P2

July 17, 2019

0.1 Advanced Lane Finding Project

The goals / steps of this project are the following:

- Compute the camera calibration matrix and distortion coefficients given a set of chessboard images.
- Apply a distortion correction to raw images.
- Use color transforms, gradients, etc., to create a thresholded binary image.
- Apply a perspective transform to rectify binary image ("birds-eye view").
- Detect lane pixels and fit to find the lane boundary.
- Determine the curvature of the lane and vehicle position with respect to center.
- Warp the detected lane boundaries back onto the original image.
- Output visual display of the lane boundaries and numerical estimation of lane curvature and vehicle position.

[1]:
```
import numpy as np
import cv2
import glob
import matplotlib.pyplot as plt
import matplotlib.image as mpimg
%matplotlib inline

import advanced_lane_line_helper_functions as aahlpf
import lane_lines_helper_functions as llhlpf
```

[2]:
```
# Make a list of calibration images
images = glob.glob('camera_cal/calibration*.jpg')
```

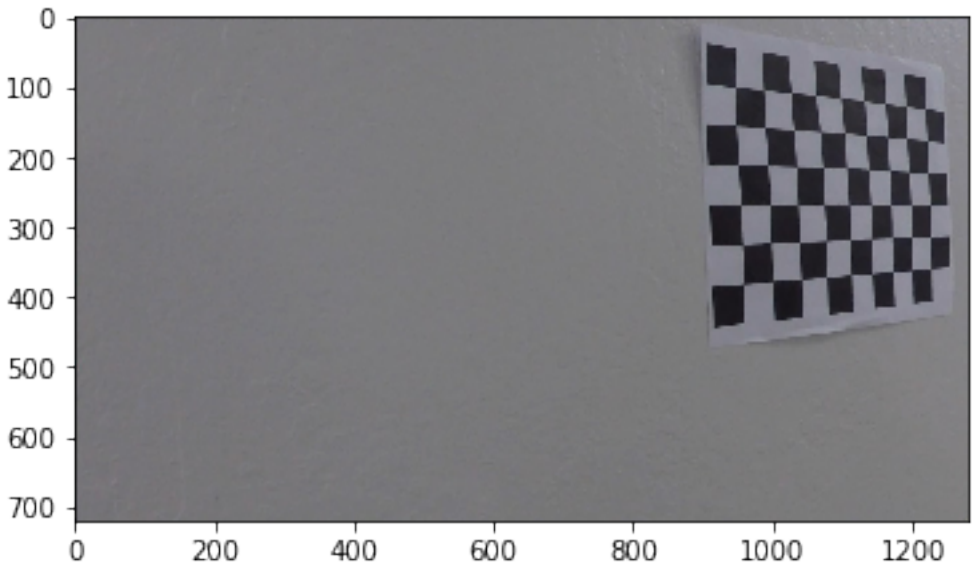
[3]:
```
print(images)
```

```
['camera_cal\\calibration1.jpg', 'camera_cal\\calibration10.jpg',
'camera_cal\\calibration11.jpg', 'camera_cal\\calibration12.jpg',
'camera_cal\\calibration13.jpg', 'camera_cal\\calibration14.jpg',
'camera_cal\\calibration15.jpg', 'camera_cal\\calibration16.jpg',
'camera_cal\\calibration17.jpg', 'camera_cal\\calibration18.jpg',
'camera_cal\\calibration19.jpg', 'camera_cal\\calibration2.jpg',
'camera_cal\\calibration20.jpg', 'camera_cal\\calibration3.jpg',
'camera_cal\\calibration4.jpg', 'camera_cal\\calibration5.jpg',
'camera_cal\\calibration6.jpg', 'camera_cal\\calibration7.jpg',
'camera_cal\\calibration8.jpg', 'camera_cal\\calibration9.jpg']
```

[4]:
```
img = cv2.imread(images[7])
rgb_img = cv2.cvtColor(img,cv2.COLOR_BGR2RGB)
print(rgb_img.shape)
plt.imshow(rgb_img)
```

```
(720, 1280, 3)
```

[4]:
```
<matplotlib.image.AxesImage at 0x197941ae0f0>
```



0.2 Compute the camera calibration matrix and distortion coefficients given a set of chessboard images

[5]:
```
# prepare object points
nx = 9 # enter the number of inside corners in x
ny = 6 # enter the number of inside corners in y

# Make a list of calibration images
img = cv2.imread(images[7])

# Convert to grayscale
gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)

# Find the chessboard corners
ret, corners = cv2.findChessboardCorners(gray, (nx, ny), None)
```

```
# If found, draw corners
if ret == True:
    # Draw and display the corners
    cv2.drawChessboardCorners(img, (nx, ny), corners, ret)
    rgb_img = cv2.cvtColor(img, cv2.COLOR_BGR2RGB)
    # plt.imshow(img)

    fig, ax = plt.subplots(figsize=(16, 9))
    ax.imshow(rgb_img)
    plt.tight_layout()
```

[6]:
```
# fig.savefig('output_images/calibration_find_corners.jpg')
```

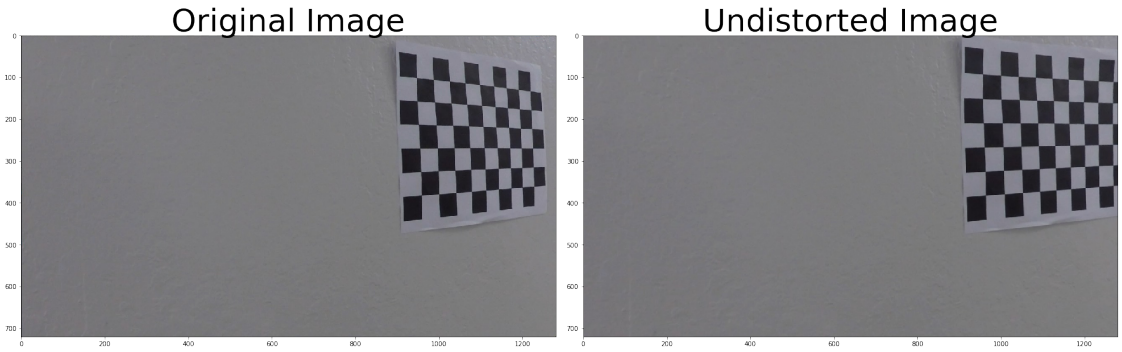
[7]:
```
'''
save_img = cv2.imread('output_images/calibration_find_corners.jpg')
f, ax = plt.subplots(1, 1, figsize=(24, 9))
f.tight_layout()
ax.imshow(cv2.cvtColor(save_img,cv2.COLOR_BGR2RGB))
plt.subplots_adjust(left=0., right=1, top=0.9, bottom=0.)
'''
```

[7]:
```
"\nsave_img = cv2.imread('output_images/calibration_find_corners.jpg')\nf, ax =
plt.subplots(1, 1, figsize=(24, 9))\nf.tight_layout()\nax.imshow(cv2.cvtColor(sa
ve_img,cv2.COLOR_BGR2RGB))\nplt.subplots_adjust(left=0., right=1, top=0.9,
bottom=0.)\n"
```

[8]:
```
imgpoints, objpoints = aahlpf.find_cal_pts(images, nx=9, ny=6)
```

[9]:
```
# Read in each image
img = cv2.imread(images[7])

# Convert image to grayscale
gray = cv2.cvtColor(img,cv2.COLOR_BGR2GRAY)

ret, mtx, dist, rvecs, tvecs = cv2.calibrateCamera(objpoints, imgpoints,
                                                   gray.shape[::-1], None, None)
```

[10]:
```
# Read in each image
img = cv2.imread(images[7])

undist = cv2.undistort(img, mtx, dist, None, mtx)

f, (ax1, ax2) = plt.subplots(1, 2, figsize=(24, 9))
f.tight_layout()
ax1.imshow(cv2.cvtColor(img,cv2.COLOR_BGR2RGB))
ax1.set_title('Original Image', fontsize=50)
ax2.imshow(cv2.cvtColor(undist,cv2.COLOR_BGR2RGB))
ax2.set_title('Undistorted Image', fontsize=50)
plt.subplots_adjust(left=0., right=1, top=0.9, bottom=0.)
```



[11]:
```
# f.savefig('output_images/calibration_distort_correct.jpg')
```

[12]:
```
'''
save_img = cv2.imread('output_images/calibration_distort_correct.jpg')
f, ax = plt.subplots(1, 1, figsize=(24, 9))
f.tight_layout()
ax.imshow(cv2.cvtColor(save_img,cv2.COLOR_BGR2RGB))
plt.subplots_adjust(left=0., right=1, top=0.9, bottom=0.)
'''
```

[12]:
```
"\nsave_img = cv2.imread('output_images/calibration_distort_correct.jpg')\nf, ax
= plt.subplots(1, 1, figsize=(24, 9))\nf.tight_layout()\nax.imshow(cv2.cvtColor(
save_img,cv2.COLOR_BGR2RGB))\nplt.subplots_adjust(left=0., right=1, top=0.9,
bottom=0.)\n"
```

0.3 Apply a distortion correction to raw images

[13]:
```
# Make a list of calibration images
lane_images = glob.glob('test_images/*.jpg')
```

[14]:
```
print(len(lane_images))
print(lane_images)
```

```
8
['test_images\\straight_lines1.jpg', 'test_images\\straight_lines2.jpg',
'test_images\\test1.jpg', 'test_images\\test2.jpg', 'test_images\\test3.jpg',
'test_images\\test4.jpg', 'test_images\\test5.jpg', 'test_images\\test6.jpg']
```

[15]:
```
im_num = 4
lane_image = mpimg.imread(lane_images[im_num])
print(lane_images[im_num])
print(lane_image.shape)
# plt.imshow(lane_image)
```

```
test_images\test3.jpg
(720, 1280, 3)
```

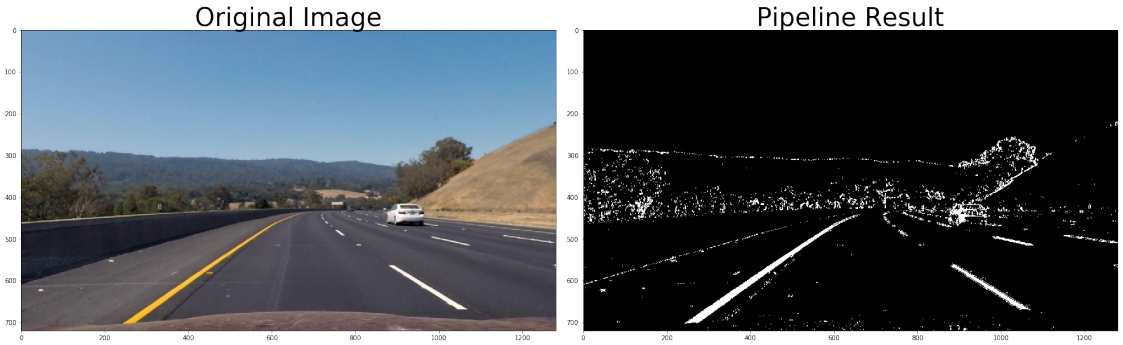
[16]:
```
lane_undist = cv2.undistort(lane_image, mtx, dist, None, mtx)

f, (ax1, ax2) = plt.subplots(1, 2, figsize=(24, 9))
f.tight_layout()
ax1.imshow(lane_image)
ax1.set_title('Original Image', fontsize=50)
ax2.imshow(lane_undist)
ax2.set_title('Undistorted Image', fontsize=50)
plt.subplots_adjust(left=0., right=1, top=0.9, bottom=0.)
```

[17]:
```
# f.savefig('output_images/test5_distort_correct.jpg')
```

0.4 Use color transforms, gradients, etc., to create a thresholded binary image

[18]:
```
result = aahlpf.pipeline(lane_undist)
```

[19]:
```
# Plot the result
f, (ax1, ax2) = plt.subplots(1, 2, figsize=(24, 9))
f.tight_layout()

ax1.imshow(lane_undist)
ax1.set_title('Original Image', fontsize=40)

ax2.imshow(result, cmap='gray')
ax2.set_title('Pipeline Result', fontsize=40)
plt.subplots_adjust(left=0., right=1, top=0.9, bottom=0.)
```



[20]:
```
# f.savefig('output_images/test5_binary.jpg')
```

[21]:
```
img = lane_undist
ksize = 3
sobelx_thresh = (20, 100)

gradx = aahlpf.abs_sobel_thresh(img, orient='x', sobel_kernel=ksize,␣
 ↪thresh=sobelx_thresh)

combined = np.zeros_like(gradx)
combined[(gradx == 1)] = 1

'''
f, ax1 = plt.subplots(1, 1, figsize=(24, 9))
f.tight_layout()
ax1.imshow(gradx, cmap='gray')
```

```
plt.subplots_adjust(left=0., right=1, top=0.9, bottom=0.)
'''
```

[21]:
```
"\nf, ax1 = plt.subplots(1, 1, figsize=(24,
9))\nf.tight_layout()\nax1.imshow(gradx,
cmap='gray')\nplt.subplots_adjust(left=0., right=1, top=0.9, bottom=0.)\n"
```

[22]:
```
img = lane_undist
s_thresh = (215, 240)

hls = cv2.cvtColor(img, cv2.COLOR_RGB2HLS)
s_channel = hls[:,:,2]

s_binary = np.zeros_like(s_channel)
s_binary[(s_channel >= s_thresh[0]) & (s_channel <= s_thresh[1])] = 1

'''
f, ax1 = plt.subplots(1, 1, figsize=(24, 9))
f.tight_layout()
ax1.imshow(s_binary, cmap='gray')
plt.subplots_adjust(left=0., right=1, top=0.9, bottom=0.)
'''
```

[22]:
```
"\nf, ax1 = plt.subplots(1, 1, figsize=(24,
9))\nf.tight_layout()\nax1.imshow(s_binary,
cmap='gray')\nplt.subplots_adjust(left=0., right=1, top=0.9, bottom=0.)\n"
```

[23]:
```
img = lane_undist
r_thresh = (225, 255)

r = img[:,:,0]

r_binary = np.zeros_like(r)
r_binary[(r > r_thresh[0]) & (r <= r_thresh[1])] = 1

'''
f, ax1 = plt.subplots(1, 1, figsize=(24, 9))
f.tight_layout()
ax1.imshow(r_binary, cmap='gray')
plt.subplots_adjust(left=0., right=1, top=0.9, bottom=0.)
'''
```

[23]:
```
"\nf, ax1 = plt.subplots(1, 1, figsize=(24,
9))\nf.tight_layout()\nax1.imshow(r_binary,
cmap='gray')\nplt.subplots_adjust(left=0., right=1, top=0.9, bottom=0.)\n"
```

[24]:
```
combined = np.zeros_like(gradx)
combined[(gradx == 1)] = 1

color_combined = np.zeros_like(s_binary)
```

```
color_combined[(s_binary == 1) | (r_binary == 1)] = 1

color_binary = np.zeros_like(combined)
color_binary[(combined == 1) | (color_combined == 1)] = 1

'''
f, ax1 = plt.subplots(1, 1, figsize=(24, 9))
f.tight_layout()
ax1.imshow(color_binary, cmap='gray')
plt.subplots_adjust(left=0., right=1, top=0.9, bottom=0.)
'''
```

[24]:
```
"\nf, ax1 = plt.subplots(1, 1, figsize=(24,
9))\nf.tight_layout()\nax1.imshow(color_binary,
cmap='gray')\nplt.subplots_adjust(left=0., right=1, top=0.9, bottom=0.)\n"
```

0.5 Apply a perspective transform to rectify binary image

[25]:
```
print(lane_images)
```

```
['test_images\\straight_lines1.jpg', 'test_images\\straight_lines2.jpg',
'test_images\\test1.jpg', 'test_images\\test2.jpg', 'test_images\\test3.jpg',
'test_images\\test4.jpg', 'test_images\\test5.jpg', 'test_images\\test6.jpg']
```

[26]:
```
straight_lines1 = plt.imread(lane_images[0])
print(straight_lines1.shape)
```

```
(720, 1280, 3)
```

[27]:
```
straight_lines1_undist = cv2.undistort(straight_lines1, mtx, dist, None, mtx)

f, (ax1, ax2) = plt.subplots(1, 2, figsize=(24, 9))
f.tight_layout()
ax1.imshow(straight_lines1)
ax1.set_title('Original Image', fontsize=50)
ax2.imshow(straight_lines1_undist)
ax2.set_title('Undistorted Image', fontsize=50)
plt.subplots_adjust(left=0., right=1, top=0.9, bottom=0.)
```

[28]:
```
rho = 1 # distance resolution in pixels of the Hough grid
theta = np.pi/180 # angular resolution in radians of the Hough grid
threshold = 25      # minimum number of votes (intersections in Hough grid cell)
min_line_len = 25 #minimum number of pixels making up a line
max_line_gap = 25    # maximum gap in pixels between connectable line segments
```

[29]:
```
trans_ratio = (80/128)
print(trans_ratio*straight_lines1.shape[0])
```

```
450.0
```

[30]:
```
print(trans_ratio)
```

```
0.625
```

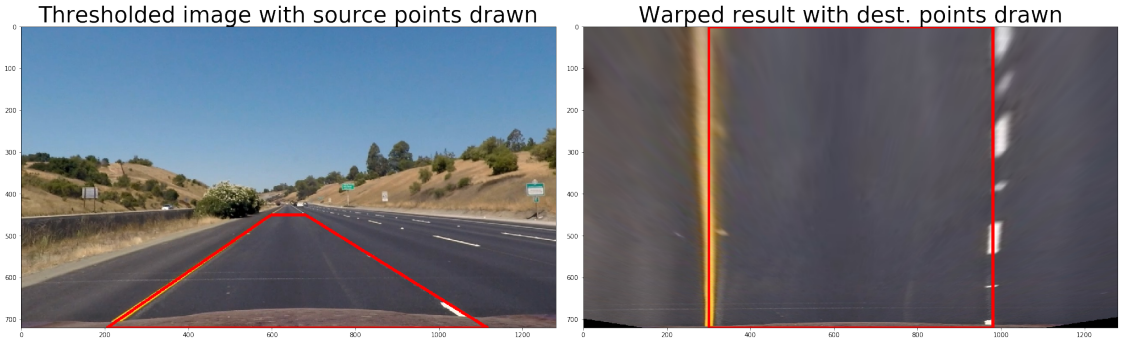
[31]:
```
src, dst, edges = llhlpf.get_line_params_advanced(straight_lines1_undist, rho,␣
↪theta, threshold, min_line_len, max_line_gap,
                                                  trans_im_h=trans_ratio,␣
↪margin=300)
```

[32]:
```
print(src)
print(dst)
```

```
[[ 205.  720.]
 [ 598.  450.]
 [ 681.  450.]
 [1116.  720.]]
[[300. 720.]
 [300.   0.]
 [980.   0.]
 [980. 720.]]
```

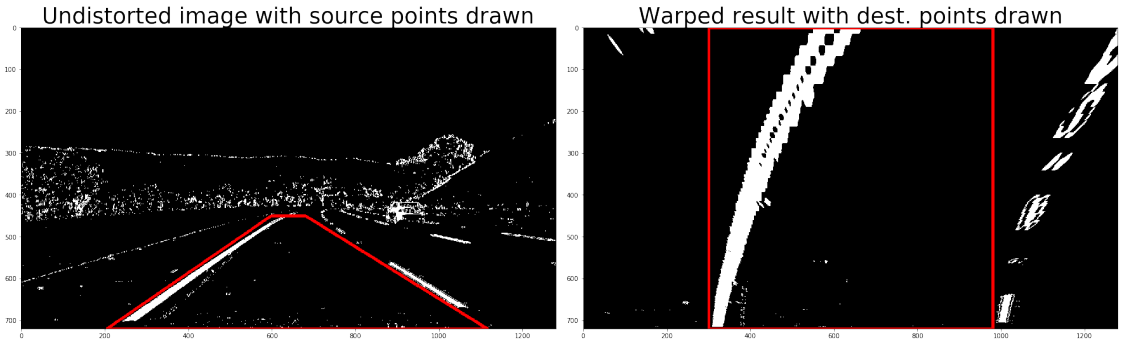
[33]:
```
M = cv2.getPerspectiveTransform(src, dst)
Minv = cv2.getPerspectiveTransform(dst, src)
```

[34]:
```
img_poly = straight_lines1_undist.copy()
vrx = np.int32(src)
vrx_reshape = vrx.reshape((-1,1,2))
cv2.polylines(img_poly, [vrx_reshape], True, (255, 0, 0), 5)

straight_lines1_warped = cv2.warpPerspective(
    straight_lines1_undist, M, (edges.shape[1], edges.shape[0]), flags=cv2.
 ↪INTER_LINEAR)

img_warped_poly = straight_lines1_warped.copy()
vrx_warped = np.int32(dst)
vrx_warped_reshape = vrx_warped.reshape((-1,1,2))
cv2.polylines(img_warped_poly, [vrx_warped_reshape], True, (255, 0, 0), 5)

f, (ax1, ax2) = plt.subplots(1, 2, figsize=(24, 9))
f.tight_layout()
ax1.imshow(img_poly)
ax1.set_title('Thresholded image with source points drawn', fontsize=35)
ax2.imshow(img_warped_poly)
ax2.set_title('Warped result with dest. points drawn', fontsize=35)
plt.subplots_adjust(left=0., right=1, top=0.9, bottom=0.)
```



[35]:
```
bin_img_poly = np.dstack((result, result, result))*255
vrx = np.int32(src)
vrx_reshape = vrx.reshape((-1,1,2))
cv2.polylines(bin_img_poly, [vrx_reshape], True, (255, 0, 0), 5)

result_warped = cv2.warpPerspective(
    result, M, (result.shape[1], result.shape[0]), flags=cv2.INTER_LINEAR)

bin_img_warped_poly = np.dstack((result_warped, result_warped,␣
 ↪result_warped))*255
vrx_warped = np.int32(dst)
vrx_warped_reshape = vrx_warped.reshape((-1,1,2))
cv2.polylines(bin_img_warped_poly, [vrx_warped_reshape], True, (255, 0, 0), 5)
```

```
f, (ax1, ax2) = plt.subplots(1, 2, figsize=(24, 9))
f.tight_layout()
ax1.imshow(bin_img_poly)
ax1.set_title('Undistorted image with source points drawn', fontsize=35)
ax2.imshow(bin_img_warped_poly)
ax2.set_title('Warped result with dest. points drawn', fontsize=35)
plt.subplots_adjust(left=0., right=1, top=0.9, bottom=0.)
```



[36]:
```
# f.savefig('output_images/test5_warped.jpg')
```

0.6 Detect lane pixels and fit to find the lane boundary

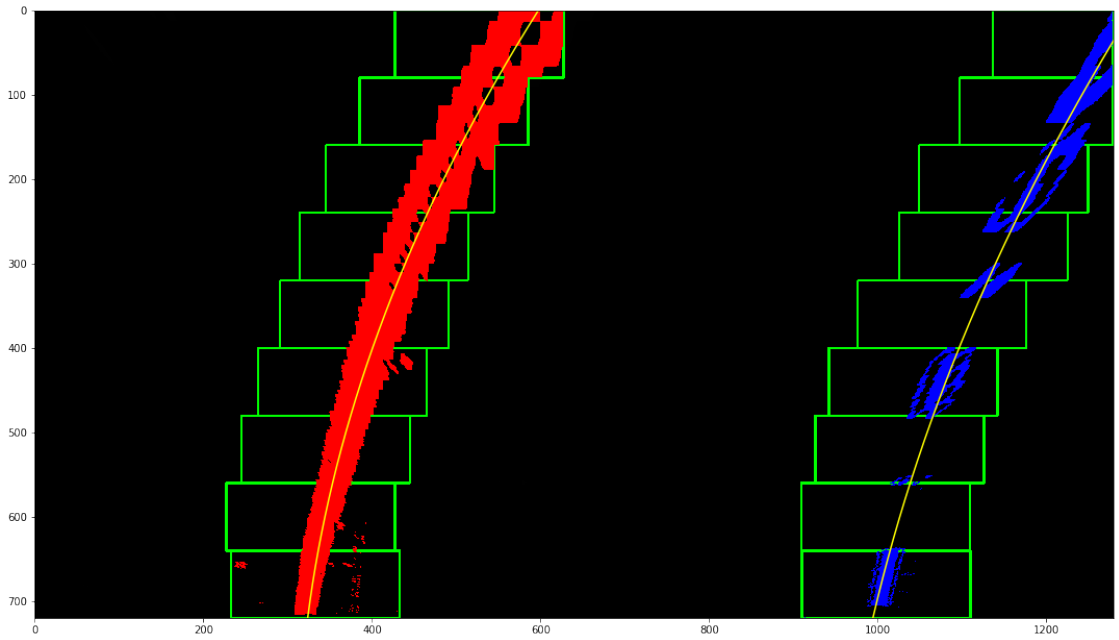
[37]:
```
# Create histogram of image binary activations
histogram = aahlpf.hist(result_warped, h_frac=(3/4))
```

[38]:
```
# Visualize the resulting histogram
'''
f, ax = plt.subplots(1, 1, figsize=(24, 9))
ax.plot(histogram)
plt.subplots_adjust(left=0., right=1, top=0.9, bottom=0.)
'''
```

[38]:
```
'\nf, ax = plt.subplots(1, 1, figsize=(24,
9))\nax.plot(histogram)\nplt.subplots_adjust(left=0., right=1, top=0.9,
bottom=0.)\n'
```

[39]:
```
leftx, lefty, rightx, righty, out_img = aahlpf.find_lane_pixels(result_warped,␣
↪h_frac=(3/4))

left_fit = np.polyfit(lefty, leftx, 2)
right_fit = np.polyfit(righty, rightx, 2)

left_xy, right_xy = aahlpf.fit_polynomial(result_warped, left_fit, right_fit)
```

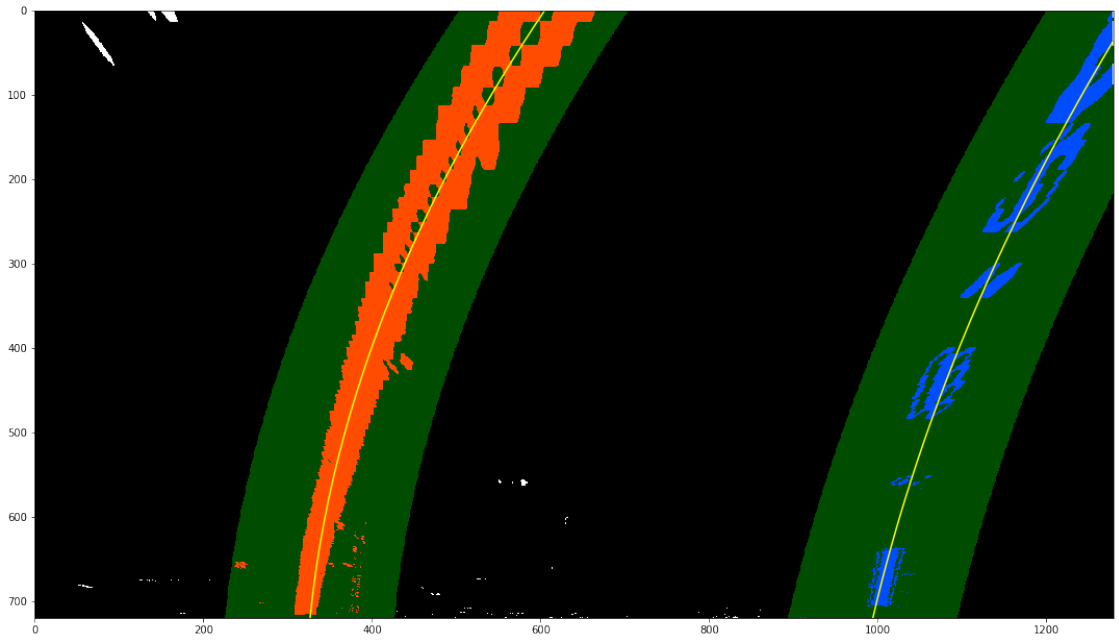
[40]:
```
f, ax = plt.subplots(1, 1, figsize=(24, 9))
f.tight_layout()
ax.imshow(out_img)
ax.plot(left_xy[0], left_xy[1], color='yellow')
ax.plot(right_xy[0], right_xy[1], color='yellow')
plt.subplots_adjust(left=0., right=1, top=0.9, bottom=0.)
```



[41]:
```
# f.savefig('output_images/test5_detect_lane_slide.jpg')
```

[42]:
```
# Find our lane pixels first
leftx, lefty, rightx, righty, out_img = aahlpf.find_lane_pixels(result_warped,␣
 ↪h_frac=(3/4))

### TO-DO: Fit a second order polynomial to each using `np.polyfit` ###
left_fit = np.polyfit(lefty, leftx, 2)
right_fit = np.polyfit(righty, rightx, 2)

# Run image through the pipeline
# Note that in your project, you'll also want to feed in the previous fits
leftx, lefty, rightx, righty, out_img = aahlpf.
 ↪search_around_poly(result_warped, left_fit, right_fit)
left_fit = np.polyfit(lefty, leftx, 2)
right_fit = np.polyfit(righty, rightx, 2)
lane_pix_detect, left_xy, right_xy = aahlpf.visual_around_poly(result_warped,␣
 ↪left_fit, right_fit, out_img)
```

[43]:
```
# View your output
f, ax = plt.subplots(1, 1, figsize=(24, 9))
f.tight_layout()
ax.imshow(lane_pix_detect)
plt.plot(left_xy[0], left_xy[1], color='yellow')
plt.plot(right_xy[0], right_xy[1], color='yellow')
plt.subplots_adjust(left=0., right=1, top=0.9, bottom=0.)
```



[44]:
```
# f.savefig('output_images/test5_detect_lane_prev.jpg')
```

[45]:
```
leftx_conv, lefty_conv, rightx_conv, righty_conv, out_img_conv = aahlpf.
 ↪find_lane_pixels_conv(result_warped, h_frac=(3/4))

left_fit_conv = np.polyfit(lefty_conv, leftx_conv, 2)
right_fit_conv = np.polyfit(righty_conv, rightx_conv, 2)

left_xy_conv, right_xy_conv = aahlpf.fit_polynomial(result_warped,␣
 ↪left_fit_conv, right_fit_conv)
```

[46]:
```
'''
f, ax = plt.subplots(1, 1, figsize=(24, 9))
f.tight_layout()
ax.imshow(out_img_conv)
ax.plot(left_xy_conv[0], left_xy_conv[1], color='yellow')
ax.plot(right_xy_conv[0], right_xy_conv[1], color='yellow')
plt.subplots_adjust(left=0., right=1, top=0.9, bottom=0.)
'''
```

[46]:
```
"\nf, ax = plt.subplots(1, 1, figsize=(24,
9))\nf.tight_layout()\nax.imshow(out_img_conv)\nax.plot(left_xy_conv[0],
left_xy_conv[1], color='yellow')\nax.plot(right_xy_conv[0], right_xy_conv[1],
color='yellow')\nplt.subplots_adjust(left=0., right=1, top=0.9, bottom=0.)\n"
```

0.7 Determine the curvature of the lane and vehicle position with respect to center

[47]:
```
# Find our lane pixels first
leftx, lefty, rightx, righty, out_img = aahlpf.find_lane_pixels(result_warped,␣
 ↪h_frac=(3/4))

### TO-DO: Fit a second order polynomial to each using `np.polyfit` ###
left_fit = np.polyfit(lefty, leftx, 2)
right_fit = np.polyfit(righty, rightx, 2)

# Generate x and y values for plotting
ploty = np.linspace(0, result_warped.shape[0]-1, result_warped.shape[0] )

# Calculate the radius of curvature in pixels for both lane lines
left_curverad, right_curverad = aahlpf.measure_curvature_pixels(ploty,␣
 ↪left_fit, right_fit)
```

[48]:
```
# print(left_curverad, right_curverad)
```

[49]:
```
y_eval = np.max(ploty)

left_fitx_eval = left_fit[0]*y_eval**2 + left_fit[1]*y_eval + left_fit[2]
right_fitx_eval = right_fit[0]*y_eval**2 + right_fit[1]*y_eval + right_fit[2]

lane_center = np.abs(left_fitx_eval - right_fitx_eval)/2 + left_fitx_eval

vehicle_center = result_warped.shape[1]/2

vehicle_pos = vehicle_center - lane_center
```

[50]:
```
# print('Vehicle Position: ', vehicle_pos)
```

[51]:
```
# Find our lane pixels first
leftx, lefty, rightx, righty, out_img = aahlpf.find_lane_pixels(result_warped,␣
 ↪h_frac=(3/4))

ym_per_pix=(30/720)
xm_per_pix=(3.7/700)

### TO-DO: Fit a second order polynomial to each using `np.polyfit` ###
left_fit_m = np.polyfit(ym_per_pix*lefty, xm_per_pix*leftx, 2)
right_fit_m = np.polyfit(ym_per_pix*righty, xm_per_pix*rightx, 2)
```

```
# Generate x and y values for plotting
ploty = np.linspace(0, result_warped.shape[0]-1, result_warped.shape[0] )

# Calculate the radius of curvature in pixels for both lane lines
left_curverad_m, right_curverad_m = aahlpf.measure_curvature_real(ploty,␣
 ↪left_fit_m, right_fit_m)
```

[52]:
```
# print(left_curverad_m, 'm', right_curverad_m, 'm')
```

[53]:
```
print(left_curverad_m/right_curverad_m)
print(right_curverad_m/left_curverad_m)
```

```
0.7687111808587435
1.3008786978782838
```

[54]:
```
y_eval = np.max(ploty)
y_m = y_eval*ym_per_pix

left_fitx_eval_m = left_fit_m[0]*y_m**2 + left_fit_m[1]*y_m + left_fit_m[2]
right_fitx_eval_m = right_fit_m[0]*y_m**2 + right_fit_m[1]*y_m + right_fit_m[2]

lane_center_m = np.abs(left_fitx_eval_m - right_fitx_eval_m)/2 +␣
 ↪left_fitx_eval_m

vehicle_center_m = xm_per_pix*result_warped.shape[1]/2

vehicle_pos_m = vehicle_center_m - lane_center_m
```

[55]:
```
# print('Vehicle Position (m): ', xm_per_pix*vehicle_pos)
```

[56]:
```
lane_width_bottom = np.abs(left_fitx_eval - right_fitx_eval)
print(lane_width_bottom)
```

```
670.5841996948775
```

[57]:
```
y_min = np.min(ploty)

left_fitx_eval_min = left_fit[0]*y_min**2 + left_fit[1]*y_min + left_fit[2]
right_fitx_eval_min = right_fit[0]*y_min**2 + right_fit[1]*y_min + right_fit[2]

lane_width_top = np.abs(left_fitx_eval_min - right_fitx_eval_min)
print(lane_width_top)
```

```
704.1634075492692
```

[58]:
```
print(np.abs(lane_width_bottom - lane_width_top))
```

```
33.57920785439171
```

[59]:
```
print(left_fit)
print(right_fit)
```

```
[ 3.48848130e-04 -6.31219280e-01  5.97240321e+02]
[ 2.68409537e-04 -6.20086585e-01  1.30140373e+03]
```

0.8 Warp the detected lane boundaries back onto the original image

[60]:
```
# Create an image to draw the lines on
warp_zero = np.zeros_like(result_warped).astype(np.uint8)
color_warp = np.dstack((warp_zero, warp_zero, warp_zero))

# Recast the x and y points into usable format for cv2.fillPoly()
pts_left = np.array([np.transpose(np.vstack([left_xy[0], left_xy[1]]))])
pts_right = np.array([np.flipud(np.transpose(np.vstack([right_xy[0],␣
 ↪right_xy[1]])))])
pts = np.hstack((pts_left, pts_right))

# Draw the lane onto the warped blank image
cv2.fillPoly(color_warp, np.int_([pts]), (0,255, 0))

# Warp the blank back to original image space using inverse perspective matrix␣
 ↪(Minv)
newwarp = cv2.warpPerspective(color_warp, Minv, (lane_undist.shape[1],␣
 ↪lane_undist.shape[0]))

# Combine the result with the original image
result_lane = cv2.addWeighted(lane_undist, 1, newwarp, 0.3, 0)
```

[61]:
```
'''
f, ax = plt.subplots(1, 1, figsize=(24, 9))
f.tight_layout()
ax.imshow(result_lane)
plt.subplots_adjust(left=0., right=1, top=0.9, bottom=0.)
'''
```

[61]:
```
'\nf, ax = plt.subplots(1, 1, figsize=(24,
9))\nf.tight_layout()\nax.imshow(result_lane)\nplt.subplots_adjust(left=0.,
right=1, top=0.9, bottom=0.)\n'
```

0.9 Output visual display of lane boundaries and lane curvature and vehicle position estimations

[62]:
```
text1 = "Left Lane Curvature: " + str(left_curverad_m) + " m"
text2 = "Right Lane Curvature: " + str(right_curverad_m) + " m"
text3 = "Vehicle Position: " + str(xm_per_pix*vehicle_pos) + " m"
fontFace = cv2.FONT_HERSHEY_SIMPLEX
fontScale = 1.5;
thickness = 2;

img = np.copy(result_lane)
```

[63]:
```
baseline=0;
textSize1, baseline1 = cv2.getTextSize(text1, fontFace, fontScale, thickness);
textSize2, baseline2 = cv2.getTextSize(text2, fontFace, fontScale, thickness);
textSize3, baseline3 = cv2.getTextSize(text3, fontFace, fontScale, thickness);
```

[64]:
```
# center the text
textOrg1 = ((img.shape[1] - textSize1[0] - baseline1), (textSize1[1] +␣
 ↪baseline1))
textOrg2 = ((img.shape[1] - textSize2[0] - baseline2),
            (textSize1[1] + baseline1 + textSize2[1] + baseline2))
textOrg3 = ((img.shape[1] - textSize3[0] - baseline3),
            (textSize1[1] + baseline1 + textSize2[1] + baseline2 + textSize3[1]␣
 ↪+ baseline3))
```

[65]:
```
# then put the text itself
cv2.putText(img, text1, textOrg1, fontFace, fontScale, (255, 255, 255),␣
 ↪thickness, 8);
cv2.putText(img, text2, textOrg2, fontFace, fontScale, (255, 255, 255),␣
 ↪thickness, 8);
cv2.putText(img, text3, textOrg3, fontFace, fontScale, (255, 255, 255),␣
 ↪thickness, 8);
```

[66]:
```
f, ax = plt.subplots(1, 1, figsize=(24, 9))
f.tight_layout()
ax.imshow(img)
plt.subplots_adjust(left=0., right=1, top=0.9, bottom=0.)
```

[67]:
```
# f.savefig('output_images/test5_curve_pos.jpg')
```

0.10 Process Video

[68]:
```
# Import everything needed to edit/save/watch video clips
from moviepy.editor import VideoFileClip
from IPython.display import HTML
```

[69]:
```
right_line = None
left_line = None
```

[70]:
```
def process_image(image):
    # NOTE: The output you return should be a color image (3 channel) for␣
 ↪processing video below
    # TODO: put your pipeline here,
    # you should return the final output (image where lines are drawn on lanes)

    global left_line
    global right_line
    global M
    global Minv

    n = 3

    # Apply a distortion correction to raw images
    image_undist = cv2.undistort(image, mtx, dist, None, mtx)
```

```
    # Use color transforms, gradients, etc., to create a thresholded binary␣
↪image
    binary_image = aahlpf.pipeline(image_undist)

    # Apply a perspective transform to rectify binary image ("birds-eye view")
    binary_warped = cv2.warpPerspective(binary_image, M, (binary_image.
↪shape[1], binary_image.shape[0]),
                                        flags=cv2.INTER_LINEAR)

    # Have lane lines been detected previously?
    try:
        right_line
    except NameError:
        right_line = None
        left_line = None

    # print(right_line)
    # print(left_line)

    # Detect lane pixels and fit to find the lane boundary
    if right_line is None:

        # Sliding window
        leftx, lefty, rightx, righty, out_img = aahlpf.
↪find_lane_pixels(binary_warped, h_frac=(3/4))
        left_fit = np.polyfit(lefty, leftx, 2)
        right_fit = np.polyfit(righty, rightx, 2)
        left_xy, right_xy = aahlpf.fit_polynomial(binary_warped, left_fit,␣
↪right_fit)

        # Save info about detected lane lines
        is_detected = True

        # Save info about detected lane lines
        ploty = np.linspace(0, binary_warped.shape[0]-1, binary_warped.shape[0])
        # Fit x values
        left_fitx_full = left_fit[0]*ploty**2 + left_fit[1]*ploty + left_fit[2]
        right_fitx_full = right_fit[0]*ploty**2 + right_fit[1]*ploty +␣
↪right_fit[2]

    else:

        # Search around polynomial
        leftx, lefty, rightx, righty, out_img = aahlpf.search_around_poly(
            binary_warped, left_line.best_fit, right_line.best_fit)
        left_fit = np.polyfit(lefty, leftx, 2)
```

```
        right_fit = np.polyfit(righty, rightx, 2)

        # Sanity check
        # Find lane width
        # Lane width at bottom of image
        # Lane width at top of image
        ploty = np.linspace(0, binary_warped.shape[0]-1, binary_warped.shape[0])
        is_detected, lane_width, lane_width_min = aahlpf.sanity_check(
            ploty, left_fit, right_fit, leftx, lefty, rightx, righty,
            thresh_lane=(600, 800), thresh_lane_diff=200, thresh_curve=(7.0/4))

        # Check fails
        if not is_detected:

            # Sliding window
            leftx, lefty, rightx, righty, out_img = aahlpf.
↪find_lane_pixels(binary_warped, h_frac=(3/4))
            left_fit = np.polyfit(lefty, leftx, 2)
            right_fit = np.polyfit(righty, rightx, 2)

        # Sanity check
        # Find lane width
        # Lane width at bottom of image
        # Lane width at top of image
        ploty = np.linspace(0, binary_warped.shape[0]-1, binary_warped.shape[0])
        is_detected, lane_width, lane_width_min = aahlpf.sanity_check(
            ploty, left_fit, right_fit, leftx, lefty, rightx, righty,
            thresh_lane=(600, 800), thresh_lane_diff=200, thresh_curve=(7.0/4))

        # Check doesn't fail
        if is_detected:

            # Save info about detected lane lines
            #x values for detected line pixels
            right_line.allx.append(rightx)
            #y values for detected line pixels
            right_line.ally.append(righty)
            #x values for detected line pixels
            left_line.allx.append(leftx)
            #y values for detected line pixels
            left_line.ally.append(lefty)

            # Save info about detected lane lines
            ploty = np.linspace(0, binary_warped.shape[0]-1, binary_warped.
↪shape[0])
            # Fit x values
```

```
            left_fitx_full = left_fit[0]*ploty**2 + left_fit[1]*ploty +␣
↪left_fit[2]
            right_fitx_full = right_fit[0]*ploty**2 + right_fit[1]*ploty +␣
↪right_fit[2]

            # Save info about detected lane lines
            # x values of the last n fits of the line
            while(len(right_line.recent_xfitted) >= n):
                del right_line.recent_xfitted[0]
            right_line.recent_xfitted.append(right_fitx_full)
            # x values of the last n fits of the line
            while(len(left_line.recent_xfitted) >= n):
                del left_line.recent_xfitted[0]
            left_line.recent_xfitted.append(left_fitx_full)

        # Average results from previous frames
        leftx = []
        lefty = []
        rightx = []
        righty = []
        n_min = np.minimum(n, len(left_line.allx))

        # Average results from previous frames
        for i in range(n_min):
            leftx.append(left_line.allx[-1 - i])
            lefty.append(left_line.ally[-1 - i])
            rightx.append(right_line.allx[-1 - i])
            righty.append(right_line.ally[-1 - i])

        # Average results from previous frames
        leftx = np.concatenate(leftx)
        lefty = np.concatenate(lefty)
        rightx = np.concatenate(rightx)
        righty = np.concatenate(righty)

        # Average results from previous frames
        left_fit = np.polyfit(lefty, leftx, 2)
        right_fit = np.polyfit(righty, rightx, 2)
        left_xy, right_xy = aahlpf.fit_polynomial(binary_warped, left_fit,␣
↪right_fit)

        # Save info about detected lane lines
        ploty = np.linspace(0, binary_warped.shape[0]-1, binary_warped.shape[0])
        # Fit x values
        left_fitx_full = left_fit[0]*ploty**2 + left_fit[1]*ploty + left_fit[2]
        right_fitx_full = right_fit[0]*ploty**2 + right_fit[1]*ploty +␣
↪right_fit[2]
```

```
    # Determine the curvature of the lane
    ym_per_pix=(30/720)
    xm_per_pix=(3.7/700)
    left_fit_m = np.polyfit(ym_per_pix*lefty, xm_per_pix*leftx, 2)
    right_fit_m = np.polyfit(ym_per_pix*righty, xm_per_pix*rightx, 2)
    ploty = np.linspace(0, binary_warped.shape[0]-1, binary_warped.shape[0])
    left_curverad_m, right_curverad_m = aahlpf.measure_curvature_real(ploty,␣
↪left_fit_m, right_fit_m)

    # Determine the vehicle position with respect to center
    ploty = np.linspace(0, binary_warped.shape[0]-1, binary_warped.shape[0])
    y_eval = np.max(ploty)
    left_fitx_eval = left_fit[0]*y_eval**2 + left_fit[1]*y_eval + left_fit[2]
    right_fitx_eval = right_fit[0]*y_eval**2 + right_fit[1]*y_eval +␣
↪right_fit[2]
    lane_center = np.abs(left_fitx_eval - right_fitx_eval)/2 + left_fitx_eval
    vehicle_center = binary_warped.shape[1]/2
    vehicle_pos = vehicle_center - lane_center
    vehicle_pos_m = xm_per_pix*vehicle_pos

    # Warp the detected lane boundaries back onto the original image
    warp_zero = np.zeros_like(binary_warped).astype(np.uint8)
    color_warp = np.dstack((warp_zero, warp_zero, warp_zero))
    pts_left = np.array([np.transpose(np.vstack([left_xy[0], left_xy[1]]))])
    pts_right = np.array([np.flipud(np.transpose(np.vstack([right_xy[0],␣
↪right_xy[1]])))])
    pts = np.hstack((pts_left, pts_right))
    cv2.fillPoly(color_warp, np.int_([pts]), (0,255, 0))
    newwarp = cv2.warpPerspective(color_warp, Minv, (image_undist.shape[1],␣
↪image_undist.shape[0]))
    image_lane_detect = cv2.addWeighted(image_undist, 1, newwarp, 0.3, 0)

    # Output visual display of the lane boundaries and numerical estimation of␣
↪lane curvature and vehicle position
    text1 = "Left Lane Curvature: " + str(left_curverad_m) + "m"
    text2 = "Right Lane Curvature: " + str(right_curverad_m) + "m"
    text3 = "Vehicle Position: " + str(vehicle_pos_m) + "m"
    fontFace = cv2.FONT_HERSHEY_SIMPLEX
    fontScale = 1.5;
    thickness = 2;
    image_est = np.copy(image_lane_detect)
    textSize1, baseline1 = cv2.getTextSize(text1, fontFace, fontScale,␣
↪thickness);
    textSize2, baseline2 = cv2.getTextSize(text2, fontFace, fontScale,␣
↪thickness);
```

```
   textSize3, baseline3 = cv2.getTextSize(text3, fontFace, fontScale,␣
↪thickness);
   textOrg1 = ((image_est.shape[1] - textSize1[0] - baseline1), (textSize1[1]␣
↪+ baseline1))
   textOrg2 = ((image_est.shape[1] - textSize2[0] - baseline2),
               (textSize1[1] + baseline1 + textSize2[1] + baseline2))
   textOrg3 = ((image_est.shape[1] - textSize3[0] - baseline3),
               (textSize1[1] + baseline1 + textSize2[1] + baseline2 +␣
↪textSize3[1] + baseline3))
   cv2.putText(image_est, text1, textOrg1, fontFace, fontScale, (255, 255,␣
↪255), thickness, 8);
   cv2.putText(image_est, text2, textOrg2, fontFace, fontScale, (255, 255,␣
↪255), thickness, 8);
   cv2.putText(image_est, text3, textOrg3, fontFace, fontScale, (255, 255,␣
↪255), thickness, 8);

   # Save info about detected lane lines
   if right_line is None:

       right_line = aahlpf.Line()
       # was the line detected in the last iteration?
       right_line.detected = True
       # x values of the last n fits of the line
       right_line.recent_xfitted.append(right_fitx_full)
       #average x values of the fitted line over the last n iterations
       right_line.bestx = right_fitx_full
       #polynomial coefficients averaged over the last n iterations
       right_line.best_fit = right_fit
       #polynomial coefficients for the most recent fit
       right_line.current_fit = right_fit
       #radius of curvature of the line in meters
       right_line.radius_of_curvature = right_curverad_m
       #distance in meters of vehicle center from the line
       right_line.line_base_pos = vehicle_pos_m
       #difference in fit coefficients between last and new fits
       # right_line.diffs = np.array([0,0,0], dtype='float')
       #x values for detected line pixels
       right_line.allx = []
       right_line.allx.append(rightx)
       #y values for detected line pixels
       right_line.ally = []
       right_line.ally.append(righty)

       left_line = aahlpf.Line()
       # was the line detected in the last iteration?
       left_line.detected = True
```

```
        # x values of the last n fits of the line
        left_line.recent_xfitted.append(left_fitx_full)
        #average x values of the fitted line over the last n iterations
        left_line.bestx = left_fitx_full
        #polynomial coefficients averaged over the last n iterations
        left_line.best_fit = left_fit
        #polynomial coefficients for the most recent fit
        left_line.current_fit = left_fit
        #radius of curvature of the line in meters
        left_line.radius_of_curvature = left_curverad_m
        #distance in meters of vehicle center from the line
        left_line.line_base_pos = vehicle_pos_m
        #difference in fit coefficients between last and new fits
        left_line.diffs = np.array([0,0,0], dtype='float')
        #x values for detected line pixels
        left_line.allx = []
        left_line.allx.append(leftx)
        #y values for detected line pixels
        left_line.ally = []
        left_line.ally.append(lefty)

    else:

        # was the line detected in the last iteration?
        right_line.detected = is_detected
        # x values of the last n fits of the line
        '''
        while(len(right_line.recent_xfitted) >= n):
            del right_line.recent_xfitted[0]
        right_line.recent_xfitted.append(right_fitx_full)
        '''
        #average x values of the fitted line over the last n iterations
        '''
        right_fitx_cat = np.vstack(right_line.recent_xfitted)
        right_fitx_ave = np.mean(right_fitx_cat, axis=0)
        right_line.bestx = right_fitx_ave
        '''
        right_line.bestx = right_fitx_full
        #polynomial coefficients averaged over the last n iterations
        right_line.best_fit = right_fit
        #polynomial coefficients for the most recent fit
        right_fit_last = right_line.current_fit
        right_line.current_fit = right_fit
        #radius of curvature of the line in meters
        right_line.radius_of_curvature = right_curverad_m
        #distance in meters of vehicle center from the line
        right_line.line_base_pos = vehicle_pos_m
```

```
        #difference in fit coefficients between last and new fits
        right_line.diffs = np.abs(right_fit_last - right_fit)
        #x values for detected line pixels
        # right_line.allx.append(rightx)
        #y values for detected line pixels
        # right_line.ally.append(righty)

        # was the line detected in the last iteration?
        left_line.detected = is_detected
        # x values of the last n fits of the line
        '''
        while(len(left_line.recent_xfitted) >= n):
            del left_line.recent_xfitted[0]
        left_line.recent_xfitted.append(left_fitx_full)
        '''
        #average x values of the fitted line over the last n iterations
        '''
        left_fitx_cat = np.vstack(left_line.recent_xfitted)
        left_fitx_ave = np.mean(left_fitx_cat, axis=0)
        left_line.bestx = left_fitx_ave
        '''
        left_line.bestx = left_fitx_full
        #polynomial coefficients averaged over the last n iterations
        left_line.best_fit = left_fit
        #polynomial coefficients for the most recent fit
        left_fit_last = left_line.current_fit
        left_line.current_fit = left_fit
        #radius of curvature of the line in meters
        left_line.radius_of_curvature = left_curverad_m
        #distance in meters of vehicle center from the line
        left_line.line_base_pos = vehicle_pos_m
        #difference in fit coefficients between last and new fits
        left_line.diffs = np.abs(left_fit_last - left_fit)
        #x values for detected line pixels
        # left_line.allx.append(leftx)
        #y values for detected line pixels
        # left_line.ally.append(lefty)

    return image_est
```

[71]:
```
print(len(lane_images))
print(lane_images)
```

```
8
['test_images\\straight_lines1.jpg', 'test_images\\straight_lines2.jpg',
'test_images\\test1.jpg', 'test_images\\test2.jpg', 'test_images\\test3.jpg',
'test_images\\test4.jpg', 'test_images\\test5.jpg', 'test_images\\test6.jpg']
```

[72]:
```
im_num = 5
print(lane_images[im_num])
lane_image = mpimg.imread(lane_images[im_num])
```

```
test_images\test4.jpg
```

[73]:
```
test_output = process_image(lane_image)
```

[74]:
```
print(len( left_line.recent_xfitted))
print(len(right_line.allx))
print(left_line.best_fit)
```

```
1
1
[ 2.30898644e-04 -3.00368386e-01  4.42493590e+02]
```

[75]:
```
f, ax = plt.subplots(1, 1, figsize=(24, 9))
f.tight_layout()
ax.imshow(test_output)
plt.subplots_adjust(left=0., right=1, top=0.9, bottom=0.)
```

[77]:
```
output = 'output_videos/project_video_out.mp4'
## To speed up the testing process you may want to try your pipeline on a␣
 ↪shorter subclip of the video
## To do so add .subclip(start_second,end_second) to the end of the line below
```

```
## Where start_second and end_second are integer values representing the start␣
 ↪and end of the subclip
## You may also uncomment the following line for a subclip of the first 5␣
 ↪seconds
##clip1 = VideoFileClip("test_videos/solidWhiteRight.mp4").subclip(0,5)
clip1 = VideoFileClip("project_video.mp4")
clip = clip1.fl_image(process_image) #NOTE: this function expects color images!!
%time clip.write_videofile(output, audio=False)
```

```
Moviepy - Building video output_videos/project_video_out.mp4.
```

```
Moviepy - Writing video output_videos/project_video_out.mp4
```

```
t:   0%|                                                                          |
2/1260 [01:48<10:59,  1.91it/s, now=None]
t:   0%|
| 0/1260 [00:00<?, ?it/s, now=None]
t:   0%|                                                                          |
2/1260 [00:01<11:21,  1.84it/s, now=None]
t:   0%|                                                                         |
3/1260 [00:02<14:37,  1.43it/s, now=None]
t:   0%|                                                                         |
4/1260 [00:03<16:10,  1.29it/s, now=None]
t:   0%|                                                                         |
5/1260 [00:04<17:14,  1.21it/s, now=None]
t:   0%|                                                                         |
6/1260 [00:04<17:50,  1.17it/s, now=None]
t:   1%|                                                                         |
7/1260 [00:05<18:09,  1.15it/s, now=None]
t:   1%|                                                                         |
8/1260 [00:06<18:10,  1.15it/s, now=None]
t:   1%|                                                                         |
9/1260 [00:07<18:27,  1.13it/s, now=None]
t:   1%|                                                                        |
10/1260 [00:08<18:47,  1.11it/s, now=None]
t:   1%|                                                                        |
11/1260 [00:09<19:20,  1.08it/s, now=None]
t:   1%|                                                                        |
12/1260 [00:10<20:19,  1.02it/s, now=None]
t:   1%|                                                                        |
13/1260 [00:11<20:11,  1.03it/s, now=None]
t:   1%|                                                                        |
14/1260 [00:12<20:06,  1.03it/s, now=None]
```

```
t:   1%|                                                                  |
15/1260 [00:13<19:49,  1.05it/s, now=None]
t:   1%|                                                                  |
16/1260 [00:14<19:29,  1.06it/s, now=None]
t:   1%|                                                                  |
17/1260 [00:15<19:09,  1.08it/s, now=None]
t:   1%|                                                                  |
18/1260 [00:16<19:18,  1.07it/s, now=None]
t:   2%|                                                                  |
19/1260 [00:17<19:35,  1.06it/s, now=None]
t:   2%|                                                                  |
20/1260 [00:18<19:26,  1.06it/s, now=None]
t:   2%|                                                                  |
21/1260 [00:19<19:32,  1.06it/s, now=None]
t:   2%|                                                                 |
22/1260 [00:20<19:12,  1.07it/s, now=None]
t:   2%|                                                                 |
23/1260 [00:20<19:01,  1.08it/s, now=None]
t:   2%|                                                                 |
24/1260 [00:21<19:13,  1.07it/s, now=None]
t:   2%|                                                                 |
25/1260 [00:22<19:51,  1.04it/s, now=None]
t:   2%|                                                                 |
26/1260 [00:23<20:11,  1.02it/s, now=None]
t:   2%|                                                                 |
27/1260 [00:24<20:00,  1.03it/s, now=None]
t:   2%|                                                                 |
28/1260 [00:25<19:40,  1.04it/s, now=None]
t:   2%|                                                                 |
29/1260 [00:26<19:35,  1.05it/s, now=None]
t:   2%|                                                                 |
30/1260 [00:27<19:27,  1.05it/s, now=None]
t:   2%|                                                                 |
31/1260 [00:28<19:15,  1.06it/s, now=None]
t:   3%|                                                                 |
32/1260 [00:29<19:07,  1.07it/s, now=None]
t:   3%|                                                                 |
33/1260 [00:30<19:09,  1.07it/s, now=None]
t:   3%|                                                                 |
34/1260 [00:31<19:05,  1.07it/s, now=None]
t:   3%|                                                                 |
35/1260 [00:32<19:17,  1.06it/s, now=None]
t:   3%|                                                                 |
36/1260 [00:33<19:10,  1.06it/s, now=None]
t:   3%|                                                                 |
37/1260 [00:34<19:07,  1.07it/s, now=None]
t:   3%|                                                                 |
38/1260 [00:35<18:55,  1.08it/s, now=None]
```

```
t:   3%|                                                                                 |
39/1260 [00:36<19:00,  1.07it/s, now=None]
t:   3%|                                                                                |
40/1260 [00:37<19:14,  1.06it/s, now=None]
t:   3%|                                                                                |
41/1260 [00:38<19:30,  1.04it/s, now=None]
t:   3%|                                                                                |
42/1260 [00:39<19:42,  1.03it/s, now=None]
t:   3%|                                                                                |
43/1260 [00:39<19:23,  1.05it/s, now=None]
t:   3%|                                                                                |
44/1260 [00:40<19:33,  1.04it/s, now=None]
t:   4%|                                                                                |
45/1260 [00:41<19:47,  1.02it/s, now=None]
t:   4%|                                                                                |
46/1260 [00:43<19:58,  1.01it/s, now=None]
t:   4%|                                                                                |
47/1260 [00:43<19:47,  1.02it/s, now=None]
t:   4%|                                                                                |
48/1260 [00:44<19:21,  1.04it/s, now=None]
t:   4%|                                                                                |
49/1260 [00:45<19:31,  1.03it/s, now=None]
t:   4%|                                                                                |
50/1260 [00:46<19:42,  1.02it/s, now=None]
t:   4%|                                                                                |
51/1260 [00:47<19:47,  1.02it/s, now=None]
t:   4%|                                                                                |
52/1260 [00:48<20:01,  1.01it/s, now=None]
t:   4%|                                                                                |
53/1260 [00:49<20:09,  1.00s/it, now=None]
t:   4%|                                                                                |
54/1260 [00:50<20:04,  1.00it/s, now=None]
t:   4%|                                                                                |
55/1260 [00:51<20:16,  1.01s/it, now=None]
t:   4%|                                                                                |
56/1260 [00:53<21:20,  1.06s/it, now=None]
t:   5%|                                                                                |
57/1260 [00:54<22:07,  1.10s/it, now=None]
t:   5%|                                                                                |
58/1260 [00:55<21:43,  1.08s/it, now=None]
t:   5%|                                                                               |
59/1260 [00:56<21:34,  1.08s/it, now=None]
t:   5%|                                                                               |
60/1260 [00:57<21:47,  1.09s/it, now=None]
t:   5%|                                                                               |
61/1260 [00:58<21:20,  1.07s/it, now=None]
t:   5%|                                                                               |
62/1260 [00:59<21:26,  1.07s/it, now=None]
```

```
t:   5%|                                                                        |
63/1260 [01:00<21:20,  1.07s/it, now=None]
t:   5%|                                                                        |
64/1260 [01:01<21:58,  1.10s/it, now=None]
t:   5%|                                                                        |
65/1260 [01:03<22:18,  1.12s/it, now=None]
t:   5%|                                                                        |
66/1260 [01:04<23:00,  1.16s/it, now=None]
t:   5%|                                                                        |
67/1260 [01:05<23:12,  1.17s/it, now=None]
t:   5%|                                                                        |
68/1260 [01:06<23:11,  1.17s/it, now=None]
t:   5%|                                                                        |
69/1260 [01:07<23:34,  1.19s/it, now=None]
t:   6%|                                                                        |
70/1260 [01:08<23:08,  1.17s/it, now=None]
t:   6%|                                                                        |
71/1260 [01:10<23:09,  1.17s/it, now=None]
t:   6%|                                                                        |
72/1260 [01:11<22:46,  1.15s/it, now=None]
t:   6%|                                                                        |
73/1260 [01:12<22:16,  1.13s/it, now=None]
t:   6%|                                                                        |
74/1260 [01:13<21:55,  1.11s/it, now=None]
t:   6%|                                                                        |
75/1260 [01:14<21:48,  1.10s/it, now=None]
t:   6%|                                                                        |
76/1260 [01:15<21:37,  1.10s/it, now=None]
t:   6%|                                                                        |
77/1260 [01:16<21:24,  1.09s/it, now=None]
t:   6%|                                                                       |
78/1260 [01:17<21:27,  1.09s/it, now=None]
t:   6%|                                                                       |
79/1260 [01:18<21:40,  1.10s/it, now=None]
t:   6%|                                                                       |
80/1260 [01:19<21:28,  1.09s/it, now=None]
t:   6%|                                                                       |
81/1260 [01:21<21:25,  1.09s/it, now=None]
t:   7%|                                                                       |
82/1260 [01:22<21:34,  1.10s/it, now=None]
t:   7%|                                                                       |
83/1260 [01:23<21:26,  1.09s/it, now=None]
t:   7%|                                                                       |
84/1260 [01:24<21:54,  1.12s/it, now=None]
t:   7%|                                                                       |
85/1260 [01:25<22:15,  1.14s/it, now=None]
t:   7%|                                                                       |
86/1260 [01:26<23:11,  1.19s/it, now=None]
```

```
t:   7%|                                                           |
87/1260 [01:28<23:21,  1.19s/it, now=None]
t:   7%|                                                           |
88/1260 [01:29<23:06,  1.18s/it, now=None]
t:   7%|                                                           |
89/1260 [01:30<22:55,  1.17s/it, now=None]
t:   7%|                                                           |
90/1260 [01:31<23:41,  1.21s/it, now=None]
t:   7%|                                                           |
91/1260 [01:32<23:20,  1.20s/it, now=None]
t:   7%|                                                           |
92/1260 [01:33<22:27,  1.15s/it, now=None]
t:   7%|                                                           |
93/1260 [01:34<21:38,  1.11s/it, now=None]
t:   7%|                                                           |
94/1260 [01:35<21:10,  1.09s/it, now=None]
t:   8%|                                                           |
95/1260 [01:37<20:56,  1.08s/it, now=None]
t:   8%|                                                           |
96/1260 [01:38<21:05,  1.09s/it, now=None]
t:   8%|                                                          |
97/1260 [01:39<20:57,  1.08s/it, now=None]
t:   8%|                                                          |
98/1260 [01:40<20:42,  1.07s/it, now=None]
t:   8%|                                                          |
99/1260 [01:41<20:22,  1.05s/it, now=None]
t:   8%|                                                         |
100/1260 [01:42<20:09,  1.04s/it, now=None]
t:   8%|                                                         |
101/1260 [01:43<20:04,  1.04s/it, now=None]
t:   8%|                                                         |
102/1260 [01:44<20:33,  1.06s/it, now=None]
t:   8%|                                                         |
103/1260 [01:45<20:46,  1.08s/it, now=None]
t:   8%|                                                         |
104/1260 [01:46<21:37,  1.12s/it, now=None]
t:   8%|                                                         |
105/1260 [01:47<21:46,  1.13s/it, now=None]
t:   8%|                                                         |
106/1260 [01:49<21:55,  1.14s/it, now=None]
t:   8%|                                                         |
107/1260 [01:50<22:04,  1.15s/it, now=None]
t:   9%|                                                         |
108/1260 [01:51<22:01,  1.15s/it, now=None]
t:   9%|                                                         |
109/1260 [01:52<22:32,  1.18s/it, now=None]
t:   9%|                                                         |
110/1260 [01:53<22:25,  1.17s/it, now=None]
```

```
t:   9%|                                                            |
111/1260 [01:54<22:13,  1.16s/it, now=None]
t:   9%|                                                            |
112/1260 [01:55<21:27,  1.12s/it, now=None]
t:   9%|                                                            |
113/1260 [01:57<21:41,  1.13s/it, now=None]
t:   9%|                                                            |
114/1260 [01:58<21:27,  1.12s/it, now=None]
t:   9%|                                                            |
115/1260 [01:59<20:49,  1.09s/it, now=None]
t:   9%|                                                            |
116/1260 [02:00<20:31,  1.08s/it, now=None]
t:   9%|                                                           |
117/1260 [02:01<20:10,  1.06s/it, now=None]
t:   9%|                                                           |
118/1260 [02:02<19:51,  1.04s/it, now=None]
t:   9%|                                                           |
119/1260 [02:03<19:49,  1.04s/it, now=None]
t:  10%|                                                           |
120/1260 [02:04<19:52,  1.05s/it, now=None]
t:  10%|                                                           |
121/1260 [02:05<19:48,  1.04s/it, now=None]
t:  10%|                                                           |
122/1260 [02:06<19:46,  1.04s/it, now=None]
t:  10%|                                                           |
123/1260 [02:07<19:34,  1.03s/it, now=None]
t:  10%|                                                           |
124/1260 [02:08<19:39,  1.04s/it, now=None]
t:  10%|                                                           |
125/1260 [02:09<19:25,  1.03s/it, now=None]
t:  10%|                                                           |
126/1260 [02:10<19:23,  1.03s/it, now=None]
t:  10%|                                                           |
127/1260 [02:11<19:15,  1.02s/it, now=None]
t:  10%|                                                           |
128/1260 [02:12<19:18,  1.02s/it, now=None]
t:  10%|                                                           |
129/1260 [02:13<19:21,  1.03s/it, now=None]
t:  10%|                                                           |
130/1260 [02:14<19:24,  1.03s/it, now=None]
t:  10%|                                                           |
131/1260 [02:15<19:35,  1.04s/it, now=None]
t:  10%|                                                           |
132/1260 [02:16<19:48,  1.05s/it, now=None]
t:  11%|                                                           |
133/1260 [02:17<19:45,  1.05s/it, now=None]
t:  11%|                                                           |
134/1260 [02:18<19:32,  1.04s/it, now=None]
```

```
t:  11%|                                                          |
135/1260 [02:19<19:13,  1.03s/it, now=None]
t:  11%|                                                          |
136/1260 [02:20<19:11,  1.02s/it, now=None]
t:  11%|                                                         |
137/1260 [02:21<19:05,  1.02s/it, now=None]
t:  11%|                                                         |
138/1260 [02:22<19:10,  1.03s/it, now=None]
t:  11%|                                                         |
139/1260 [02:23<18:52,  1.01s/it, now=None]
t:  11%|                                                         |
140/1260 [02:24<18:49,  1.01s/it, now=None]
t:  11%|                                                         |
141/1260 [02:25<18:59,  1.02s/it, now=None]
t:  11%|                                                         |
142/1260 [02:26<18:59,  1.02s/it, now=None]
t:  11%|                                                         |
143/1260 [02:28<19:01,  1.02s/it, now=None]
t:  11%|                                                         |
144/1260 [02:29<18:55,  1.02s/it, now=None]
t:  12%|                                                         |
145/1260 [02:30<18:58,  1.02s/it, now=None]
t:  12%|                                                         |
146/1260 [02:31<19:01,  1.02s/it, now=None]
t:  12%|                                                         |
147/1260 [02:32<19:04,  1.03s/it, now=None]
t:  12%|                                                         |
148/1260 [02:33<18:53,  1.02s/it, now=None]
t:  12%|                                                         |
149/1260 [02:34<18:39,  1.01s/it, now=None]
t:  12%|                                                         |
150/1260 [02:35<18:15,  1.01it/s, now=None]
t:  12%|                                                         |
151/1260 [02:36<18:12,  1.01it/s, now=None]
t:  12%|                                                         |
152/1260 [02:37<18:26,  1.00it/s, now=None]
t:  12%|                                                         |
153/1260 [02:38<18:19,  1.01it/s, now=None]
t:  12%|                                                         |
154/1260 [02:39<18:29,  1.00s/it, now=None]
t:  12%|                                                         |
155/1260 [02:40<18:19,  1.01it/s, now=None]
t:  12%|                                                        |
156/1260 [02:41<18:45,  1.02s/it, now=None]
t:  12%|                                                        |
157/1260 [02:42<18:45,  1.02s/it, now=None]
t:  13%|                                                        |
158/1260 [02:43<18:52,  1.03s/it, now=None]
```

```
t:  13%|                                                                    |
159/1260 [02:44<18:37,  1.01s/it, now=None]
t:  13%|                                                                    |
160/1260 [02:45<18:22,  1.00s/it, now=None]
t:  13%|                                                                    |
161/1260 [02:46<18:03,  1.01it/s, now=None]
t:  13%|                                                                    |
162/1260 [02:47<18:11,  1.01it/s, now=None]
t:  13%|                                                                    |
163/1260 [02:48<18:17,  1.00s/it, now=None]
t:  13%|                                                                    |
164/1260 [02:49<18:22,  1.01s/it, now=None]
t:  13%|                                                                    |
165/1260 [02:50<18:17,  1.00s/it, now=None]
t:  13%|                                                                    |
166/1260 [02:51<18:27,  1.01s/it, now=None]
t:  13%|                                                                    |
167/1260 [02:52<18:31,  1.02s/it, now=None]
t:  13%|                                                                    |
168/1260 [02:53<18:32,  1.02s/it, now=None]
t:  13%|                                                                    |
169/1260 [02:54<18:28,  1.02s/it, now=None]
t:  13%|                                                                    |
170/1260 [02:55<18:31,  1.02s/it, now=None]
t:  14%|                                                                    |
171/1260 [02:56<18:34,  1.02s/it, now=None]
t:  14%|                                                                    |
172/1260 [02:57<18:52,  1.04s/it, now=None]
t:  14%|                                                                    |
173/1260 [02:58<19:20,  1.07s/it, now=None]
t:  14%|                                                                    |
174/1260 [02:59<19:36,  1.08s/it, now=None]
t:  14%|                                                                   |
175/1260 [03:00<19:07,  1.06s/it, now=None]
t:  14%|                                                                   |
176/1260 [03:01<18:54,  1.05s/it, now=None]
t:  14%|                                                                   |
177/1260 [03:02<18:41,  1.04s/it, now=None]
t:  14%|                                                                   |
178/1260 [03:03<18:23,  1.02s/it, now=None]
t:  14%|                                                                   |
179/1260 [03:04<18:11,  1.01s/it, now=None]
t:  14%|                                                                   |
180/1260 [03:05<18:15,  1.01s/it, now=None]
t:  14%|                                                                   |
181/1260 [03:06<18:44,  1.04s/it, now=None]
t:  14%|                                                                   |
182/1260 [03:07<19:07,  1.06s/it, now=None]
```

```
t:  15%|                                                                  |
183/1260 [03:08<19:07,  1.07s/it, now=None]
t:  15%|                                                                  |
184/1260 [03:10<19:45,  1.10s/it, now=None]
t:  15%|                                                                  |
185/1260 [03:11<19:33,  1.09s/it, now=None]
t:  15%|                                                                  |
186/1260 [03:12<19:13,  1.07s/it, now=None]
t:  15%|                                                                  |
187/1260 [03:13<19:02,  1.06s/it, now=None]
t:  15%|                                                                  |
188/1260 [03:14<18:50,  1.05s/it, now=None]
t:  15%|                                                                  |
189/1260 [03:15<18:47,  1.05s/it, now=None]
t:  15%|                                                                  |
190/1260 [03:16<18:41,  1.05s/it, now=None]
t:  15%|                                                                  |
191/1260 [03:17<18:34,  1.04s/it, now=None]
t:  15%|                                                                  |
192/1260 [03:18<18:24,  1.03s/it, now=None]
t:  15%|                                                                  |
193/1260 [03:19<18:18,  1.03s/it, now=None]
t:  15%|                                                                 |
194/1260 [03:20<18:20,  1.03s/it, now=None]
t:  15%|                                                                 |
195/1260 [03:21<18:09,  1.02s/it, now=None]
t:  16%|                                                                 |
196/1260 [03:22<18:03,  1.02s/it, now=None]
t:  16%|                                                                 |
197/1260 [03:23<17:48,  1.01s/it, now=None]
t:  16%|                                                                 |
198/1260 [03:24<17:46,  1.00s/it, now=None]
t:  16%|                                                                 |
199/1260 [03:25<17:45,  1.00s/it, now=None]
t:  16%|                                                                 |
200/1260 [03:26<17:50,  1.01s/it, now=None]
t:  16%|                                                                 |
201/1260 [03:27<18:00,  1.02s/it, now=None]
t:  16%|                                                                 |
202/1260 [03:28<18:11,  1.03s/it, now=None]
t:  16%|                                                                 |
203/1260 [03:29<18:06,  1.03s/it, now=None]
t:  16%|                                                                 |
204/1260 [03:30<17:58,  1.02s/it, now=None]
t:  16%|                                                                 |
205/1260 [03:31<18:10,  1.03s/it, now=None]
t:  16%|                                                                 |
206/1260 [03:32<17:59,  1.02s/it, now=None]
```

```
t:  16%|                                                                 |
207/1260 [03:33<17:51,  1.02s/it, now=None]
t:  17%|                                                                 |
208/1260 [03:34<18:13,  1.04s/it, now=None]
t:  17%|                                                                 |
209/1260 [03:35<18:16,  1.04s/it, now=None]
t:  17%|                                                                 |
210/1260 [03:36<18:16,  1.04s/it, now=None]
t:  17%|                                                                 |
211/1260 [03:37<18:17,  1.05s/it, now=None]
t:  17%|                                                                 |
212/1260 [03:38<18:12,  1.04s/it, now=None]
t:  17%|                                                                |
213/1260 [03:40<19:40,  1.13s/it, now=None]
t:  17%|                                                                |
214/1260 [03:42<22:48,  1.31s/it, now=None]
t:  17%|                                                                |
215/1260 [03:43<22:09,  1.27s/it, now=None]
t:  17%|                                                                |
216/1260 [03:44<21:03,  1.21s/it, now=None]
t:  17%|                                                                |
217/1260 [03:45<20:17,  1.17s/it, now=None]
t:  17%|                                                                |
218/1260 [03:46<19:51,  1.14s/it, now=None]
t:  17%|                                                                |
219/1260 [03:47<21:24,  1.23s/it, now=None]
t:  17%|                                                                |
220/1260 [03:49<21:56,  1.27s/it, now=None]
t:  18%|                                                                |
221/1260 [03:50<21:24,  1.24s/it, now=None]
t:  18%|                                                                |
222/1260 [03:51<20:30,  1.19s/it, now=None]
t:  18%|                                                                |
223/1260 [03:52<19:58,  1.16s/it, now=None]
t:  18%|                                                                |
224/1260 [03:53<19:45,  1.14s/it, now=None]
t:  18%|                                                                |
225/1260 [03:54<19:23,  1.12s/it, now=None]
t:  18%|                                                                |
226/1260 [03:55<19:07,  1.11s/it, now=None]
t:  18%|                                                                |
227/1260 [03:57<20:28,  1.19s/it, now=None]
t:  18%|                                                                |
228/1260 [03:58<21:04,  1.23s/it, now=None]
t:  18%|                                                                |
229/1260 [03:59<20:50,  1.21s/it, now=None]
t:  18%|                                                                |
230/1260 [04:00<20:24,  1.19s/it, now=None]
```

```
t:  18%|                                                                 |
231/1260 [04:01<20:20,  1.19s/it, now=None]
t:  18%|                                                                |
232/1260 [04:03<20:40,  1.21s/it, now=None]
t:  18%|                                                                |
233/1260 [04:04<20:34,  1.20s/it, now=None]
t:  19%|                                                                |
234/1260 [04:05<20:26,  1.20s/it, now=None]
t:  19%|                                                                |
235/1260 [04:06<20:38,  1.21s/it, now=None]
t:  19%|                                                                |
236/1260 [04:08<20:29,  1.20s/it, now=None]
t:  19%|                                                                |
237/1260 [04:09<20:37,  1.21s/it, now=None]
t:  19%|                                                                |
238/1260 [04:10<20:05,  1.18s/it, now=None]
t:  19%|                                                                |
239/1260 [04:11<20:32,  1.21s/it, now=None]
t:  19%|                                                                |
240/1260 [04:12<20:39,  1.22s/it, now=None]
t:  19%|                                                                |
241/1260 [04:14<20:20,  1.20s/it, now=None]
t:  19%|                                                                |
242/1260 [04:15<19:49,  1.17s/it, now=None]
t:  19%|                                                                |
243/1260 [04:16<19:43,  1.16s/it, now=None]
t:  19%|                                                                |
244/1260 [04:17<19:29,  1.15s/it, now=None]
t:  19%|                                                                |
245/1260 [04:18<19:29,  1.15s/it, now=None]
t:  20%|                                                                |
246/1260 [04:19<19:18,  1.14s/it, now=None]
t:  20%|                                                                |
247/1260 [04:20<19:29,  1.15s/it, now=None]
t:  20%|                                                                |
248/1260 [04:22<19:40,  1.17s/it, now=None]
t:  20%|                                                                |
249/1260 [04:23<19:31,  1.16s/it, now=None]
t:  20%|                                                                |
250/1260 [04:24<19:26,  1.16s/it, now=None]
t:  20%|                                                               |
251/1260 [04:25<19:02,  1.13s/it, now=None]
t:  20%|                                                               |
252/1260 [04:26<18:54,  1.13s/it, now=None]
t:  20%|                                                               |
253/1260 [04:27<18:38,  1.11s/it, now=None]
t:  20%|                                                               |
254/1260 [04:28<18:56,  1.13s/it, now=None]
```

```
t:  20%|                                                                 |
255/1260 [04:29<18:54,  1.13s/it, now=None]
t:  20%|                                                                 |
256/1260 [04:30<18:37,  1.11s/it, now=None]
t:  20%|                                                                 |
257/1260 [04:32<18:21,  1.10s/it, now=None]
t:  20%|                                                                 |
258/1260 [04:33<18:26,  1.10s/it, now=None]
t:  21%|                                                                 |
259/1260 [04:34<18:18,  1.10s/it, now=None]
t:  21%|                                                                 |
260/1260 [04:35<18:03,  1.08s/it, now=None]
t:  21%|                                                                 |
261/1260 [04:36<17:49,  1.07s/it, now=None]
t:  21%|                                                                 |
262/1260 [04:37<17:56,  1.08s/it, now=None]
t:  21%|                                                                 |
263/1260 [04:38<18:12,  1.10s/it, now=None]
t:  21%|                                                                 |
264/1260 [04:39<18:32,  1.12s/it, now=None]
t:  21%|                                                                 |
265/1260 [04:40<18:41,  1.13s/it, now=None]
t:  21%|                                                                 |
266/1260 [04:42<19:16,  1.16s/it, now=None]
t:  21%|                                                                 |
267/1260 [04:43<19:29,  1.18s/it, now=None]
t:  21%|                                                                 |
268/1260 [04:44<19:28,  1.18s/it, now=None]
t:  21%|                                                                 |
269/1260 [04:45<19:27,  1.18s/it, now=None]
t:  21%|                                                                |
270/1260 [04:46<19:25,  1.18s/it, now=None]
t:  22%|                                                                |
271/1260 [04:48<19:21,  1.17s/it, now=None]
t:  22%|                                                                |
272/1260 [04:49<19:08,  1.16s/it, now=None]
t:  22%|                                                                |
273/1260 [04:50<18:59,  1.15s/it, now=None]
t:  22%|                                                                |
274/1260 [04:51<19:02,  1.16s/it, now=None]
t:  22%|                                                                |
275/1260 [04:52<19:00,  1.16s/it, now=None]
t:  22%|                                                                |
276/1260 [04:53<19:04,  1.16s/it, now=None]
t:  22%|                                                                |
277/1260 [04:55<19:17,  1.18s/it, now=None]
t:  22%|                                                                |
278/1260 [04:56<19:19,  1.18s/it, now=None]
```

```
t:  22%|                                                                 |
279/1260 [04:57<19:05,  1.17s/it, now=None]
t:  22%|                                                                 |
280/1260 [04:58<19:01,  1.17s/it, now=None]
t:  22%|                                                                 |
281/1260 [04:59<18:55,  1.16s/it, now=None]
t:  22%|                                                                 |
282/1260 [05:00<18:44,  1.15s/it, now=None]
t:  22%|                                                                 |
283/1260 [05:01<18:40,  1.15s/it, now=None]
t:  23%|                                                                 |
284/1260 [05:03<18:45,  1.15s/it, now=None]
t:  23%|                                                                 |
285/1260 [05:04<18:30,  1.14s/it, now=None]
t:  23%|                                                                 |
286/1260 [05:05<18:19,  1.13s/it, now=None]
t:  23%|                                                                 |
287/1260 [05:06<18:14,  1.12s/it, now=None]
t:  23%|                                                                 |
288/1260 [05:07<18:17,  1.13s/it, now=None]
t:  23%|                                                                |
289/1260 [05:08<18:42,  1.16s/it, now=None]
t:  23%|                                                                |
290/1260 [05:09<18:44,  1.16s/it, now=None]
t:  23%|                                                                |
291/1260 [05:11<19:08,  1.19s/it, now=None]
t:  23%|                                                                |
292/1260 [05:12<19:14,  1.19s/it, now=None]
t:  23%|                                                                |
293/1260 [05:13<18:57,  1.18s/it, now=None]
t:  23%|                                                                |
294/1260 [05:14<18:42,  1.16s/it, now=None]
t:  23%|                                                                |
295/1260 [05:15<18:59,  1.18s/it, now=None]
t:  23%|                                                                |
296/1260 [05:17<18:50,  1.17s/it, now=None]
t:  24%|                                                                |
297/1260 [05:18<18:46,  1.17s/it, now=None]
t:  24%|                                                                |
298/1260 [05:19<18:51,  1.18s/it, now=None]
t:  24%|                                                                |
299/1260 [05:20<18:44,  1.17s/it, now=None]
t:  24%|                                                                |
300/1260 [05:21<18:40,  1.17s/it, now=None]
t:  24%|                                                                |
301/1260 [05:22<18:45,  1.17s/it, now=None]
t:  24%|                                                                |
302/1260 [05:24<19:04,  1.19s/it, now=None]
```

```
t:  24%|                                                          |
303/1260 [05:25<19:14,  1.21s/it, now=None]
t:  24%|                                                          |
304/1260 [05:26<19:08,  1.20s/it, now=None]
t:  24%|                                                          |
305/1260 [05:27<18:56,  1.19s/it, now=None]
t:  24%|                                                          |
306/1260 [05:28<18:38,  1.17s/it, now=None]
t:  24%|                                                          |
307/1260 [05:30<18:30,  1.17s/it, now=None]
t:  24%|                                                         |
308/1260 [05:31<18:31,  1.17s/it, now=None]
t:  25%|                                                         |
309/1260 [05:32<18:12,  1.15s/it, now=None]
t:  25%|                                                         |
310/1260 [05:33<18:16,  1.15s/it, now=None]
t:  25%|                                                         |
311/1260 [05:34<18:03,  1.14s/it, now=None]
t:  25%|                                                         |
312/1260 [05:35<17:59,  1.14s/it, now=None]
t:  25%|                                                         |
313/1260 [05:36<18:05,  1.15s/it, now=None]
t:  25%|                                                         |
314/1260 [05:38<18:02,  1.14s/it, now=None]
t:  25%|                                                         |
315/1260 [05:39<18:12,  1.16s/it, now=None]
t:  25%|                                                         |
316/1260 [05:40<18:23,  1.17s/it, now=None]
t:  25%|                                                         |
317/1260 [05:41<18:01,  1.15s/it, now=None]
t:  25%|                                                         |
318/1260 [05:42<17:52,  1.14s/it, now=None]
t:  25%|                                                         |
319/1260 [05:43<18:11,  1.16s/it, now=None]
t:  25%|                                                         |
320/1260 [05:45<18:29,  1.18s/it, now=None]
t:  25%|                                                         |
321/1260 [05:46<18:07,  1.16s/it, now=None]
t:  26%|                                                         |
322/1260 [05:47<18:14,  1.17s/it, now=None]
t:  26%|                                                         |
323/1260 [05:48<18:09,  1.16s/it, now=None]
t:  26%|                                                         |
324/1260 [05:49<18:01,  1.16s/it, now=None]
t:  26%|                                                         |
325/1260 [05:50<18:01,  1.16s/it, now=None]
t:  26%|                                                         |
326/1260 [05:51<18:09,  1.17s/it, now=None]
```

```
t:  26%|                                                    |
327/1260 [05:53<18:05,  1.16s/it, now=None]
t:  26%|                                                    |
328/1260 [05:54<18:51,  1.21s/it, now=None]
t:  26%|                                                    |
329/1260 [05:55<18:49,  1.21s/it, now=None]
t:  26%|                                                    |
330/1260 [05:56<19:16,  1.24s/it, now=None]
t:  26%|                                                    |
331/1260 [05:58<19:16,  1.24s/it, now=None]
t:  26%|                                                    |
332/1260 [05:59<18:48,  1.22s/it, now=None]
t:  26%|                                                    |
333/1260 [06:00<18:52,  1.22s/it, now=None]
t:  27%|                                                    |
334/1260 [06:01<18:43,  1.21s/it, now=None]
t:  27%|                                                    |
335/1260 [06:02<18:14,  1.18s/it, now=None]
t:  27%|                                                    |
336/1260 [06:04<17:48,  1.16s/it, now=None]
t:  27%|                                                    |
337/1260 [06:05<17:26,  1.13s/it, now=None]
t:  27%|                                                    |
338/1260 [06:06<17:43,  1.15s/it, now=None]
t:  27%|                                                    |
339/1260 [06:07<17:36,  1.15s/it, now=None]
t:  27%|                                                    |
340/1260 [06:08<17:37,  1.15s/it, now=None]
t:  27%|                                                    |
341/1260 [06:09<17:41,  1.16s/it, now=None]
t:  27%|                                                    |
342/1260 [06:10<17:32,  1.15s/it, now=None]
t:  27%|                                                    |
343/1260 [06:12<17:41,  1.16s/it, now=None]
t:  27%|                                                    |
344/1260 [06:13<17:31,  1.15s/it, now=None]
t:  27%|                                                    |
345/1260 [06:14<17:25,  1.14s/it, now=None]
t:  27%|                                                    |
346/1260 [06:15<17:30,  1.15s/it, now=None]
t:  28%|                                                   |
347/1260 [06:16<17:35,  1.16s/it, now=None]
t:  28%|                                                   |
348/1260 [06:17<17:26,  1.15s/it, now=None]
t:  28%|                                                   |
349/1260 [06:18<17:23,  1.15s/it, now=None]
t:  28%|                                                   |
350/1260 [06:20<17:15,  1.14s/it, now=None]
```

```
t:  28%|                                                    |
351/1260 [06:21<17:14,  1.14s/it, now=None]
t:  28%|                                                    |
352/1260 [06:22<17:07,  1.13s/it, now=None]
t:  28%|                                                    |
353/1260 [06:23<16:49,  1.11s/it, now=None]
t:  28%|                                                    |
354/1260 [06:24<16:50,  1.11s/it, now=None]
t:  28%|                                                    |
355/1260 [06:25<17:04,  1.13s/it, now=None]
t:  28%|                                                    |
356/1260 [06:26<17:04,  1.13s/it, now=None]
t:  28%|                                                    |
357/1260 [06:27<16:55,  1.12s/it, now=None]
t:  28%|                                                    |
358/1260 [06:28<16:41,  1.11s/it, now=None]
t:  28%|                                                    |
359/1260 [06:30<16:48,  1.12s/it, now=None]
t:  29%|                                                    |
360/1260 [06:31<16:53,  1.13s/it, now=None]
t:  29%|                                                    |
361/1260 [06:32<16:47,  1.12s/it, now=None]
t:  29%|                                                    |
362/1260 [06:33<16:48,  1.12s/it, now=None]
t:  29%|                                                    |
363/1260 [06:34<17:10,  1.15s/it, now=None]
t:  29%|                                                    |
364/1260 [06:35<17:21,  1.16s/it, now=None]
t:  29%|                                                    |
365/1260 [06:37<17:44,  1.19s/it, now=None]
t:  29%|                                                   |
366/1260 [06:38<17:40,  1.19s/it, now=None]
t:  29%|                                                   |
367/1260 [06:39<17:44,  1.19s/it, now=None]
t:  29%|                                                   |
368/1260 [06:40<17:36,  1.18s/it, now=None]
t:  29%|                                                   |
369/1260 [06:41<17:31,  1.18s/it, now=None]
t:  29%|                                                   |
370/1260 [06:43<17:15,  1.16s/it, now=None]
t:  29%|                                                   |
371/1260 [06:44<17:02,  1.15s/it, now=None]
t:  30%|                                                   |
372/1260 [06:45<17:00,  1.15s/it, now=None]
t:  30%|                                                   |
373/1260 [06:46<17:00,  1.15s/it, now=None]
t:  30%|                                                   |
374/1260 [06:47<16:47,  1.14s/it, now=None]
```

```
t:  30%|                                                  |
375/1260 [06:48<16:42,  1.13s/it, now=None]
t:  30%|                                                  |
376/1260 [06:49<16:32,  1.12s/it, now=None]
t:  30%|                                                  |
377/1260 [06:50<16:24,  1.11s/it, now=None]
t:  30%|                                                  |
378/1260 [06:51<16:12,  1.10s/it, now=None]
t:  30%|                                                  |
379/1260 [06:53<16:05,  1.10s/it, now=None]
t:  30%|                                                  |
380/1260 [06:54<16:23,  1.12s/it, now=None]
t:  30%|                                                  |
381/1260 [06:55<16:04,  1.10s/it, now=None]
t:  30%|                                                  |
382/1260 [06:56<16:06,  1.10s/it, now=None]
t:  30%|                                                  |
383/1260 [06:57<16:08,  1.10s/it, now=None]
t:  30%|                                                  |
384/1260 [06:58<16:07,  1.10s/it, now=None]
t:  31%|                                                 |
385/1260 [06:59<15:55,  1.09s/it, now=None]
t:  31%|                                                 |
386/1260 [07:00<15:53,  1.09s/it, now=None]
t:  31%|                                                 |
387/1260 [07:01<15:55,  1.09s/it, now=None]
t:  31%|                                                 |
388/1260 [07:02<15:55,  1.10s/it, now=None]
t:  31%|                                                 |
389/1260 [07:04<16:25,  1.13s/it, now=None]
t:  31%|                                                 |
390/1260 [07:05<16:16,  1.12s/it, now=None]
t:  31%|                                                 |
391/1260 [07:06<16:08,  1.11s/it, now=None]
t:  31%|                                                 |
392/1260 [07:07<15:58,  1.10s/it, now=None]
t:  31%|                                                 |
393/1260 [07:08<15:58,  1.11s/it, now=None]
t:  31%|                                                 |
394/1260 [07:09<15:50,  1.10s/it, now=None]
t:  31%|                                                 |
395/1260 [07:10<16:11,  1.12s/it, now=None]
t:  31%|                                                 |
396/1260 [07:11<16:30,  1.15s/it, now=None]
t:  32%|                                                 |
397/1260 [07:13<16:34,  1.15s/it, now=None]
t:  32%|                                                 |
398/1260 [07:14<16:46,  1.17s/it, now=None]
```

```
t:  32%|                                                  |
399/1260 [07:15<16:38,  1.16s/it, now=None]
t:  32%|                                                  |
400/1260 [07:16<16:28,  1.15s/it, now=None]
t:  32%|                                                  |
401/1260 [07:17<16:17,  1.14s/it, now=None]
t:  32%|                                                  |
402/1260 [07:18<16:07,  1.13s/it, now=None]
t:  32%|                                                  |
403/1260 [07:19<15:57,  1.12s/it, now=None]
t:  32%|                                                 |
404/1260 [07:21<15:58,  1.12s/it, now=None]
t:  32%|                                                 |
405/1260 [07:22<15:44,  1.10s/it, now=None]
t:  32%|                                                 |
406/1260 [07:23<15:40,  1.10s/it, now=None]
t:  32%|                                                 |
407/1260 [07:24<15:32,  1.09s/it, now=None]
t:  32%|                                                 |
408/1260 [07:25<15:38,  1.10s/it, now=None]
t:  32%|                                                 |
409/1260 [07:26<15:28,  1.09s/it, now=None]
t:  33%|                                                 |
410/1260 [07:27<15:27,  1.09s/it, now=None]
t:  33%|                                                 |
411/1260 [07:28<15:27,  1.09s/it, now=None]
t:  33%|                                                 |
412/1260 [07:29<15:29,  1.10s/it, now=None]
t:  33%|                                                 |
413/1260 [07:30<15:25,  1.09s/it, now=None]
t:  33%|                                                 |
414/1260 [07:31<15:23,  1.09s/it, now=None]
t:  33%|                                                 |
415/1260 [07:33<15:20,  1.09s/it, now=None]
t:  33%|                                                 |
416/1260 [07:34<15:25,  1.10s/it, now=None]
t:  33%|                                                 |
417/1260 [07:35<15:20,  1.09s/it, now=None]
t:  33%|                                                 |
418/1260 [07:36<15:22,  1.10s/it, now=None]
t:  33%|                                                 |
419/1260 [07:37<15:32,  1.11s/it, now=None]
t:  33%|                                                 |
420/1260 [07:38<15:26,  1.10s/it, now=None]
t:  33%|                                                 |
421/1260 [07:39<15:34,  1.11s/it, now=None]
t:  33%|                                                 |
422/1260 [07:40<15:48,  1.13s/it, now=None]
```

```
t:  34%|                                                  |
423/1260 [07:41<15:41,  1.13s/it, now=None]
t:  34%|                                                  |
424/1260 [07:43<15:58,  1.15s/it, now=None]
t:  34%|                                                  |
425/1260 [07:44<16:00,  1.15s/it, now=None]
t:  34%|                                                  |
426/1260 [07:45<16:04,  1.16s/it, now=None]
t:  34%|                                                  |
427/1260 [07:46<16:08,  1.16s/it, now=None]
t:  34%|                                                  |
428/1260 [07:47<16:11,  1.17s/it, now=None]
t:  34%|                                                  |
429/1260 [07:48<16:05,  1.16s/it, now=None]
t:  34%|                                                  |
430/1260 [07:50<16:35,  1.20s/it, now=None]
t:  34%|                                                  |
431/1260 [07:51<16:45,  1.21s/it, now=None]
t:  34%|                                                  |
432/1260 [07:52<16:46,  1.22s/it, now=None]
t:  34%|                                                  |
433/1260 [07:53<16:45,  1.22s/it, now=None]
t:  34%|                                                  |
434/1260 [07:55<16:53,  1.23s/it, now=None]
t:  35%|                                                  |
435/1260 [07:56<16:50,  1.22s/it, now=None]
t:  35%|                                                  |
436/1260 [07:58<18:26,  1.34s/it, now=None]
t:  35%|                                                  |
437/1260 [07:59<18:19,  1.34s/it, now=None]
t:  35%|                                                  |
438/1260 [08:00<18:06,  1.32s/it, now=None]
t:  35%|                                                  |
439/1260 [08:01<17:11,  1.26s/it, now=None]
t:  35%|                                                  |
440/1260 [08:02<17:06,  1.25s/it, now=None]
t:  35%|                                                  |
441/1260 [08:04<16:41,  1.22s/it, now=None]
t:  35%|                                                 |
442/1260 [08:05<16:28,  1.21s/it, now=None]
t:  35%|                                                 |
443/1260 [08:06<16:02,  1.18s/it, now=None]
t:  35%|                                                 |
444/1260 [08:07<15:53,  1.17s/it, now=None]
t:  35%|                                                 |
445/1260 [08:08<16:15,  1.20s/it, now=None]
t:  35%|                                                 |
446/1260 [08:10<18:09,  1.34s/it, now=None]
```

```
t:  35%|                                                  |
447/1260 [08:11<18:27,  1.36s/it, now=None]
t:  36%|                                                  |
448/1260 [08:13<17:55,  1.32s/it, now=None]
t:  36%|                                                  |
449/1260 [08:14<17:44,  1.31s/it, now=None]
t:  36%|                                                  |
450/1260 [08:15<17:16,  1.28s/it, now=None]
t:  36%|                                                  |
451/1260 [08:16<17:05,  1.27s/it, now=None]
t:  36%|                                                  |
452/1260 [08:18<16:41,  1.24s/it, now=None]
t:  36%|                                                  |
453/1260 [08:19<16:11,  1.20s/it, now=None]
t:  36%|                                                  |
454/1260 [08:20<16:00,  1.19s/it, now=None]
t:  36%|                                                  |
455/1260 [08:21<16:05,  1.20s/it, now=None]
t:  36%|                                                  |
456/1260 [08:23<17:56,  1.34s/it, now=None]
t:  36%|                                                  |
457/1260 [08:24<17:28,  1.31s/it, now=None]
t:  36%|                                                  |
458/1260 [08:25<17:00,  1.27s/it, now=None]
t:  36%|                                                  |
459/1260 [08:26<17:00,  1.27s/it, now=None]
t:  37%|                                                  |
460/1260 [08:28<16:20,  1.23s/it, now=None]
t:  37%|                                                 |
461/1260 [08:29<15:49,  1.19s/it, now=None]
t:  37%|                                                 |
462/1260 [08:30<15:27,  1.16s/it, now=None]
t:  37%|                                                 |
463/1260 [08:31<15:23,  1.16s/it, now=None]
t:  37%|                                                 |
464/1260 [08:32<15:13,  1.15s/it, now=None]
t:  37%|                                                 |
465/1260 [08:33<15:05,  1.14s/it, now=None]
t:  37%|                                                 |
466/1260 [08:34<15:19,  1.16s/it, now=None]
t:  37%|                                                 |
467/1260 [08:36<15:27,  1.17s/it, now=None]
t:  37%|                                                 |
468/1260 [08:37<15:17,  1.16s/it, now=None]
t:  37%|                                                 |
469/1260 [08:38<15:29,  1.18s/it, now=None]
t:  37%|                                                 |
470/1260 [08:39<15:52,  1.21s/it, now=None]
```

```
t:  37%|                                                  |
471/1260 [08:40<16:20,  1.24s/it, now=None]
t:  37%|                                                  |
472/1260 [08:42<16:48,  1.28s/it, now=None]
t:  38%|                                                  |
473/1260 [08:43<16:11,  1.23s/it, now=None]
t:  38%|                                                  |
474/1260 [08:44<16:13,  1.24s/it, now=None]
t:  38%|                                                  |
475/1260 [08:45<16:00,  1.22s/it, now=None]
t:  38%|                                                  |
476/1260 [08:47<15:47,  1.21s/it, now=None]
t:  38%|                                                  |
477/1260 [08:48<15:29,  1.19s/it, now=None]
t:  38%|                                                  |
478/1260 [08:49<15:24,  1.18s/it, now=None]
t:  38%|                                                  |
479/1260 [08:50<15:24,  1.18s/it, now=None]
t:  38%|                                                 |
480/1260 [08:51<15:39,  1.20s/it, now=None]
t:  38%|                                                 |
481/1260 [08:53<15:40,  1.21s/it, now=None]
t:  38%|                                                 |
482/1260 [08:54<15:33,  1.20s/it, now=None]
t:  38%|                                                 |
483/1260 [08:55<15:32,  1.20s/it, now=None]
t:  38%|                                                 |
484/1260 [08:56<15:24,  1.19s/it, now=None]
t:  38%|                                                 |
485/1260 [08:58<16:11,  1.25s/it, now=None]
t:  39%|                                                 |
486/1260 [08:59<15:46,  1.22s/it, now=None]
t:  39%|                                                 |
487/1260 [09:00<15:48,  1.23s/it, now=None]
t:  39%|                                                 |
488/1260 [09:01<15:55,  1.24s/it, now=None]
t:  39%|                                                 |
489/1260 [09:02<15:45,  1.23s/it, now=None]
t:  39%|                                                 |
490/1260 [09:03<15:19,  1.19s/it, now=None]
t:  39%|                                                 |
491/1260 [09:05<16:29,  1.29s/it, now=None]
t:  39%|                                                 |
492/1260 [09:06<16:26,  1.28s/it, now=None]
t:  39%|                                                 |
493/1260 [09:08<16:19,  1.28s/it, now=None]
t:  39%|                                                 |
494/1260 [09:09<16:04,  1.26s/it, now=None]
```

```
t:  39%|                                                  |
495/1260 [09:10<16:03,  1.26s/it, now=None]
t:  39%|                                                  |
496/1260 [09:11<16:07,  1.27s/it, now=None]
t:  39%|                                                  |
497/1260 [09:13<16:07,  1.27s/it, now=None]
t:  40%|                                                  |
498/1260 [09:14<16:03,  1.26s/it, now=None]
t:  40%|                                                 |
499/1260 [09:15<16:05,  1.27s/it, now=None]
t:  40%|                                                 |
500/1260 [09:16<16:02,  1.27s/it, now=None]
t:  40%|                                                 |
501/1260 [09:18<16:03,  1.27s/it, now=None]
t:  40%|                                                 |
502/1260 [09:19<16:00,  1.27s/it, now=None]
t:  40%|                                                 |
503/1260 [09:20<16:56,  1.34s/it, now=None]
t:  40%|                                                 |
504/1260 [09:22<16:41,  1.33s/it, now=None]
t:  40%|                                                 |
505/1260 [09:23<16:26,  1.31s/it, now=None]
t:  40%|                                                 |
506/1260 [09:24<16:38,  1.32s/it, now=None]
t:  40%|                                                 |
507/1260 [09:26<17:00,  1.35s/it, now=None]
t:  40%|                                                 |
508/1260 [09:27<16:30,  1.32s/it, now=None]
t:  40%|                                                 |
509/1260 [09:28<16:07,  1.29s/it, now=None]
t:  40%|                                                 |
510/1260 [09:29<16:02,  1.28s/it, now=None]
t:  41%|                                                 |
511/1260 [09:31<15:43,  1.26s/it, now=None]
t:  41%|                                                 |
512/1260 [09:32<15:31,  1.25s/it, now=None]
t:  41%|                                                 |
513/1260 [09:33<15:22,  1.23s/it, now=None]
t:  41%|                                                 |
514/1260 [09:35<16:04,  1.29s/it, now=None]
t:  41%|                                                 |
515/1260 [09:36<17:20,  1.40s/it, now=None]
t:  41%|                                                 |
516/1260 [09:38<17:07,  1.38s/it, now=None]
t:  41%|                                                 |
517/1260 [09:39<17:27,  1.41s/it, now=None]
t:  41%|                                                |
518/1260 [09:41<17:56,  1.45s/it, now=None]
```

```
t:  41%|                                                |
519/1260 [09:42<17:50,  1.44s/it, now=None]
t:  41%|                                                |
520/1260 [09:43<17:39,  1.43s/it, now=None]
t:  41%|                                                |
521/1260 [09:45<18:04,  1.47s/it, now=None]
t:  41%|                                                |
522/1260 [09:47<18:46,  1.53s/it, now=None]
t:  42%|                                                |
523/1260 [09:48<18:44,  1.53s/it, now=None]
t:  42%|                                                |
524/1260 [09:50<18:32,  1.51s/it, now=None]
t:  42%|                                                |
525/1260 [09:51<18:21,  1.50s/it, now=None]
t:  42%|                                                |
526/1260 [09:52<17:32,  1.43s/it, now=None]
t:  42%|                                                |
527/1260 [09:53<16:27,  1.35s/it, now=None]
t:  42%|                                                |
528/1260 [09:55<15:17,  1.25s/it, now=None]
t:  42%|                                                |
529/1260 [09:56<14:58,  1.23s/it, now=None]
t:  42%|                                                |
530/1260 [09:57<14:57,  1.23s/it, now=None]
t:  42%|                                                |
531/1260 [09:58<15:28,  1.27s/it, now=None]
t:  42%|                                                |
532/1260 [09:59<14:39,  1.21s/it, now=None]
t:  42%|                                                |
533/1260 [10:00<13:31,  1.12s/it, now=None]
t:  42%|                                                |
534/1260 [10:01<13:02,  1.08s/it, now=None]
t:  42%|                                                |
535/1260 [10:02<12:51,  1.06s/it, now=None]
t:  43%|                                                |
536/1260 [10:03<12:50,  1.06s/it, now=None]
t:  43%|                                               |
537/1260 [10:04<12:35,  1.05s/it, now=None]
t:  43%|                                               |
538/1260 [10:05<12:10,  1.01s/it, now=None]
t:  43%|                                               |
539/1260 [10:06<11:32,  1.04it/s, now=None]
t:  43%|                                               |
540/1260 [10:07<11:45,  1.02it/s, now=None]
t:  43%|                                               |
541/1260 [10:08<11:18,  1.06it/s, now=None]
t:  43%|                                               |
542/1260 [10:09<11:06,  1.08it/s, now=None]
```

```
t:  43%|                                          |
543/1260 [10:10<11:05,  1.08it/s, now=None]
t:  43%|                                          |
544/1260 [10:11<10:59,  1.09it/s, now=None]
t:  43%|                                          |
545/1260 [10:12<10:37,  1.12it/s, now=None]
t:  43%|                                          |
546/1260 [10:12<10:20,  1.15it/s, now=None]
t:  43%|                                          |
547/1260 [10:13<10:04,  1.18it/s, now=None]
t:  43%|                                          |
548/1260 [10:14<10:04,  1.18it/s, now=None]
t:  44%|                                          |
549/1260 [10:15<09:56,  1.19it/s, now=None]
t:  44%|                                          |
550/1260 [10:16<10:22,  1.14it/s, now=None]
t:  44%|                                          |
551/1260 [10:17<10:34,  1.12it/s, now=None]
t:  44%|                                          |
552/1260 [10:18<10:49,  1.09it/s, now=None]
t:  44%|                                          |
553/1260 [10:19<10:51,  1.08it/s, now=None]
t:  44%|                                          |
554/1260 [10:19<10:38,  1.10it/s, now=None]
t:  44%|                                          |
555/1260 [10:20<10:08,  1.16it/s, now=None]
t:  44%|                                          |
556/1260 [10:21<09:24,  1.25it/s, now=None]
t:  44%|                                         |
557/1260 [10:22<09:15,  1.26it/s, now=None]
t:  44%|                                         |
558/1260 [10:22<09:09,  1.28it/s, now=None]
t:  44%|                                         |
559/1260 [10:23<08:55,  1.31it/s, now=None]
t:  44%|                                         |
560/1260 [10:24<08:26,  1.38it/s, now=None]
t:  45%|                                         |
561/1260 [10:24<08:12,  1.42it/s, now=None]
t:  45%|                                         |
562/1260 [10:25<08:06,  1.44it/s, now=None]
t:  45%|                                         |
563/1260 [10:26<07:57,  1.46it/s, now=None]
t:  45%|                                         |
564/1260 [10:26<07:52,  1.47it/s, now=None]
t:  45%|                                         |
565/1260 [10:27<07:17,  1.59it/s, now=None]
t:  45%|                                         |
566/1260 [10:28<06:58,  1.66it/s, now=None]
```

```
t:  45%|                                          |
567/1260 [10:28<06:54,  1.67it/s, now=None]
t:  45%|                                          |
568/1260 [10:29<06:48,  1.69it/s, now=None]
t:  45%|                                          |
569/1260 [10:29<06:51,  1.68it/s, now=None]
t:  45%|                                          |
570/1260 [10:30<06:27,  1.78it/s, now=None]
t:  45%|                                          |
571/1260 [10:30<06:01,  1.91it/s, now=None]
t:  45%|                                          |
572/1260 [10:31<05:57,  1.93it/s, now=None]
t:  45%|                                          |
573/1260 [10:31<05:55,  1.93it/s, now=None]
t:  46%|                                          |
574/1260 [10:32<05:53,  1.94it/s, now=None]
t:  46%|                                          |
575/1260 [10:32<05:43,  1.99it/s, now=None]
t:  46%|                                         |
576/1260 [10:33<05:29,  2.07it/s, now=None]
t:  46%|                                         |
577/1260 [10:33<05:34,  2.04it/s, now=None]
t:  46%|                                         |
578/1260 [10:34<05:26,  2.09it/s, now=None]
t:  46%|                                         |
579/1260 [10:34<05:46,  1.96it/s, now=None]
t:  46%|                                         |
580/1260 [10:35<05:53,  1.92it/s, now=None]
t:  46%|                                         |
581/1260 [10:35<05:41,  1.99it/s, now=None]
t:  46%|                                         |
582/1260 [10:36<05:39,  2.00it/s, now=None]
t:  46%|                                         |
583/1260 [10:36<05:25,  2.08it/s, now=None]
t:  46%|                                         |
584/1260 [10:37<05:10,  2.18it/s, now=None]
t:  46%|                                         |
585/1260 [10:37<05:22,  2.09it/s, now=None]
t:  47%|                                         |
586/1260 [10:37<05:08,  2.18it/s, now=None]
t:  47%|                                         |
587/1260 [10:38<05:13,  2.15it/s, now=None]
t:  47%|                                         |
588/1260 [10:38<05:08,  2.18it/s, now=None]
t:  47%|                                         |
589/1260 [10:39<05:29,  2.03it/s, now=None]
t:  47%|                                         |
590/1260 [10:40<05:50,  1.91it/s, now=None]
```

```
t:  47%|                                      |
591/1260 [10:40<05:30,  2.02it/s, now=None]
t:  47%|                                      |
592/1260 [10:40<05:19,  2.09it/s, now=None]
t:  47%|                                      |
593/1260 [10:41<05:21,  2.07it/s, now=None]
t:  47%|                                      |
594/1260 [10:41<05:34,  1.99it/s, now=None]
t:  47%|                                      |
595/1260 [10:42<05:45,  1.92it/s, now=None]
t:  47%|                                      |
596/1260 [10:43<05:53,  1.88it/s, now=None]
t:  47%|                                      |
597/1260 [10:43<06:04,  1.82it/s, now=None]
t:  47%|                                      |
598/1260 [10:44<06:02,  1.83it/s, now=None]
t:  48%|                                      |
599/1260 [10:44<06:11,  1.78it/s, now=None]
t:  48%|                                      |
600/1260 [10:45<06:19,  1.74it/s, now=None]
t:  48%|                                      |
601/1260 [10:46<06:27,  1.70it/s, now=None]
t:  48%|                                      |
602/1260 [10:46<06:40,  1.64it/s, now=None]
t:  48%|                                      |
603/1260 [10:47<06:45,  1.62it/s, now=None]
t:  48%|                                      |
604/1260 [10:48<06:59,  1.57it/s, now=None]
t:  48%|                                      |
605/1260 [10:48<06:53,  1.58it/s, now=None]
t:  48%|                                      |
606/1260 [10:49<07:08,  1.53it/s, now=None]
t:  48%|                                      |
607/1260 [10:50<07:42,  1.41it/s, now=None]
t:  48%|                                      |
608/1260 [10:50<08:00,  1.36it/s, now=None]
t:  48%|                                      |
609/1260 [10:51<08:24,  1.29it/s, now=None]
t:  48%|                                      |
610/1260 [10:52<08:40,  1.25it/s, now=None]
t:  48%|                                      |
611/1260 [10:53<09:00,  1.20it/s, now=None]
t:  49%|                                      |
612/1260 [10:54<09:11,  1.18it/s, now=None]
t:  49%|                                      |
613/1260 [10:55<09:50,  1.10it/s, now=None]
t:  49%|                                     |
614/1260 [10:56<09:59,  1.08it/s, now=None]
```

```
t:  49%|                                    |
615/1260 [10:57<10:12,  1.05it/s, now=None]
t:  49%|                                    |
616/1260 [10:58<10:33,  1.02it/s, now=None]
t:  49%|                                    |
617/1260 [10:59<10:46,  1.00s/it, now=None]
t:  49%|                                    |
618/1260 [11:00<11:34,  1.08s/it, now=None]
t:  49%|                                    |
619/1260 [11:02<11:42,  1.10s/it, now=None]
t:  49%|                                    |
620/1260 [11:02<11:12,  1.05s/it, now=None]
t:  49%|                                    |
621/1260 [11:03<11:03,  1.04s/it, now=None]
t:  49%|                                    |
622/1260 [11:05<11:23,  1.07s/it, now=None]
t:  49%|                                    |
623/1260 [11:06<13:25,  1.27s/it, now=None]
t:  50%|                                    |
624/1260 [11:08<13:06,  1.24s/it, now=None]
t:  50%|                                    |
625/1260 [11:09<12:47,  1.21s/it, now=None]
t:  50%|                                    |
626/1260 [11:10<12:27,  1.18s/it, now=None]
t:  50%|                                    |
627/1260 [11:11<11:56,  1.13s/it, now=None]
t:  50%|                                    |
628/1260 [11:12<11:25,  1.08s/it, now=None]
t:  50%|                                    |
629/1260 [11:13<11:01,  1.05s/it, now=None]
t:  50%|                                    |
630/1260 [11:14<10:53,  1.04s/it, now=None]
t:  50%|                                    |
631/1260 [11:15<11:01,  1.05s/it, now=None]
t:  50%|                                    |
632/1260 [11:16<11:12,  1.07s/it, now=None]
t:  50%|                                    |
633/1260 [11:17<11:14,  1.08s/it, now=None]
t:  50%|                                    |
634/1260 [11:18<11:21,  1.09s/it, now=None]
t:  50%|                                    |
635/1260 [11:19<11:27,  1.10s/it, now=None]
t:  50%|                                    |
636/1260 [11:20<11:22,  1.09s/it, now=None]
t:  51%|                                    |
637/1260 [11:21<11:17,  1.09s/it, now=None]
t:  51%|                                    |
638/1260 [11:22<11:10,  1.08s/it, now=None]
```

```
t:  51%|                                    |
639/1260 [11:24<11:06,  1.07s/it, now=None]
t:  51%|                                    |
640/1260 [11:25<11:05,  1.07s/it, now=None]
t:  51%|                                    |
641/1260 [11:26<11:14,  1.09s/it, now=None]
t:  51%|                                    |
642/1260 [11:27<11:18,  1.10s/it, now=None]
t:  51%|                                    |
643/1260 [11:28<11:24,  1.11s/it, now=None]
t:  51%|                                    |
644/1260 [11:29<11:24,  1.11s/it, now=None]
t:  51%|                                    |
645/1260 [11:30<11:20,  1.11s/it, now=None]
t:  51%|                                    |
646/1260 [11:31<11:21,  1.11s/it, now=None]
t:  51%|                                    |
647/1260 [11:33<11:49,  1.16s/it, now=None]
t:  51%|                                    |
648/1260 [11:34<12:07,  1.19s/it, now=None]
t:  52%|                                    |
649/1260 [11:35<12:21,  1.21s/it, now=None]
t:  52%|                                    |
650/1260 [11:36<12:18,  1.21s/it, now=None]
t:  52%|                                    |
651/1260 [11:38<12:11,  1.20s/it, now=None]
t:  52%|                                     |
652/1260 [11:39<12:05,  1.19s/it, now=None]
t:  52%|                                     |
653/1260 [11:40<11:54,  1.18s/it, now=None]
t:  52%|                                     |
654/1260 [11:41<11:37,  1.15s/it, now=None]
t:  52%|                                     |
655/1260 [11:42<11:37,  1.15s/it, now=None]
t:  52%|                                     |
656/1260 [11:43<11:51,  1.18s/it, now=None]
t:  52%|                                     |
657/1260 [11:45<11:54,  1.19s/it, now=None]
t:  52%|                                     |
658/1260 [11:46<11:57,  1.19s/it, now=None]
t:  52%|                                     |
659/1260 [11:47<12:03,  1.20s/it, now=None]
t:  52%|                                     |
660/1260 [11:48<12:19,  1.23s/it, now=None]
t:  52%|                                     |
661/1260 [11:49<12:18,  1.23s/it, now=None]
t:  53%|                                     |
662/1260 [11:51<12:19,  1.24s/it, now=None]
```

```
t:  53%|                                    |
663/1260 [11:52<12:11,  1.22s/it, now=None]
t:  53%|                                    |
664/1260 [11:53<12:00,  1.21s/it, now=None]
t:  53%|                                    |
665/1260 [11:54<11:47,  1.19s/it, now=None]
t:  53%|                                    |
666/1260 [11:55<11:31,  1.16s/it, now=None]
t:  53%|                                    |
667/1260 [11:57<11:48,  1.19s/it, now=None]
t:  53%|                                    |
668/1260 [11:58<12:09,  1.23s/it, now=None]
t:  53%|                                    |
669/1260 [11:59<12:04,  1.23s/it, now=None]
t:  53%|                                    |
670/1260 [12:00<11:50,  1.20s/it, now=None]
t:  53%|                                    |
671/1260 [12:02<11:54,  1.21s/it, now=None]
t:  53%|                                    |
672/1260 [12:03<11:46,  1.20s/it, now=None]
t:  53%|                                    |
673/1260 [12:04<11:29,  1.18s/it, now=None]
t:  53%|                                    |
674/1260 [12:05<11:18,  1.16s/it, now=None]
t:  54%|                                    |
675/1260 [12:06<11:17,  1.16s/it, now=None]
t:  54%|                                    |
676/1260 [12:07<11:18,  1.16s/it, now=None]
t:  54%|                                    |
677/1260 [12:08<11:10,  1.15s/it, now=None]
t:  54%|                                    |
678/1260 [12:10<11:07,  1.15s/it, now=None]
t:  54%|                                    |
679/1260 [12:11<11:19,  1.17s/it, now=None]
t:  54%|                                    |
680/1260 [12:12<11:12,  1.16s/it, now=None]
t:  54%|                                    |
681/1260 [12:13<11:07,  1.15s/it, now=None]
t:  54%|                                    |
682/1260 [12:14<11:14,  1.17s/it, now=None]
t:  54%|                                    |
683/1260 [12:15<11:17,  1.17s/it, now=None]
t:  54%|                                    |
684/1260 [12:17<11:04,  1.15s/it, now=None]
t:  54%|                                    |
685/1260 [12:18<11:16,  1.18s/it, now=None]
t:  54%|                                    |
686/1260 [12:19<11:58,  1.25s/it, now=None]
```

```
t:  55%|                                  |
687/1260 [12:20<11:54,  1.25s/it, now=None]
t:  55%|                                  |
688/1260 [12:22<11:45,  1.23s/it, now=None]
t:  55%|                                  |
689/1260 [12:23<11:50,  1.24s/it, now=None]
t:  55%|                                  |
690/1260 [12:24<11:40,  1.23s/it, now=None]
t:  55%|                                  |
691/1260 [12:25<11:45,  1.24s/it, now=None]
t:  55%|                                  |
692/1260 [12:27<11:33,  1.22s/it, now=None]
t:  55%|                                  |
693/1260 [12:28<11:16,  1.19s/it, now=None]
t:  55%|                                  |
694/1260 [12:29<11:20,  1.20s/it, now=None]
t:  55%|                                  |
695/1260 [12:30<11:17,  1.20s/it, now=None]
t:  55%|                                  |
696/1260 [12:31<11:24,  1.21s/it, now=None]
t:  55%|                                  |
697/1260 [12:33<11:34,  1.23s/it, now=None]
t:  55%|                                  |
698/1260 [12:34<12:22,  1.32s/it, now=None]
t:  55%|                                  |
699/1260 [12:35<12:19,  1.32s/it, now=None]
t:  56%|                                  |
700/1260 [12:37<11:54,  1.28s/it, now=None]
t:  56%|                                  |
701/1260 [12:38<12:17,  1.32s/it, now=None]
t:  56%|                                  |
702/1260 [12:40<13:37,  1.47s/it, now=None]
t:  56%|                                  |
703/1260 [12:41<13:22,  1.44s/it, now=None]
t:  56%|                                  |
704/1260 [12:42<12:45,  1.38s/it, now=None]
t:  56%|                                  |
705/1260 [12:44<12:15,  1.33s/it, now=None]
t:  56%|                                  |
706/1260 [12:45<12:11,  1.32s/it, now=None]
t:  56%|                                  |
707/1260 [12:46<12:11,  1.32s/it, now=None]
t:  56%|                                  |
708/1260 [12:48<11:51,  1.29s/it, now=None]
t:  56%|                                 |
709/1260 [12:49<11:19,  1.23s/it, now=None]
t:  56%|                                 |
710/1260 [12:50<11:02,  1.21s/it, now=None]
```

```
t:  56%|                                |
711/1260 [12:51<11:19,  1.24s/it, now=None]
t:  57%|                                |
712/1260 [12:52<11:21,  1.24s/it, now=None]
t:  57%|                                |
713/1260 [12:54<11:24,  1.25s/it, now=None]
t:  57%|                                |
714/1260 [12:55<11:23,  1.25s/it, now=None]
t:  57%|                                |
715/1260 [12:56<11:03,  1.22s/it, now=None]
t:  57%|                                |
716/1260 [12:57<11:03,  1.22s/it, now=None]
t:  57%|                                |
717/1260 [12:58<10:51,  1.20s/it, now=None]
t:  57%|                                |
718/1260 [12:59<10:37,  1.18s/it, now=None]
t:  57%|                                |
719/1260 [13:01<10:32,  1.17s/it, now=None]
t:  57%|                                |
720/1260 [13:02<10:29,  1.16s/it, now=None]
t:  57%|                                |
721/1260 [13:03<10:08,  1.13s/it, now=None]
t:  57%|                                |
722/1260 [13:04<09:57,  1.11s/it, now=None]
t:  57%|                                |
723/1260 [13:05<10:04,  1.13s/it, now=None]
t:  57%|                                |
724/1260 [13:06<10:04,  1.13s/it, now=None]
t:  58%|                                |
725/1260 [13:07<10:17,  1.15s/it, now=None]
t:  58%|                                |
726/1260 [13:08<10:05,  1.13s/it, now=None]
t:  58%|                                |
727/1260 [13:10<09:57,  1.12s/it, now=None]
t:  58%|                                |
728/1260 [13:11<10:09,  1.15s/it, now=None]
t:  58%|                                |
729/1260 [13:12<10:05,  1.14s/it, now=None]
t:  58%|                                |
730/1260 [13:13<10:04,  1.14s/it, now=None]
t:  58%|                                |
731/1260 [13:14<09:55,  1.12s/it, now=None]
t:  58%|                                |
732/1260 [13:15<09:46,  1.11s/it, now=None]
t:  58%|                                |
733/1260 [13:16<09:50,  1.12s/it, now=None]
t:  58%|                                |
734/1260 [13:17<09:38,  1.10s/it, now=None]
```

```
t:  58%|                              |
735/1260 [13:18<09:26,  1.08s/it, now=None]
t:  58%|                              |
736/1260 [13:19<09:16,  1.06s/it, now=None]
t:  58%|                              |
737/1260 [13:21<09:10,  1.05s/it, now=None]
t:  59%|                              |
738/1260 [13:22<09:05,  1.05s/it, now=None]
t:  59%|                              |
739/1260 [13:23<08:56,  1.03s/it, now=None]
t:  59%|                              |
740/1260 [13:24<08:52,  1.02s/it, now=None]
t:  59%|                              |
741/1260 [13:24<08:41,  1.01s/it, now=None]
t:  59%|                              |
742/1260 [13:25<08:38,  1.00s/it, now=None]
t:  59%|                              |
743/1260 [13:26<08:36,  1.00it/s, now=None]
t:  59%|                              |
744/1260 [13:27<08:36,  1.00s/it, now=None]
t:  59%|                              |
745/1260 [13:28<08:31,  1.01it/s, now=None]
t:  59%|                              |
746/1260 [13:29<08:28,  1.01it/s, now=None]
t:  59%|                             |
747/1260 [13:30<08:31,  1.00it/s, now=None]
t:  59%|                             |
748/1260 [13:31<08:34,  1.00s/it, now=None]
t:  59%|                             |
749/1260 [13:33<08:39,  1.02s/it, now=None]
t:  60%|                             |
750/1260 [13:34<08:43,  1.03s/it, now=None]
t:  60%|                             |
751/1260 [13:35<09:00,  1.06s/it, now=None]
t:  60%|                             |
752/1260 [13:36<08:54,  1.05s/it, now=None]
t:  60%|                             |
753/1260 [13:37<08:43,  1.03s/it, now=None]
t:  60%|                             |
754/1260 [13:38<08:37,  1.02s/it, now=None]
t:  60%|                             |
755/1260 [13:39<08:39,  1.03s/it, now=None]
t:  60%|                             |
756/1260 [13:40<08:42,  1.04s/it, now=None]
t:  60%|                             |
757/1260 [13:41<08:33,  1.02s/it, now=None]
t:  60%|                             |
758/1260 [13:42<08:33,  1.02s/it, now=None]
```

```
t:  60%|                          |
759/1260 [13:43<08:34,  1.03s/it, now=None]
t:  60%|                          |
760/1260 [13:44<08:33,  1.03s/it, now=None]
t:  60%|                          |
761/1260 [13:45<08:35,  1.03s/it, now=None]
t:  60%|                          |
762/1260 [13:46<08:37,  1.04s/it, now=None]
t:  61%|                          |
763/1260 [13:47<08:33,  1.03s/it, now=None]
t:  61%|                          |
764/1260 [13:48<08:41,  1.05s/it, now=None]
t:  61%|                          |
765/1260 [13:49<08:42,  1.05s/it, now=None]
t:  61%|                          |
766/1260 [13:50<08:43,  1.06s/it, now=None]
t:  61%|                         |
767/1260 [13:51<08:43,  1.06s/it, now=None]
t:  61%|                         |
768/1260 [13:52<08:42,  1.06s/it, now=None]
t:  61%|                         |
769/1260 [13:53<08:39,  1.06s/it, now=None]
t:  61%|                         |
770/1260 [13:55<08:42,  1.07s/it, now=None]
t:  61%|                         |
771/1260 [13:56<08:37,  1.06s/it, now=None]
t:  61%|                         |
772/1260 [13:57<09:09,  1.13s/it, now=None]
t:  61%|                         |
773/1260 [13:58<09:09,  1.13s/it, now=None]
t:  61%|                         |
774/1260 [13:59<09:01,  1.11s/it, now=None]
t:  62%|                         |
775/1260 [14:00<08:56,  1.11s/it, now=None]
t:  62%|                         |
776/1260 [14:01<08:46,  1.09s/it, now=None]
t:  62%|                         |
777/1260 [14:02<08:44,  1.09s/it, now=None]
t:  62%|                         |
778/1260 [14:03<08:41,  1.08s/it, now=None]
t:  62%|                         |
779/1260 [14:04<08:34,  1.07s/it, now=None]
t:  62%|                         |
780/1260 [14:06<08:43,  1.09s/it, now=None]
t:  62%|                         |
781/1260 [14:07<08:39,  1.09s/it, now=None]
t:  62%|                         |
782/1260 [14:08<08:37,  1.08s/it, now=None]
```

```
t:  62%|                          |
783/1260 [14:09<08:32,  1.08s/it, now=None]
t:  62%|                          |
784/1260 [14:10<08:32,  1.08s/it, now=None]
t:  62%|                          |
785/1260 [14:11<08:32,  1.08s/it, now=None]
t:  62%|                         |
786/1260 [14:12<08:34,  1.09s/it, now=None]
t:  62%|                         |
787/1260 [14:13<08:26,  1.07s/it, now=None]
t:  63%|                         |
788/1260 [14:14<08:27,  1.07s/it, now=None]
t:  63%|                         |
789/1260 [14:15<08:24,  1.07s/it, now=None]
t:  63%|                         |
790/1260 [14:16<08:30,  1.09s/it, now=None]
t:  63%|                         |
791/1260 [14:17<08:27,  1.08s/it, now=None]
t:  63%|                         |
792/1260 [14:18<08:29,  1.09s/it, now=None]
t:  63%|                         |
793/1260 [14:20<08:32,  1.10s/it, now=None]
t:  63%|                         |
794/1260 [14:21<08:36,  1.11s/it, now=None]
t:  63%|                         |
795/1260 [14:22<08:40,  1.12s/it, now=None]
t:  63%|                         |
796/1260 [14:23<08:47,  1.14s/it, now=None]
t:  63%|                         |
797/1260 [14:24<09:09,  1.19s/it, now=None]
t:  63%|                         |
798/1260 [14:26<09:18,  1.21s/it, now=None]
t:  63%|                         |
799/1260 [14:27<09:28,  1.23s/it, now=None]
t:  63%|                         |
800/1260 [14:28<09:41,  1.26s/it, now=None]
t:  64%|                         |
801/1260 [14:29<09:30,  1.24s/it, now=None]
t:  64%|                         |
802/1260 [14:31<09:25,  1.23s/it, now=None]
t:  64%|                         |
803/1260 [14:32<09:20,  1.23s/it, now=None]
t:  64%|                         |
804/1260 [14:33<09:12,  1.21s/it, now=None]
t:  64%|                        |
805/1260 [14:34<09:10,  1.21s/it, now=None]
t:  64%|                        |
806/1260 [14:35<09:11,  1.21s/it, now=None]
```

```
t:  64%|                        |
807/1260 [14:37<09:05,  1.20s/it, now=None]
t:  64%|                        |
808/1260 [14:38<09:01,  1.20s/it, now=None]
t:  64%|                        |
809/1260 [14:39<08:50,  1.18s/it, now=None]
t:  64%|                        |
810/1260 [14:40<08:39,  1.16s/it, now=None]
t:  64%|                        |
811/1260 [14:41<08:34,  1.15s/it, now=None]
t:  64%|                        |
812/1260 [14:42<08:29,  1.14s/it, now=None]
t:  65%|                        |
813/1260 [14:43<08:28,  1.14s/it, now=None]
t:  65%|                        |
814/1260 [14:45<08:30,  1.14s/it, now=None]
t:  65%|                        |
815/1260 [14:46<08:26,  1.14s/it, now=None]
t:  65%|                        |
816/1260 [14:47<08:22,  1.13s/it, now=None]
t:  65%|                        |
817/1260 [14:48<08:16,  1.12s/it, now=None]
t:  65%|                        |
818/1260 [14:49<08:13,  1.12s/it, now=None]
t:  65%|                        |
819/1260 [14:50<08:11,  1.11s/it, now=None]
t:  65%|                        |
820/1260 [14:51<08:13,  1.12s/it, now=None]
t:  65%|                        |
821/1260 [14:52<08:24,  1.15s/it, now=None]
t:  65%|                        |
822/1260 [14:54<08:31,  1.17s/it, now=None]
t:  65%|                        |
823/1260 [14:55<08:28,  1.16s/it, now=None]
t:  65%|                       |
824/1260 [14:56<08:43,  1.20s/it, now=None]
t:  65%|                        |
825/1260 [14:57<08:31,  1.18s/it, now=None]
t:  66%|                        |
826/1260 [14:59<09:11,  1.27s/it, now=None]
t:  66%|                        |
827/1260 [15:00<09:00,  1.25s/it, now=None]
t:  66%|                        |
828/1260 [15:01<08:49,  1.23s/it, now=None]
t:  66%|                        |
829/1260 [15:03<09:39,  1.34s/it, now=None]
t:  66%|                        |
830/1260 [15:04<09:32,  1.33s/it, now=None]
```

```
t:  66%|                       |
831/1260 [15:05<09:04,  1.27s/it, now=None]
t:  66%|                       |
832/1260 [15:06<08:55,  1.25s/it, now=None]
t:  66%|                       |
833/1260 [15:08<08:43,  1.23s/it, now=None]
t:  66%|                       |
834/1260 [15:09<08:27,  1.19s/it, now=None]
t:  66%|                       |
835/1260 [15:10<08:20,  1.18s/it, now=None]
t:  66%|                       |
836/1260 [15:11<08:11,  1.16s/it, now=None]
t:  66%|                       |
837/1260 [15:12<08:01,  1.14s/it, now=None]
t:  67%|                       |
838/1260 [15:13<07:58,  1.13s/it, now=None]
t:  67%|                       |
839/1260 [15:14<07:55,  1.13s/it, now=None]
t:  67%|                       |
840/1260 [15:15<07:54,  1.13s/it, now=None]
t:  67%|                       |
841/1260 [15:16<07:49,  1.12s/it, now=None]
t:  67%|                       |
842/1260 [15:18<07:51,  1.13s/it, now=None]
t:  67%|                      |
843/1260 [15:19<07:50,  1.13s/it, now=None]
t:  67%|                       |
844/1260 [15:20<07:48,  1.13s/it, now=None]
t:  67%|                      |
845/1260 [15:21<07:51,  1.14s/it, now=None]
t:  67%|                       |
846/1260 [15:22<07:47,  1.13s/it, now=None]
t:  67%|                      |
847/1260 [15:23<07:36,  1.11s/it, now=None]
t:  67%|                       |
848/1260 [15:24<07:35,  1.10s/it, now=None]
t:  67%|                       |
849/1260 [15:25<07:35,  1.11s/it, now=None]
t:  67%|                       |
850/1260 [15:27<07:41,  1.13s/it, now=None]
t:  68%|                       |
851/1260 [15:28<07:45,  1.14s/it, now=None]
t:  68%|                       |
852/1260 [15:29<07:40,  1.13s/it, now=None]
t:  68%|                       |
853/1260 [15:30<07:39,  1.13s/it, now=None]
t:  68%|                       |
854/1260 [15:31<07:37,  1.13s/it, now=None]
```

```
t:  68%|                     |
855/1260 [15:32<07:30,  1.11s/it, now=None]
t:  68%|                     |
856/1260 [15:33<07:36,  1.13s/it, now=None]
t:  68%|                     |
857/1260 [15:34<07:32,  1.12s/it, now=None]
t:  68%|                     |
858/1260 [15:36<07:27,  1.11s/it, now=None]
t:  68%|                     |
859/1260 [15:37<07:15,  1.09s/it, now=None]
t:  68%|                     |
860/1260 [15:38<07:10,  1.08s/it, now=None]
t:  68%|                     |
861/1260 [15:39<07:07,  1.07s/it, now=None]
t:  68%|                     |
862/1260 [15:40<07:09,  1.08s/it, now=None]
t:  68%|                     |
863/1260 [15:41<07:13,  1.09s/it, now=None]
t:  69%|                     |
864/1260 [15:42<07:13,  1.09s/it, now=None]
t:  69%|                     |
865/1260 [15:43<07:13,  1.10s/it, now=None]
t:  69%|                     |
866/1260 [15:44<07:12,  1.10s/it, now=None]
t:  69%|                     |
867/1260 [15:45<07:09,  1.09s/it, now=None]
t:  69%|                     |
868/1260 [15:46<07:05,  1.08s/it, now=None]
t:  69%|                     |
869/1260 [15:47<07:03,  1.08s/it, now=None]
t:  69%|                     |
870/1260 [15:49<07:05,  1.09s/it, now=None]
t:  69%|                     |
871/1260 [15:50<07:01,  1.08s/it, now=None]
t:  69%|                     |
872/1260 [15:51<07:03,  1.09s/it, now=None]
t:  69%|                     |
873/1260 [15:52<07:04,  1.10s/it, now=None]
t:  69%|                     |
874/1260 [15:53<07:08,  1.11s/it, now=None]
t:  69%|                     |
875/1260 [15:54<07:09,  1.11s/it, now=None]
t:  70%|                     |
876/1260 [15:55<07:15,  1.14s/it, now=None]
t:  70%|                     |
877/1260 [15:57<07:35,  1.19s/it, now=None]
t:  70%|                     |
878/1260 [15:58<08:19,  1.31s/it, now=None]
```

```
t:  70%|                    |
879/1260 [15:59<08:03,  1.27s/it, now=None]
t:  70%|                     |
880/1260 [16:01<07:54,  1.25s/it, now=None]
t:  70%|                    |
881/1260 [16:02<07:45,  1.23s/it, now=None]
t:  70%|                    |
882/1260 [16:03<07:37,  1.21s/it, now=None]
t:  70%|                    |
883/1260 [16:04<07:31,  1.20s/it, now=None]
t:  70%|                    |
884/1260 [16:05<07:23,  1.18s/it, now=None]
t:  70%|                    |
885/1260 [16:06<07:11,  1.15s/it, now=None]
t:  70%|                    |
886/1260 [16:07<07:10,  1.15s/it, now=None]
t:  70%|                    |
887/1260 [16:09<07:06,  1.14s/it, now=None]
t:  70%|                    |
888/1260 [16:10<07:03,  1.14s/it, now=None]
t:  71%|                    |
889/1260 [16:11<07:00,  1.13s/it, now=None]
t:  71%|                    |
890/1260 [16:12<07:00,  1.14s/it, now=None]
t:  71%|                    |
891/1260 [16:13<07:07,  1.16s/it, now=None]
t:  71%|                    |
892/1260 [16:14<07:02,  1.15s/it, now=None]
t:  71%|                    |
893/1260 [16:15<07:02,  1.15s/it, now=None]
t:  71%|                    |
894/1260 [16:17<07:05,  1.16s/it, now=None]
t:  71%|                    |
895/1260 [16:18<07:00,  1.15s/it, now=None]
t:  71%|                    |
896/1260 [16:19<06:57,  1.15s/it, now=None]
t:  71%|                    |
897/1260 [16:20<06:57,  1.15s/it, now=None]
t:  71%|                    |
898/1260 [16:21<06:56,  1.15s/it, now=None]
t:  71%|                    |
899/1260 [16:22<06:52,  1.14s/it, now=None]
t:  71%|                    |
900/1260 [16:23<06:50,  1.14s/it, now=None]
t:  72%|                    |
901/1260 [16:25<06:46,  1.13s/it, now=None]
t:  72%|                    |
902/1260 [16:26<06:46,  1.13s/it, now=None]
```

```
t:  72%|                   |
903/1260 [16:27<06:48,  1.14s/it, now=None]
t:  72%|                   |
904/1260 [16:28<06:47,  1.14s/it, now=None]
t:  72%|                   |
905/1260 [16:29<06:46,  1.14s/it, now=None]
t:  72%|                   |
906/1260 [16:30<06:42,  1.14s/it, now=None]
t:  72%|                   |
907/1260 [16:31<06:40,  1.14s/it, now=None]
t:  72%|                   |
908/1260 [16:33<06:34,  1.12s/it, now=None]
t:  72%|                   |
909/1260 [16:34<06:29,  1.11s/it, now=None]
t:  72%|                   |
910/1260 [16:35<06:29,  1.11s/it, now=None]
t:  72%|                   |
911/1260 [16:36<06:29,  1.11s/it, now=None]
t:  72%|                   |
912/1260 [16:37<06:22,  1.10s/it, now=None]
t:  72%|                   |
913/1260 [16:38<06:21,  1.10s/it, now=None]
t:  73%|                   |
914/1260 [16:39<06:24,  1.11s/it, now=None]
t:  73%|                   |
915/1260 [16:40<06:25,  1.12s/it, now=None]
t:  73%|                   |
916/1260 [16:41<06:26,  1.12s/it, now=None]
t:  73%|                   |
917/1260 [16:43<06:26,  1.13s/it, now=None]
t:  73%|                   |
918/1260 [16:44<06:23,  1.12s/it, now=None]
t:  73%|                   |
919/1260 [16:45<06:21,  1.12s/it, now=None]
t:  73%|                   |
920/1260 [16:46<06:16,  1.11s/it, now=None]
t:  73%|                   |
921/1260 [16:47<06:17,  1.11s/it, now=None]
t:  73%|                   |
922/1260 [16:48<06:24,  1.14s/it, now=None]
t:  73%|                   |
923/1260 [16:49<06:22,  1.13s/it, now=None]
t:  73%|                   |
924/1260 [16:50<06:18,  1.13s/it, now=None]
t:  73%|                   |
925/1260 [16:52<06:15,  1.12s/it, now=None]
t:  73%|                   |
926/1260 [16:53<06:13,  1.12s/it, now=None]
```

```
t:  74%|                  |
927/1260 [16:54<06:18,  1.14s/it, now=None]
t:  74%|                  |
928/1260 [16:55<06:17,  1.14s/it, now=None]
t:  74%|                  |
929/1260 [16:56<06:11,  1.12s/it, now=None]
t:  74%|                  |
930/1260 [16:57<06:11,  1.12s/it, now=None]
t:  74%|                  |
931/1260 [16:58<06:11,  1.13s/it, now=None]
t:  74%|                  |
932/1260 [16:59<06:06,  1.12s/it, now=None]
t:  74%|                  |
933/1260 [17:01<06:05,  1.12s/it, now=None]
t:  74%|                  |
934/1260 [17:02<06:03,  1.11s/it, now=None]
t:  74%|                  |
935/1260 [17:03<06:00,  1.11s/it, now=None]
t:  74%|                  |
936/1260 [17:04<05:57,  1.10s/it, now=None]
t:  74%|                  |
937/1260 [17:05<05:48,  1.08s/it, now=None]
t:  74%|                 |
938/1260 [17:06<05:46,  1.08s/it, now=None]
t:  75%|                 |
939/1260 [17:07<05:47,  1.08s/it, now=None]
t:  75%|                 |
940/1260 [17:08<05:42,  1.07s/it, now=None]
t:  75%|                 |
941/1260 [17:09<05:40,  1.07s/it, now=None]
t:  75%|                 |
942/1260 [17:10<05:44,  1.08s/it, now=None]
t:  75%|                 |
943/1260 [17:11<05:45,  1.09s/it, now=None]
t:  75%|                 |
944/1260 [17:12<05:42,  1.08s/it, now=None]
t:  75%|                 |
945/1260 [17:13<05:38,  1.07s/it, now=None]
t:  75%|                 |
946/1260 [17:15<05:41,  1.09s/it, now=None]
t:  75%|                 |
947/1260 [17:16<05:35,  1.07s/it, now=None]
t:  75%|                 |
948/1260 [17:17<05:28,  1.05s/it, now=None]
t:  75%|                 |
949/1260 [17:18<05:30,  1.06s/it, now=None]
t:  75%|                 |
950/1260 [17:19<05:30,  1.07s/it, now=None]
```

```
t:  75%|                |
951/1260 [17:20<05:28,  1.06s/it, now=None]
t:  76%|                |
952/1260 [17:21<05:30,  1.07s/it, now=None]
t:  76%|                |
953/1260 [17:22<05:31,  1.08s/it, now=None]
t:  76%|                |
954/1260 [17:23<05:36,  1.10s/it, now=None]
t:  76%|                |
955/1260 [17:24<05:38,  1.11s/it, now=None]
t:  76%|                |
956/1260 [17:25<05:36,  1.11s/it, now=None]
t:  76%|               |
957/1260 [17:27<05:34,  1.11s/it, now=None]
t:  76%|               |
958/1260 [17:28<05:34,  1.11s/it, now=None]
t:  76%|               |
959/1260 [17:29<05:27,  1.09s/it, now=None]
t:  76%|               |
960/1260 [17:30<05:34,  1.11s/it, now=None]
t:  76%|               |
961/1260 [17:31<05:40,  1.14s/it, now=None]
t:  76%|               |
962/1260 [17:32<05:40,  1.14s/it, now=None]
t:  76%|               |
963/1260 [17:33<05:41,  1.15s/it, now=None]
t:  77%|               |
964/1260 [17:35<05:45,  1.17s/it, now=None]
t:  77%|               |
965/1260 [17:36<05:58,  1.21s/it, now=None]
t:  77%|               |
966/1260 [17:37<06:07,  1.25s/it, now=None]
t:  77%|               |
967/1260 [17:38<06:00,  1.23s/it, now=None]
t:  77%|               |
968/1260 [17:40<06:04,  1.25s/it, now=None]
t:  77%|               |
969/1260 [17:41<06:04,  1.25s/it, now=None]
t:  77%|               |
970/1260 [17:42<06:06,  1.26s/it, now=None]
t:  77%|               |
971/1260 [17:43<06:01,  1.25s/it, now=None]
t:  77%|               |
972/1260 [17:45<05:55,  1.23s/it, now=None]
t:  77%|               |
973/1260 [17:46<05:53,  1.23s/it, now=None]
t:  77%|               |
974/1260 [17:47<05:39,  1.19s/it, now=None]
```

```
t:  77%|               |
975/1260 [17:48<05:32,  1.17s/it, now=None]
t:  77%|               |
976/1260 [17:49<05:31,  1.17s/it, now=None]
t:  78%|              |
977/1260 [17:50<05:28,  1.16s/it, now=None]
t:  78%|              |
978/1260 [17:52<05:28,  1.16s/it, now=None]
t:  78%|              |
979/1260 [17:53<05:27,  1.17s/it, now=None]
t:  78%|              |
980/1260 [17:54<05:16,  1.13s/it, now=None]
t:  78%|              |
981/1260 [17:55<05:15,  1.13s/it, now=None]
t:  78%|              |
982/1260 [17:56<05:21,  1.16s/it, now=None]
t:  78%|              |
983/1260 [17:57<05:21,  1.16s/it, now=None]
t:  78%|              |
984/1260 [17:59<05:22,  1.17s/it, now=None]
t:  78%|              |
985/1260 [18:00<05:12,  1.14s/it, now=None]
t:  78%|              |
986/1260 [18:01<05:08,  1.13s/it, now=None]
t:  78%|              |
987/1260 [18:02<05:04,  1.11s/it, now=None]
t:  78%|              |
988/1260 [18:03<04:53,  1.08s/it, now=None]
t:  78%|              |
989/1260 [18:04<04:47,  1.06s/it, now=None]
t:  79%|              |
990/1260 [18:05<04:40,  1.04s/it, now=None]
t:  79%|              |
991/1260 [18:06<04:29,  1.00s/it, now=None]
t:  79%|              |
992/1260 [18:07<04:20,  1.03it/s, now=None]
t:  79%|              |
993/1260 [18:07<04:11,  1.06it/s, now=None]
t:  79%|              |
994/1260 [18:08<04:12,  1.05it/s, now=None]
t:  79%|              |
995/1260 [18:09<04:17,  1.03it/s, now=None]
t:  79%|             |
996/1260 [18:11<04:27,  1.01s/it, now=None]
t:  79%|             |
997/1260 [18:12<04:38,  1.06s/it, now=None]
t:  79%|             |
998/1260 [18:13<04:35,  1.05s/it, now=None]
```

```
t:  79%|             |
999/1260 [18:14<04:33,  1.05s/it, now=None]
t:  79%|             |
1000/1260 [18:15<04:21,  1.01s/it, now=None]
t:  79%|             |
1001/1260 [18:16<04:11,  1.03it/s, now=None]
t:  80%|             |
1002/1260 [18:16<03:49,  1.13it/s, now=None]
t:  80%|             |
1003/1260 [18:17<03:20,  1.28it/s, now=None]
t:  80%|             |
1004/1260 [18:17<03:00,  1.42it/s, now=None]
t:  80%|             |
1005/1260 [18:18<02:48,  1.52it/s, now=None]
t:  80%|             |
1006/1260 [18:18<02:37,  1.61it/s, now=None]
t:  80%|             |
1007/1260 [18:19<02:46,  1.52it/s, now=None]
t:  80%|             |
1008/1260 [18:20<02:46,  1.51it/s, now=None]
t:  80%|             |
1009/1260 [18:21<03:00,  1.39it/s, now=None]
t:  80%|             |
1010/1260 [18:22<03:09,  1.32it/s, now=None]
t:  80%|            |
1011/1260 [18:22<03:00,  1.38it/s, now=None]
t:  80%|            |
1012/1260 [18:23<02:54,  1.42it/s, now=None]
t:  80%|            |
1013/1260 [18:23<02:33,  1.61it/s, now=None]
t:  80%|            |
1014/1260 [18:24<02:18,  1.78it/s, now=None]
t:  81%|            |
1015/1260 [18:24<02:10,  1.88it/s, now=None]
t:  81%|            |
1016/1260 [18:25<02:05,  1.95it/s, now=None]
t:  81%|            |
1017/1260 [18:25<02:00,  2.01it/s, now=None]
t:  81%|            |
1018/1260 [18:26<01:59,  2.02it/s, now=None]
t:  81%|            |
1019/1260 [18:26<02:02,  1.97it/s, now=None]
t:  81%|            |
1020/1260 [18:27<02:04,  1.92it/s, now=None]
t:  81%|            |
1021/1260 [18:27<02:08,  1.86it/s, now=None]
t:  81%|            |
1022/1260 [18:28<02:18,  1.72it/s, now=None]
```

```
t:  81%|            |
1023/1260 [18:29<02:22,  1.66it/s, now=None]
t:  81%|            |
1024/1260 [18:29<02:22,  1.65it/s, now=None]
t:  81%|            |
1025/1260 [18:30<02:26,  1.60it/s, now=None]
t:  81%|            |
1026/1260 [18:31<02:30,  1.55it/s, now=None]
t:  82%|            |
1027/1260 [18:31<02:26,  1.59it/s, now=None]
t:  82%|            |
1028/1260 [18:32<02:21,  1.64it/s, now=None]
t:  82%|            |
1029/1260 [18:32<02:20,  1.64it/s, now=None]
t:  82%|           |
1030/1260 [18:33<02:28,  1.55it/s, now=None]
t:  82%|           |
1031/1260 [18:34<02:34,  1.49it/s, now=None]
t:  82%|           |
1032/1260 [18:35<02:38,  1.44it/s, now=None]
t:  82%|           |
1033/1260 [18:35<02:46,  1.36it/s, now=None]
t:  82%|           |
1034/1260 [18:36<02:46,  1.36it/s, now=None]
t:  82%|           |
1035/1260 [18:37<02:53,  1.30it/s, now=None]
t:  82%|           |
1036/1260 [18:38<02:59,  1.25it/s, now=None]
t:  82%|           |
1037/1260 [18:39<03:04,  1.21it/s, now=None]
t:  82%|           |
1038/1260 [18:40<03:16,  1.13it/s, now=None]
t:  82%|           |
1039/1260 [18:41<03:25,  1.07it/s, now=None]
t:  83%|           |
1040/1260 [18:42<03:45,  1.02s/it, now=None]
t:  83%|           |
1041/1260 [18:43<03:50,  1.05s/it, now=None]
t:  83%|           |
1042/1260 [18:44<03:59,  1.10s/it, now=None]
t:  83%|           |
1043/1260 [18:45<04:01,  1.11s/it, now=None]
t:  83%|           |
1044/1260 [18:47<04:00,  1.11s/it, now=None]
t:  83%|           |
1045/1260 [18:48<03:55,  1.10s/it, now=None]
t:  83%|           |
1046/1260 [18:49<03:55,  1.10s/it, now=None]
```

```
t:  83%|           |
1047/1260 [18:50<03:52,  1.09s/it, now=None]
t:  83%|           |
1048/1260 [18:51<03:57,  1.12s/it, now=None]
t:  83%|           |
1049/1260 [18:52<03:54,  1.11s/it, now=None]
t:  83%|          |
1050/1260 [18:53<03:50,  1.10s/it, now=None]
t:  83%|          |
1051/1260 [18:54<03:44,  1.07s/it, now=None]
t:  83%|          |
1052/1260 [18:55<03:43,  1.08s/it, now=None]
t:  84%|          |
1053/1260 [18:56<03:40,  1.07s/it, now=None]
t:  84%|          |
1054/1260 [18:57<03:43,  1.09s/it, now=None]
t:  84%|          |
1055/1260 [18:59<03:46,  1.11s/it, now=None]
t:  84%|          |
1056/1260 [19:00<03:43,  1.09s/it, now=None]
t:  84%|          |
1057/1260 [19:01<03:45,  1.11s/it, now=None]
t:  84%|          |
1058/1260 [19:02<03:42,  1.10s/it, now=None]
t:  84%|          |
1059/1260 [19:03<03:44,  1.12s/it, now=None]
t:  84%|          |
1060/1260 [19:04<03:44,  1.12s/it, now=None]
t:  84%|          |
1061/1260 [19:06<03:57,  1.19s/it, now=None]
t:  84%|          |
1062/1260 [19:07<04:00,  1.21s/it, now=None]
t:  84%|          |
1063/1260 [19:08<03:55,  1.19s/it, now=None]
t:  84%|          |
1064/1260 [19:09<03:54,  1.20s/it, now=None]
t:  85%|          |
1065/1260 [19:10<03:44,  1.15s/it, now=None]
t:  85%|          |
1066/1260 [19:11<03:38,  1.13s/it, now=None]
t:  85%|          |
1067/1260 [19:12<03:33,  1.11s/it, now=None]
t:  85%|          |
1068/1260 [19:13<03:30,  1.10s/it, now=None]
t:  85%|         |
1069/1260 [19:14<03:27,  1.09s/it, now=None]
t:  85%|         |
1070/1260 [19:16<03:27,  1.09s/it, now=None]
```

```
t:  85%|         |
1071/1260 [19:17<03:30,  1.11s/it, now=None]
t:  85%|         |
1072/1260 [19:18<03:27,  1.11s/it, now=None]
t:  85%|         |
1073/1260 [19:19<03:27,  1.11s/it, now=None]
t:  85%|         |
1074/1260 [19:20<03:24,  1.10s/it, now=None]
t:  85%|         |
1075/1260 [19:21<03:20,  1.09s/it, now=None]
t:  85%|         |
1076/1260 [19:22<03:20,  1.09s/it, now=None]
t:  85%|         |
1077/1260 [19:23<03:19,  1.09s/it, now=None]
t:  86%|         |
1078/1260 [19:24<03:20,  1.10s/it, now=None]
t:  86%|         |
1079/1260 [19:25<03:17,  1.09s/it, now=None]
t:  86%|         |
1080/1260 [19:27<03:19,  1.11s/it, now=None]
t:  86%|         |
1081/1260 [19:28<03:15,  1.09s/it, now=None]
t:  86%|         |
1082/1260 [19:29<03:15,  1.10s/it, now=None]
t:  86%|         |
1083/1260 [19:30<03:14,  1.10s/it, now=None]
t:  86%|         |
1084/1260 [19:31<03:12,  1.09s/it, now=None]
t:  86%|         |
1085/1260 [19:32<03:12,  1.10s/it, now=None]
t:  86%|         |
1086/1260 [19:33<03:09,  1.09s/it, now=None]
t:  86%|         |
1087/1260 [19:34<03:05,  1.07s/it, now=None]
t:  86%|        |
1088/1260 [19:35<03:02,  1.06s/it, now=None]
t:  86%|        |
1089/1260 [19:36<03:02,  1.06s/it, now=None]
t:  87%|        |
1090/1260 [19:37<03:02,  1.07s/it, now=None]
t:  87%|        |
1091/1260 [19:38<03:03,  1.08s/it, now=None]
t:  87%|        |
1092/1260 [19:40<03:06,  1.11s/it, now=None]
t:  87%|        |
1093/1260 [19:41<03:07,  1.12s/it, now=None]
t:  87%|        |
1094/1260 [19:42<03:06,  1.12s/it, now=None]
```

```
t:  87%|        |
1095/1260 [19:43<03:05,  1.12s/it, now=None]
t:  87%|        |
1096/1260 [19:44<03:02,  1.12s/it, now=None]
t:  87%|        |
1097/1260 [19:45<03:00,  1.11s/it, now=None]
t:  87%|        |
1098/1260 [19:46<03:00,  1.11s/it, now=None]
t:  87%|        |
1099/1260 [19:47<02:58,  1.11s/it, now=None]
t:  87%|        |
1100/1260 [19:49<02:57,  1.11s/it, now=None]
t:  87%|        |
1101/1260 [19:50<02:54,  1.10s/it, now=None]
t:  87%|        |
1102/1260 [19:51<02:57,  1.12s/it, now=None]
t:  88%|        |
1103/1260 [19:52<02:58,  1.13s/it, now=None]
t:  88%|        |
1104/1260 [19:53<03:00,  1.16s/it, now=None]
t:  88%|        |
1105/1260 [19:54<03:00,  1.16s/it, now=None]
t:  88%|        |
1106/1260 [19:56<02:58,  1.16s/it, now=None]
t:  88%|        |
1107/1260 [19:57<03:02,  1.19s/it, now=None]
t:  88%|       |
1108/1260 [19:58<03:02,  1.20s/it, now=None]
t:  88%|       |
1109/1260 [19:59<02:59,  1.19s/it, now=None]
t:  88%|       |
1110/1260 [20:00<02:57,  1.18s/it, now=None]
t:  88%|       |
1111/1260 [20:02<02:56,  1.19s/it, now=None]
t:  88%|       |
1112/1260 [20:03<02:52,  1.17s/it, now=None]
t:  88%|       |
1113/1260 [20:04<02:49,  1.15s/it, now=None]
t:  88%|       |
1114/1260 [20:05<02:48,  1.15s/it, now=None]
t:  88%|       |
1115/1260 [20:06<02:49,  1.17s/it, now=None]
t:  89%|       |
1116/1260 [20:07<02:47,  1.17s/it, now=None]
t:  89%|       |
1117/1260 [20:08<02:45,  1.16s/it, now=None]
t:  89%|       |
1118/1260 [20:10<02:41,  1.14s/it, now=None]
```

```
t:  89%|       |
1119/1260 [20:11<02:37,  1.12s/it, now=None]
t:  89%|       |
1120/1260 [20:12<02:34,  1.11s/it, now=None]
t:  89%|       |
1121/1260 [20:13<02:33,  1.11s/it, now=None]
t:  89%|       |
1122/1260 [20:14<02:35,  1.13s/it, now=None]
t:  89%|       |
1123/1260 [20:15<02:33,  1.12s/it, now=None]
t:  89%|       |
1124/1260 [20:16<02:31,  1.12s/it, now=None]
t:  89%|       |
1125/1260 [20:17<02:32,  1.13s/it, now=None]
t:  89%|       |
1126/1260 [20:19<02:33,  1.15s/it, now=None]
t:  89%|      |
1127/1260 [20:20<02:34,  1.16s/it, now=None]
t:  90%|      |
1128/1260 [20:21<02:34,  1.17s/it, now=None]
t:  90%|      |
1129/1260 [20:22<02:35,  1.19s/it, now=None]
t:  90%|      |
1130/1260 [20:23<02:34,  1.19s/it, now=None]
t:  90%|      |
1131/1260 [20:24<02:31,  1.18s/it, now=None]
t:  90%|      |
1132/1260 [20:26<02:30,  1.18s/it, now=None]
t:  90%|      |
1133/1260 [20:27<02:27,  1.16s/it, now=None]
t:  90%|      |
1134/1260 [20:28<02:26,  1.16s/it, now=None]
t:  90%|      |
1135/1260 [20:29<02:27,  1.18s/it, now=None]
t:  90%|      |
1136/1260 [20:30<02:24,  1.17s/it, now=None]
t:  90%|      |
1137/1260 [20:31<02:22,  1.16s/it, now=None]
t:  90%|      |
1138/1260 [20:33<02:21,  1.16s/it, now=None]
t:  90%|      |
1139/1260 [20:34<02:18,  1.15s/it, now=None]
t:  90%|      |
1140/1260 [20:35<02:16,  1.14s/it, now=None]
t:  91%|      |
1141/1260 [20:36<02:14,  1.13s/it, now=None]
t:  91%|      |
1142/1260 [20:37<02:12,  1.12s/it, now=None]
```

```
t:  91%|      |
1143/1260 [20:38<02:11,  1.12s/it, now=None]
t:  91%|      |
1144/1260 [20:39<02:09,  1.12s/it, now=None]
t:  91%|      |
1145/1260 [20:40<02:08,  1.12s/it, now=None]
t:  91%|      |
1146/1260 [20:42<02:07,  1.12s/it, now=None]
t:  91%|     |
1147/1260 [20:43<02:07,  1.13s/it, now=None]
t:  91%|     |
1148/1260 [20:44<02:04,  1.12s/it, now=None]
t:  91%|     |
1149/1260 [20:45<02:04,  1.12s/it, now=None]
t:  91%|     |
1150/1260 [20:46<02:03,  1.13s/it, now=None]
t:  91%|     |
1151/1260 [20:47<02:02,  1.12s/it, now=None]
t:  91%|     |
1152/1260 [20:48<02:01,  1.12s/it, now=None]
t:  92%|     |
1153/1260 [20:49<02:00,  1.13s/it, now=None]
t:  92%|     |
1154/1260 [20:51<02:00,  1.14s/it, now=None]
t:  92%|     |
1155/1260 [20:52<02:00,  1.15s/it, now=None]
t:  92%|     |
1156/1260 [20:53<02:00,  1.15s/it, now=None]
t:  92%|     |
1157/1260 [20:54<01:57,  1.15s/it, now=None]
t:  92%|     |
1158/1260 [20:55<01:58,  1.16s/it, now=None]
t:  92%|     |
1159/1260 [20:56<01:59,  1.18s/it, now=None]
t:  92%|     |
1160/1260 [20:58<01:56,  1.17s/it, now=None]
t:  92%|     |
1161/1260 [20:59<01:54,  1.15s/it, now=None]
t:  92%|     |
1162/1260 [21:00<01:51,  1.14s/it, now=None]
t:  92%|     |
1163/1260 [21:01<01:48,  1.12s/it, now=None]
t:  92%|     |
1164/1260 [21:02<01:47,  1.12s/it, now=None]
t:  92%|     |
1165/1260 [21:03<01:45,  1.11s/it, now=None]
t:  93%|    |
1166/1260 [21:04<01:43,  1.10s/it, now=None]
```

```
t:  93%|    |
1167/1260 [21:05<01:41,  1.09s/it, now=None]
t:  93%|    |
1168/1260 [21:06<01:38,  1.07s/it, now=None]
t:  93%|    |
1169/1260 [21:07<01:36,  1.06s/it, now=None]
t:  93%|    |
1170/1260 [21:08<01:35,  1.06s/it, now=None]
t:  93%|    |
1171/1260 [21:09<01:33,  1.05s/it, now=None]
t:  93%|    |
1172/1260 [21:10<01:33,  1.06s/it, now=None]
t:  93%|    |
1173/1260 [21:12<01:32,  1.07s/it, now=None]
t:  93%|    |
1174/1260 [21:13<01:31,  1.06s/it, now=None]
t:  93%|    |
1175/1260 [21:14<01:29,  1.05s/it, now=None]
t:  93%|    |
1176/1260 [21:15<01:27,  1.05s/it, now=None]
t:  93%|    |
1177/1260 [21:16<01:27,  1.06s/it, now=None]
t:  93%|    |
1178/1260 [21:17<01:26,  1.05s/it, now=None]
t:  94%|    |
1179/1260 [21:18<01:24,  1.04s/it, now=None]
t:  94%|    |
1180/1260 [21:19<01:22,  1.04s/it, now=None]
t:  94%|    |
1181/1260 [21:20<01:21,  1.04s/it, now=None]
t:  94%|    |
1182/1260 [21:21<01:20,  1.03s/it, now=None]
t:  94%|    |
1183/1260 [21:22<01:20,  1.04s/it, now=None]
t:  94%|    |
1184/1260 [21:23<01:18,  1.04s/it, now=None]
t:  94%|   |
1185/1260 [21:24<01:18,  1.05s/it, now=None]
t:  94%|   |
1186/1260 [21:25<01:17,  1.05s/it, now=None]
t:  94%|   |
1187/1260 [21:26<01:16,  1.05s/it, now=None]
t:  94%|   |
1188/1260 [21:27<01:15,  1.04s/it, now=None]
t:  94%|   |
1189/1260 [21:28<01:13,  1.04s/it, now=None]
t:  94%|   |
1190/1260 [21:29<01:13,  1.05s/it, now=None]
```

```
t:  95%|   |
1191/1260 [21:30<01:12,  1.05s/it, now=None]
t:  95%|   |
1192/1260 [21:31<01:12,  1.07s/it, now=None]
t:  95%|   |
1193/1260 [21:33<01:12,  1.08s/it, now=None]
t:  95%|   |
1194/1260 [21:34<01:10,  1.07s/it, now=None]
t:  95%|   |
1195/1260 [21:35<01:09,  1.07s/it, now=None]
t:  95%|   |
1196/1260 [21:36<01:09,  1.08s/it, now=None]
t:  95%|   |
1197/1260 [21:37<01:08,  1.09s/it, now=None]
t:  95%|   |
1198/1260 [21:38<01:07,  1.08s/it, now=None]
t:  95%|   |
1199/1260 [21:39<01:04,  1.06s/it, now=None]
t:  95%|   |
1200/1260 [21:40<01:03,  1.05s/it, now=None]
t:  95%|   |
1201/1260 [21:41<01:02,  1.05s/it, now=None]
t:  95%|   |
1202/1260 [21:42<01:01,  1.06s/it, now=None]
t:  95%|   |
1203/1260 [21:43<01:00,  1.06s/it, now=None]
t:  96%|   |
1204/1260 [21:44<00:58,  1.05s/it, now=None]
t:  96%|  |
1205/1260 [21:45<00:57,  1.04s/it, now=None]
t:  96%|  |
1206/1260 [21:46<00:55,  1.04s/it, now=None]
t:  96%|  |
1207/1260 [21:47<00:55,  1.04s/it, now=None]
t:  96%|  |
1208/1260 [21:48<00:55,  1.06s/it, now=None]
t:  96%|  |
1209/1260 [21:49<00:54,  1.06s/it, now=None]
t:  96%|  |
1210/1260 [21:51<00:54,  1.09s/it, now=None]
t:  96%|  |
1211/1260 [21:52<00:53,  1.09s/it, now=None]
t:  96%|  |
1212/1260 [21:53<00:51,  1.08s/it, now=None]
t:  96%|  |
1213/1260 [21:54<00:50,  1.07s/it, now=None]
t:  96%|  |
1214/1260 [21:55<00:47,  1.04s/it, now=None]
```

```
t:  96%|  |
1215/1260 [21:56<00:45,  1.02s/it, now=None]
t:  97%|  |
1216/1260 [21:57<00:47,  1.07s/it, now=None]
t:  97%|  |
1217/1260 [21:58<00:45,  1.06s/it, now=None]
t:  97%|  |
1218/1260 [21:59<00:44,  1.05s/it, now=None]
t:  97%|  |
1219/1260 [22:00<00:42,  1.03s/it, now=None]
t:  97%|  |
1220/1260 [22:01<00:40,  1.02s/it, now=None]
t:  97%|  |
1221/1260 [22:02<00:39,  1.02s/it, now=None]
t:  97%|  |
1222/1260 [22:03<00:38,  1.01s/it, now=None]
t:  97%|  |
1223/1260 [22:04<00:37,  1.02s/it, now=None]
t:  97%| |
1224/1260 [22:05<00:36,  1.02s/it, now=None]
t:  97%| |
1225/1260 [22:06<00:35,  1.02s/it, now=None]
t:  97%| |
1226/1260 [22:07<00:34,  1.03s/it, now=None]
t:  97%| |
1227/1260 [22:08<00:33,  1.03s/it, now=None]
t:  97%| |
1228/1260 [22:09<00:32,  1.02s/it, now=None]
t:  98%| |
1229/1260 [22:10<00:31,  1.02s/it, now=None]
t:  98%| |
1230/1260 [22:11<00:30,  1.01s/it, now=None]
t:  98%| |
1231/1260 [22:12<00:29,  1.01s/it, now=None]
t:  98%| |
1232/1260 [22:13<00:28,  1.01s/it, now=None]
t:  98%| |
1233/1260 [22:14<00:27,  1.02s/it, now=None]
t:  98%| |
1234/1260 [22:15<00:26,  1.03s/it, now=None]
t:  98%| |
1235/1260 [22:16<00:25,  1.04s/it, now=None]
t:  98%| |
1236/1260 [22:17<00:25,  1.04s/it, now=None]
t:  98%| |
1237/1260 [22:18<00:24,  1.05s/it, now=None]
t:  98%| |
1238/1260 [22:19<00:22,  1.04s/it, now=None]
```

```
t:  98%| |
1239/1260 [22:21<00:22,  1.05s/it, now=None]
t:  98%| |
1240/1260 [22:22<00:21,  1.05s/it, now=None]
t:  98%| |
1241/1260 [22:23<00:20,  1.07s/it, now=None]
t:  99%| |
1242/1260 [22:24<00:19,  1.08s/it, now=None]
t:  99%| |
1243/1260 [22:25<00:18,  1.09s/it, now=None]
t:  99%||
1244/1260 [22:26<00:17,  1.11s/it, now=None]
t:  99%||
1245/1260 [22:27<00:16,  1.12s/it, now=None]
t:  99%||
1246/1260 [22:28<00:15,  1.13s/it, now=None]
t:  99%||
1247/1260 [22:30<00:14,  1.15s/it, now=None]
t:  99%||
1248/1260 [22:31<00:13,  1.16s/it, now=None]
t:  99%||
1249/1260 [22:32<00:12,  1.17s/it, now=None]
t:  99%||
1250/1260 [22:33<00:11,  1.16s/it, now=None]
t:  99%||
1251/1260 [22:34<00:10,  1.15s/it, now=None]
t:  99%||
1252/1260 [22:35<00:09,  1.15s/it, now=None]
t:  99%||
1253/1260 [22:37<00:08,  1.15s/it, now=None]
t: 100%||
1254/1260 [22:38<00:06,  1.14s/it, now=None]
t: 100%||
1255/1260 [22:39<00:05,  1.13s/it, now=None]
t: 100%||
1256/1260 [22:40<00:04,  1.14s/it, now=None]
t: 100%||
1257/1260 [22:41<00:03,  1.15s/it, now=None]
t: 100%||
1258/1260 [22:42<00:02,  1.17s/it, now=None]
t: 100%||
1259/1260 [22:44<00:01,  1.18s/it, now=None]
t: 100%||
1260/1260 [22:45<00:00,  1.17s/it, now=None]

Moviepy - Done !
```

```
Moviepy - video ready output_videos/project_video_out.mp4

t:   0%|                                                                      |

Wall time: 22min 47s
```

[78]:
```
HTML("""
<video width="960" height="540" controls>
  <source src="{0}">
</video>
""".format(output))
```

[78]:
```
<IPython.core.display.HTML object>
```