APPENDIX: Description of Dataset

<table>
<tr><td rowspan="5">General overview</td><td>Title</td><td>TV Viewer Engagement Image Dataset</td></tr>
<tr><td>Dates</td><td>October 2020- January 2021</td></tr>
<tr><td>Size</td><td>2220 image files, 521 MB</td></tr>
<tr><td rowspan="2">Method</td><td>Image search engines, namely Bing Images and Google Images played an important role in helping us find relevant images on a large scale for free of cost. Most of the images in this dataset belong to Stock Image Providers like dreamstime.com, istock.com, and shutterstock.com. More details can be found below:
<table>
<tr><th>Source</th><th>Number of Images</th><th>Format</th></tr>
<tr><td>DreamsTime</td><td>702</td><td>JPG</td></tr>
<tr><td>iStock</td><td>333</td><td>JPG</td></tr>
<tr><td>ShutterStock</td><td>310</td><td>JPG, PNG</td></tr>
<tr><td>DepositPhotos</td><td>123</td><td>JPEG</td></tr>
<tr><td>Youtube</td><td>156</td><td>JPEG</td></tr>
<tr><td>Miscellaneous Royalty Free Sources- interior decoration themes, etc.</td><td>596</td><td>JPEG, PNG</td></tr>
</table>
Various psychological studies were reviewed to extrapolate information on how humans behave when they are engaged versus when they are not. Summary of such information can be found in Table 1 and Table 2. Most of this information has been derived from textbooks on Behavioral Psychology, like Body Language[2], and The Dictionary of Body Language[3], and research papers based on our topic of interest, like ‘Measuring the engagement level of TV viewers’[5].</td></tr>
<tr><td>Access</td><td>Rights</td><td>We do not claim ownership of any of the images in this dataset. They have been obtained from images published on third party websites and by stock image providers through image search machines, free of cost.</td></tr>
</table>

Mood	Behavior

Bored	Using the phone/laptop, doodling, resting chin on hand, slumped posture, yawning, cheek strumming, knuckle cracking, playing with clothes, hair, etc.
Distracted	Fixating on other parts of room, scratching head, feet tapping/fidgeting, biting nails, staring into the distance
Frustration	Hand on back of neck, fiddling with pen, hands on hips, flared nostrils, hand on ears

Table 1: Disengaged behaviors.

Mood	Behavior
Interest	Eye contact with point of interest, open body pose, inclined forward, crossed finger
Delight	smile/smirks, laughter,clapping
Shock	Jaw drop, covering nose and mouth with two hands, jaw drop and mouth open
Sadness/Fear	Pursing lip,covering eyes with hand, tears

Table 2: Engaged behaviors.

Intermediate Data Code:

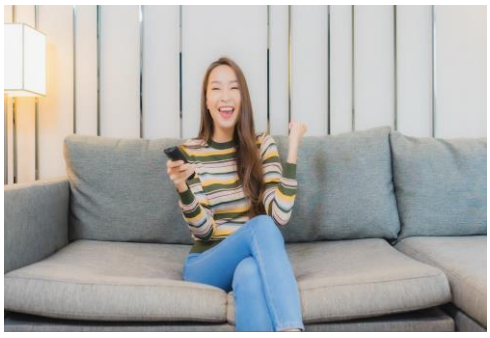
```
import os

from PIL import Image


# assign directory

directory = "C:\\Users\\avant\\OneDrive\\Desktop\\Images\\engaged"

# iterate over files in Image directory and convert different file formats to jpg, rename them and resize them

size= (1200,800)

i=1

for filename in os.listdir(directory):
```

```
    f = os.path.join(directory1, filename)
    # checking if it is a file
    if os.path.isfile(f):
        im = PIL.Image.open(f)
        rgb_im = im.convert("RGB")
        im.resize(size)
        #renaming files by order
        rgb_im.save(str(i)+".jpg")
        i=i+1


#The same thing is done for the not engaged class
directory = "C:\\Users\\avant\\OneDrive\\Desktop\\Images\\not engaged"
# iterate over files in Image directory and convert different file formats to jpg, rename them and resize them
size= (1200,800)
i=1
for filename in os.listdir(directory):
    f = os.path.join(directory1, filename)
    # checking if it is a file
    if os.path.isfile(f):
        im = PIL.Image.open(f)
        rgb_im = im.convert("RGB")
        im.resize(size)
        #renaming files by order
        rgb_im.save(str(i)+".jpg")
        i=i+1


#splitting data into training, validation and test data
splitfolders.ratio("C:\\Users\\avant\\OneDrive\\Desktop\\Images", output="data", seed=1337, ratio=(0.6, 0.2,0.2))
```

```
train_data_dir = "C:\\Users\\avant\\data\\train"
test_data_dir = "C:\\Users\\avant\\data\\test"
val_data_dir = "C:\\Users\\avant\\data\\val"

# Data Pre-processing
#Using a data generator to rescale, normalize and flip the images
train_datagen = ImageDataGenerator(rescale=1./255,
                                   horizontal_flip=True,
                                   vertical_flip=True,
                                   shear_range=0.2,
                                   zoom_range=0.2)
val_datagen = ImageDataGenerator(rescale = 1./255)
test_datagen = ImageDataGenerator(rescale = 1./255)
```

Use cases

Observations	Eye contact with POI, inclined forward, crossed fingers
Mood	Interested
Result	Engaged Viewer



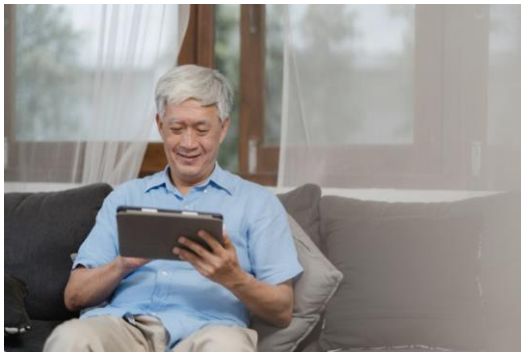
Observations	Eye contact with POI, smile, laughter, mouth open
Mood	Interested, Delight
Result	Engaged Viewer

Observations	Eye contact with POI, inclined forward, mouth open, jaw drop
Mood	Interested, Delight, Shock
Result	Engaged Viewer

Observations	Eye contact with POI, mouth open, jaw drop, tears
Mood	Interested, Delight, Shock, Fear
Result	Engaged Viewer

Observations	Nobody present
Mood	N/A
Result	Disengaged viewer

Observations	Fixating on other parts of room, book in hand
Mood	Distracted
Result	Disengaged viewer



Observations	Fixating on other parts of room, tablet in hand
Mood	Distracted, Bored
Result	Disengaged viewer

Observations	Slumped body posture, hands on forehead
Mood	Distracted, Bored, Frustrated
Result	Disengaged viewer