In [ ]:

```
import os
import pickle
import numpy as np
from tqdm.notebook import tqdm

from tensorflow.keras.applications.vgg19 import VGG19, preprocess_input
from tensorflow.keras.preprocessing.image import load_img, img_to_array
from tensorflow.keras.preprocessing.text import Tokenizer
from tensorflow.keras.preprocessing.sequence import pad_sequences
from tensorflow.keras.models import Model
from tensorflow.keras.utils import to_categorical, plot_model
from tensorflow.keras.layers import Input, Dense, LSTM, Embedding, Dropout, add
```

In [ ]:

```
from keras.models import load_model
```

In [ ]:

```
model=load_model("/content/drive/MyDrive/Aegis/NLP/VGG19 pickle files/best_model_vgg19.h5")
```

In [ ]:

```
model_temp = VGG19()
```

```
Downloading data from https://storage.googleapis.com/tensorflow/keras-applic
ations/vgg19/vgg19_weights_tf_dim_ordering_tf_kernels.h5 (https://storage.go
ogleapis.com/tensorflow/keras-applications/vgg19/vgg19_weights_tf_dim_orderi
ng_tf_kernels.h5)
574710816/574710816 [==============================] - 2s 0us/step
```

In [ ]:

```
model_vgg19 = Model(inputs=model_temp.inputs, outputs=model_temp.layers[-2].output)
```

In [ ]:

```
def preprocess_image(img):
    img = load_img(img, target_size=(224, 224)) #standard size that was used in training vg

    # convert image pixels to numpy array
    img = img_to_array(img)
    img=np.expand_dims(img,axis=0)
    #Preprocesses a tensor or Numpy array encoding a batch of images.
    img = preprocess_input(img)

    return img
```

In [ ]:

```
def encode_image(img):
  img=preprocess_image(img)
  feature_vector=model_vgg19.predict(img)
  feature_vector=feature_vector.reshape(1,feature_vector.shape[1])
  return feature_vector
```

In [ ]:

```
#Upload any image of your choice in the path below
img_path=("/content/drive/MyDrive/Aegis/NLP/NLP Project/Screenshot_447.png")
```

In [ ]:

```
max_length=34
```

In [ ]:

```
enc=encode_image(img_path)
```

```
1/1 [==============================] - 1s 820ms/step
```

In [ ]:

```
enc
```

Out[12]:

```
array([[0.        , 0.        , 1.4694233, ..., 0.        , 1.8930264,
        1.9929677]], dtype=float32)
```

In [ ]:

```
enc.shape
```

Out[13]:

```
(1, 4096)
```

In [ ]:

```
with open ("/content/drive/MyDrive/Aegis/NLP/VGG19 pickle files/word_2_idx_vgg19.pkl","rb")
  word_2_idx=pickle.load(w2i)
```

In [ ]:

```
with open ("/content/drive/MyDrive/Aegis/NLP/VGG19 pickle files/idx_2_word_vgg19.pkl","rb")
  idx_2_word=pickle.load(i2w)
```

In [ ]:

```
from PIL import Image #loading image
import matplotlib.pyplot as plt
```

In [ ]:

```
def predict_caption(photo):
    imgg= Image.open(img_path)
    plt.imshow(imgg)
    in_text = "startseq"
    max_len=34
    for i in range(max_len):
        sequence = [word_2_idx[w] for w in in_text.split() if w in word_2_idx]
        sequence = pad_sequences([sequence],maxlen=max_len,padding='post')
        #pad_sequences is used to ensure that all sequences in a list have the same length

        ypred = model.predict([photo,sequence])
        ypred = ypred.argmax() #WOrd with max prob always
        word = idx_2_word[ypred]
        in_text += (' ' + word)

        if word == "endseq":
            break


    final_caption = in_text.split()[1:-1]
    final_caption = ' '.join(final_caption)

    return final_caption
```

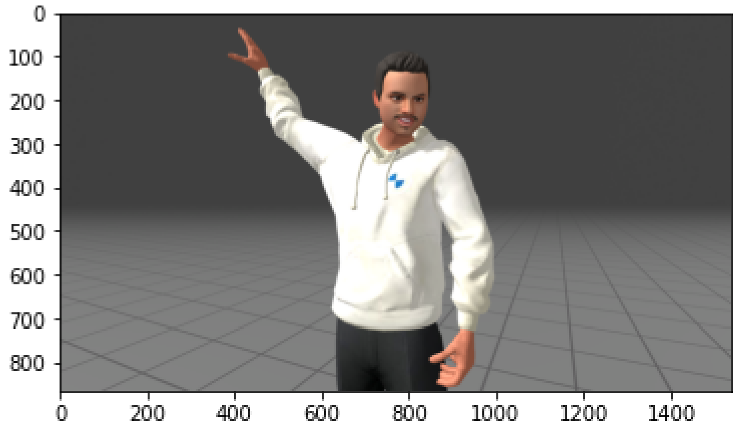
In [ ]:

```
predict_caption(enc)
```

```
1/1 [==============================] - 1s 986ms/step
1/1 [==============================] - 0s 19ms/step
1/1 [==============================] - 0s 18ms/step
1/1 [==============================] - 0s 21ms/step
1/1 [==============================] - 0s 20ms/step
1/1 [==============================] - 0s 19ms/step
1/1 [==============================] - 0s 23ms/step
1/1 [==============================] - 0s 19ms/step
1/1 [==============================] - 0s 24ms/step
1/1 [==============================] - 0s 18ms/step
1/1 [==============================] - 0s 22ms/step
1/1 [==============================] - 0s 19ms/step
1/1 [==============================] - 0s 20ms/step
1/1 [==============================] - 0s 19ms/step
1/1 [==============================] - 0s 20ms/step
1/1 [==============================] - 0s 19ms/step
```

Out[18]:

```
'man in black shirt and black shorts is standing on the edge of the street'
```



In [ ]:

```

```

In [ ]:

```

```

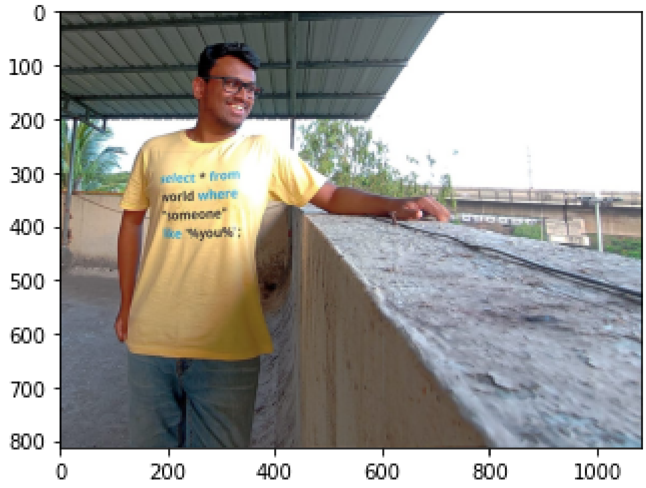
In [ ]:

```
#vgg19
predict_caption(enc)
```

```
1/1 [==============================] - 1s 1s/step
1/1 [==============================] - 0s 27ms/step
1/1 [==============================] - 0s 28ms/step
1/1 [==============================] - 0s 28ms/step
```

Out[21]:

```
'boy scales wall'
```



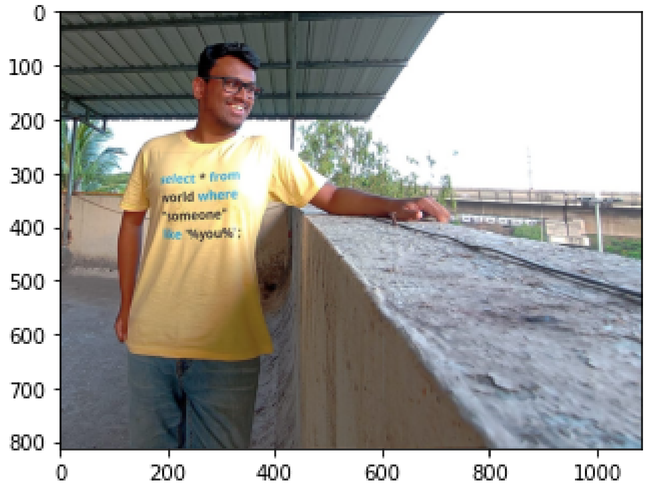
In [ ]:

```
#vgg16
predict_caption(enc)
```

```
1/1 [==============================] - 0s 33ms/step
1/1 [==============================] - 0s 39ms/step
1/1 [==============================] - 0s 33ms/step
1/1 [==============================] - 0s 30ms/step
1/1 [==============================] - 0s 34ms/step
1/1 [==============================] - 0s 31ms/step
1/1 [==============================] - 0s 31ms/step
1/1 [==============================] - 0s 30ms/step
1/1 [==============================] - 0s 27ms/step
1/1 [==============================] - 0s 29ms/step
1/1 [==============================] - 0s 34ms/step
1/1 [==============================] - 0s 34ms/step
1/1 [==============================] - 0s 33ms/step
```

Out[55]:

```
'man in blue shirt and green pants is walking on the street'
```



In [ ]:

Dataset link

[https://github.com/jbrownlee/Datasets/releases/tag/Flickr8k (https://github.com/jbrownlee/Datasets/releases/tag/Flickr8k)](https://github.com/jbrownlee/Datasets/releases/tag/Flickr8k)

[https://www.kaggle.com/datasets/adityajn105/flickr8k (https://www.kaggle.com/datasets/adityajn105/flickr8k)](https://www.kaggle.com/datasets/adityajn105/flickr8k)