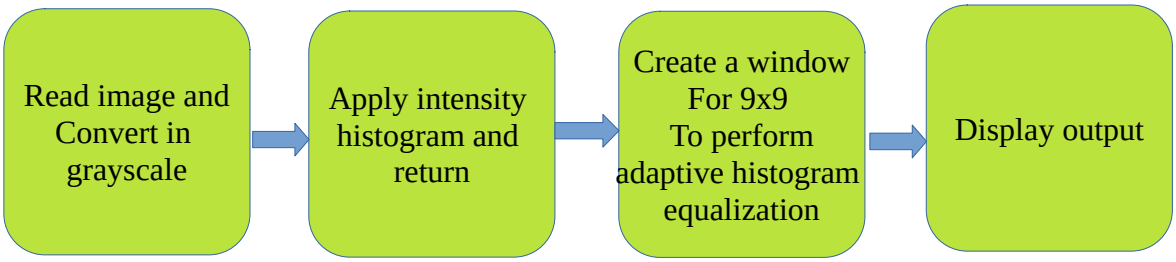
REPORT - PROJECT 2

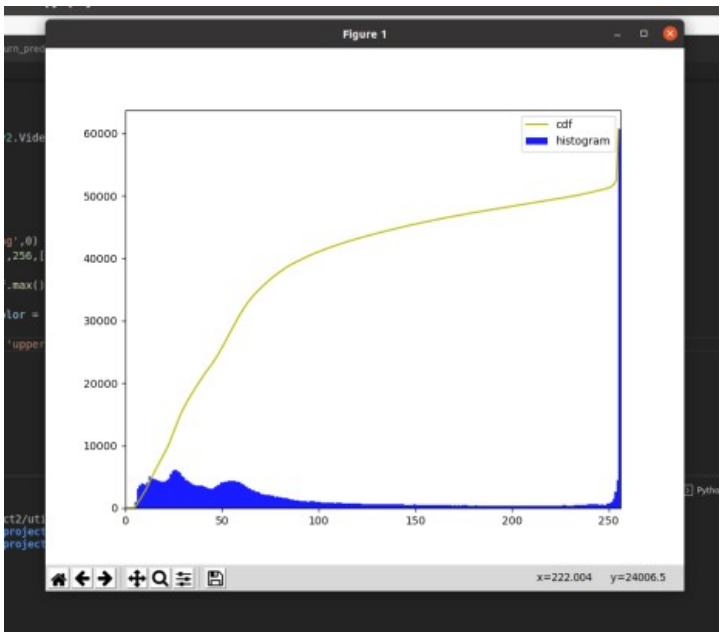
Note: Result videos are in the result section of report and also in the output folder in zip file.

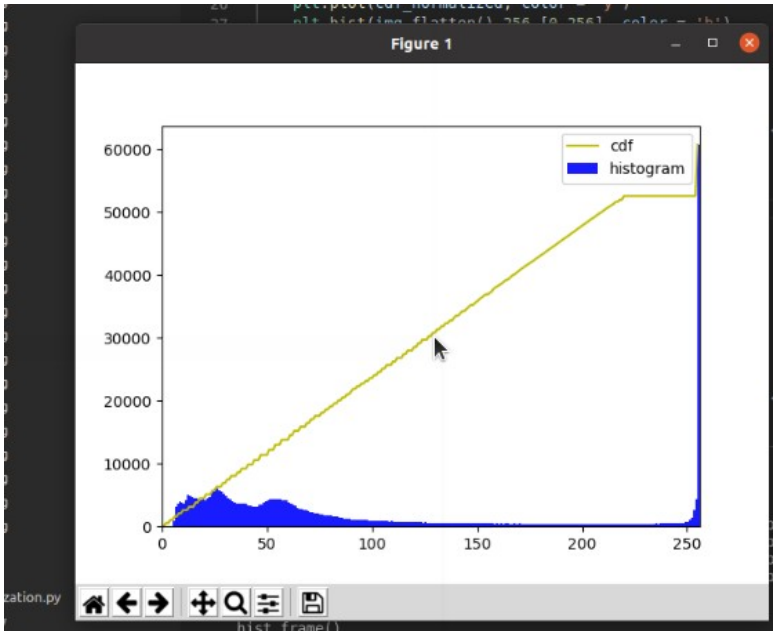
Problem 1: Histogram Equalization

Pipeline/ steps:



The histogram looks like follows for a single frame. (before vs After)





Histogram Equalization:

Problems encountered and Solution:

1. Initially, I started off with converting the image to HSV and ycrcb. The results were as follows.

They were not as smooth as gray-scale image so I went ahead with working in that. The results are displayed.

2. The Noise was enhanced when advanced histogram equalization was used. To correct the result, we need to clip the histogram and uniformly distribute those pixels which clipped to the other bins before applying histogram equalization.

Results:

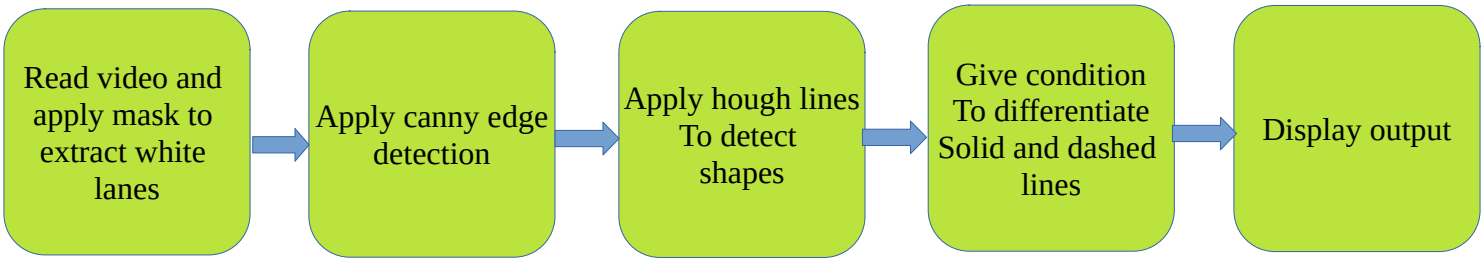
The following is the result for problem 1.

Histogram Equalization: https://drive.google.com/file/d/1d29mrbKtmmtKU6STVNDOD1gamIVUcEUC/view?usp=sharing

Adaptive Histogram Equalization:
https://drive.google.com/file/d/1vd5wJhI3ucM5Sx0y1kdAtE0TljE0R8Mn/view?usp=sharing

Problem 2: Lane Detection

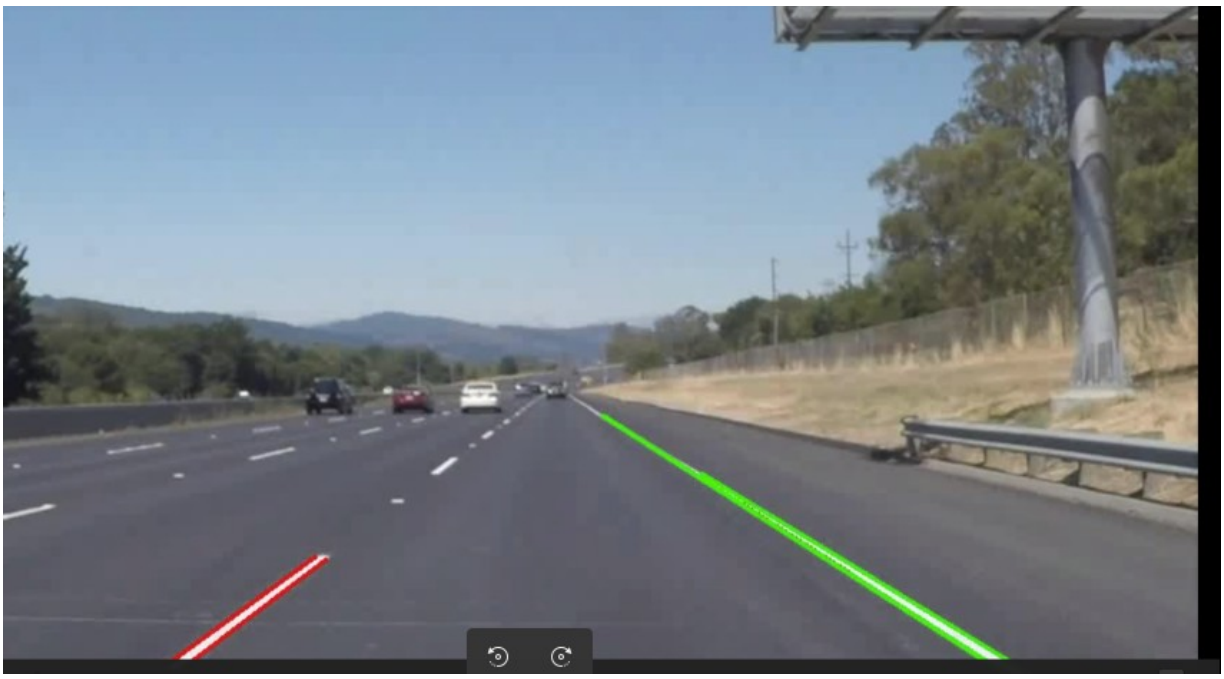
Pipeline/steps:



Problems encountered and Solution:

1. The lane prediction works fairly well with the lanes even if the video is flipped, although the issue arises with the efficiency of the code. The result can be a bit stable.

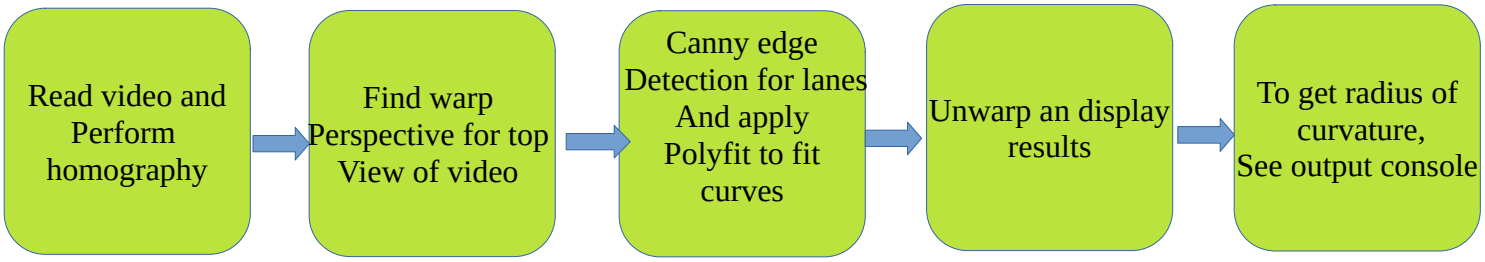
Results:



The video link is here.

Problem 3: Predicting Turn

Pipeline/steps:



```
========================RADIUS OF CURVATURE ========================

left radius of curvature 6573.378538060577
right radius of curvature 22098.494792276637

========================RADIUS OF CURVATURE ========================

left radius of curvature 4030.5321974855256
right radius of curvature 5015.185199481414

========================RADIUS OF CURVATURE ========================

left radius of curvature 3232.8631161760973
right radius of curvature 2188.040588953569

========================RADIUS OF CURVATURE ========================

left radius of curvature 3484.3572206398667
right radius of curvature 2756.7676461260944

========================RADIUS OF CURVATURE ========================

left radius of curvature 3011.337756524
right radius of curvature 2130.3452395124937

========================RADIUS OF CURVATURE ========================

left radius of curvature 1916.611592049506
right radius of curvature 3100.831229805465

mahima@mahima-Yoga-9-14ITL5:~/Desktop/git/Lane-Detection-and-Turn-Predeiction$
```

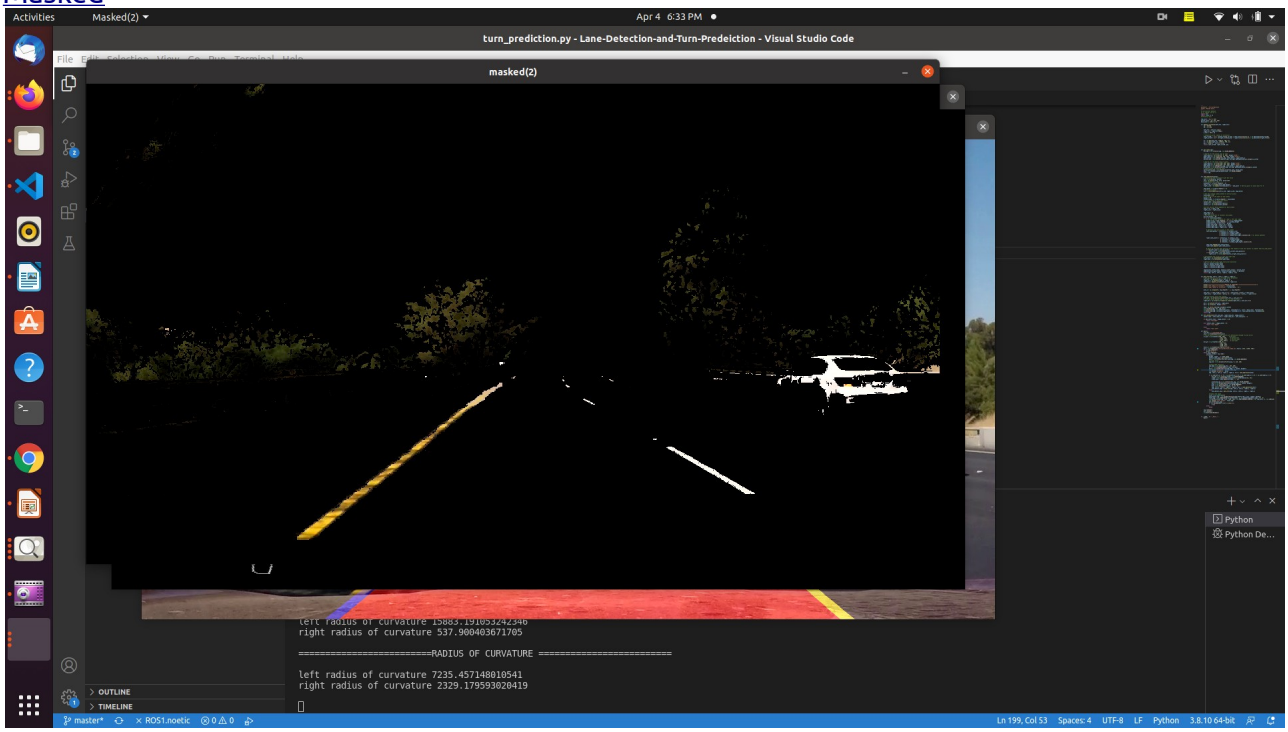
Problems encountered and Solution:

The results were fairly well for this problem but the issue faced with this implementation was that sometimes the turn prediction is not accurate. Moreover, when shade occurs, it messes up the result a bit. The solution for this can be tweaking the homography matrix so that the warping is occurring correctly since the warped video is not the best as observed.

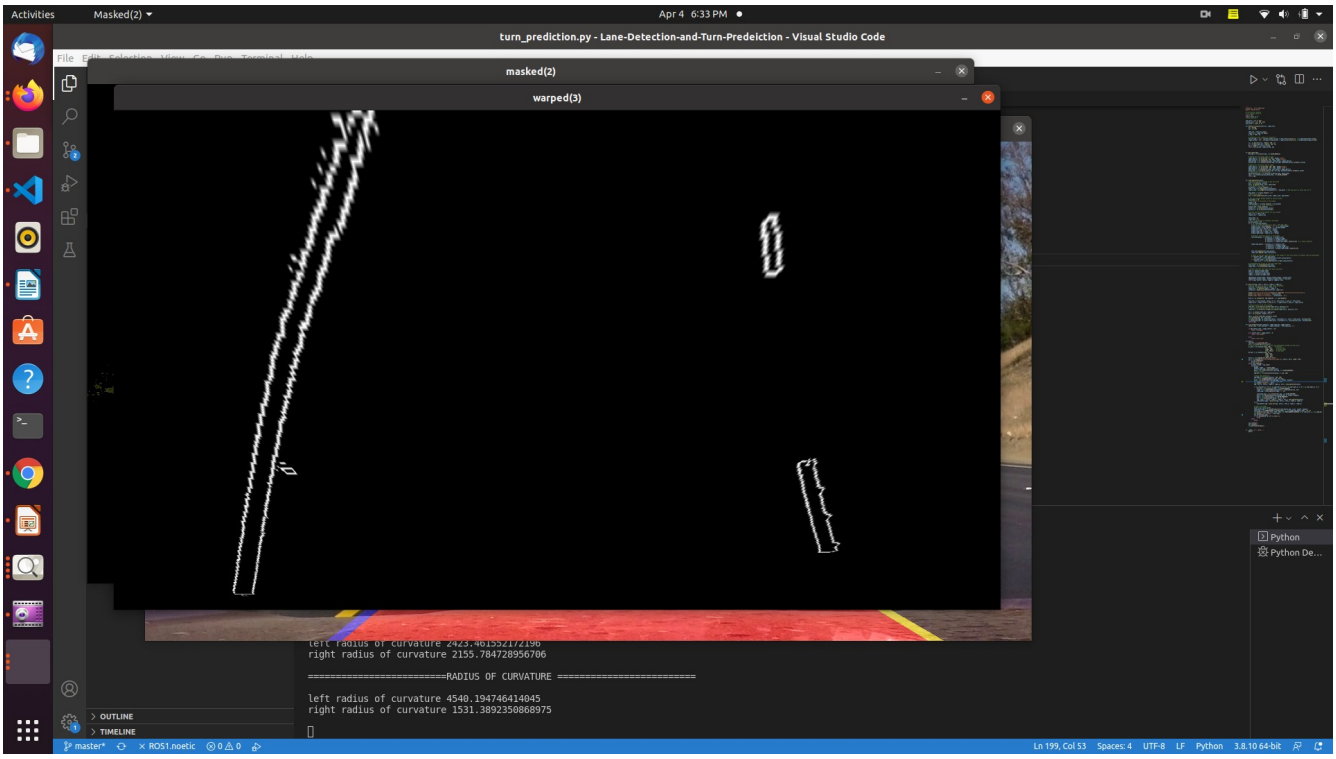
Results:

The result is :

- Masked



- Warped video: (please run the file to see that)



- Finalresult

Questions:

Q1. Your understanding of homography and how it is used?

A1. Homography is nothing but transformation between two planar projections of an image. Since the image produced in the lane detection has lines(lanes) which will meet at the horizon and the lanes are also turning, we can find the warped image.
The 3x3 homography matrix is used to warp the image and further perform functions like edge detection etc.

Q2. Your understanding of how HoughLines work ?

A2. Hough transform detect lines, circles , rectangle shapes or curves which can be further used to perform other functionalities in this case, lane detection. The goal here was to find lines or lanes in images correctly. It takes a binary image as input and tries to locate edges placed as straight lines. The idea of the Hough transform is, that every edge point in the edge map is transformed to all possible lines that could pass through that point.

Q3. How likely you think your pipeline will generalize to other similar videos?

A3. The present implementation should work fairly well with other videos. eg. for the second problem, it worked pretty well when the video was flipped and it will work fine with more data set.