 93% test Data, Kaggle Private Score was: 0.4067**



Public Private

The private leaderboard is calculated with approximately 93% of the test data.
This competition has completed. This leaderboard reflects the final standings.

#	△	Team	Members	Score	Entries	Last	Solution
1	▲ 5	Aditya 22BAI1235		0.4139	1	15d	
2	▼ 1	**Ratish R A 22BAI1106**		0.4067	1	13d	

Public Private

This leaderboard is calculated with approximately 7% of the test data. The final results will be based on the other 93%, so the final standings may be different.

#	Team	Members	Score	Entries	Last	Solution
1	**Ratish R A 22BAI1106**		0.4716	1	13d	
	Your First Entry! Welcome to the leaderboard!					
2	Ritesh P22BAI1055		0.4716	3	9d	