IMAGE CAPTION GENERATOR BY YUVRAJ DALVI DF 2204

DEEP LEARNING PROJECT

Dataset link

https://github.com/jbrownlee/Datasets/releases/tag/Flickr8k

https://www.kaggle.com/datasets/adityajn105/flickr8k

```
#Importing all necessary libraries


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


#tqdm is a library in Python which is used for creating Progress Meters or Progress Bars
#tqdm in arabic means progress


from google.colab import drive
drive.mount('/content/drive')

     Mounted at /content/drive


#Using wget I downloaded the dataset over http from github as shown below
#unzipping the dataset
#rm is for removing the zipped files which are not required later on
#-q and -qq perform the operation silently without showing output


!wget -q https://github.com/jbrownlee/Datasets/releases/download/Flickr8k/Flickr8k_Dataset
!wget -q https://github.com/jbrownlee/Datasets/releases/download/Flickr8k/Flickr8k_text.zi
!unzip -qq Flickr8k_Dataset.zip
!unzip -qq Flickr8k_text.zip
!rm Flickr8k_Dataset.zip Flickr8k_text.zip


#Created a base directory
```

```
BASE_DIR = 'Flicker8k_Dataset'



#Before proceeding further create a folder in the above base directory called "Working DIR


#Created a working directory
WORKING_DIR = '/content/Working DIR 8k'



# load vgg19 model #earlier used vgg16 model
model = VGG19()
# restructure the model
model = Model(inputs=model.inputs, outputs=model.layers[-2].output)
#fetching features using all layers (except last one) and leaving last dense layers as we
# summarize
print(model.summary())
```

```
Downloading data from https://storage.googleapis.com/tensorflow/keras-application
574710816/574710816 [==============================] - 4s 0us/step
Model: "model_1"
_________________________________________________________________
 Layer (type)                 Output Shape              Param #
=================================================================
 input_2 (InputLayer)         [(None, 224, 224, 3)]     0

 block1_conv1 (Conv2D)        (None, 224, 224, 64)      1792

 block1_conv2 (Conv2D)        (None, 224, 224, 64)      36928

 block1_pool (MaxPooling2D)   (None, 112, 112, 64)      0

 block2_conv1 (Conv2D)        (None, 112, 112, 128)     73856

 block2_conv2 (Conv2D)        (None, 112, 112, 128)     147584

 block2_pool (MaxPooling2D)   (None, 56, 56, 128)       0

 block3_conv1 (Conv2D)        (None, 56, 56, 256)       295168

 block3_conv2 (Conv2D)        (None, 56, 56, 256)       590080

 block3_conv3 (Conv2D)        (None, 56, 56, 256)       590080

 block3_conv4 (Conv2D)        (None, 56, 56, 256)       590080

 block3_pool (MaxPooling2D)   (None, 28, 28, 256)       0

 block4_conv1 (Conv2D)        (None, 28, 28, 512)       1180160

 block4_conv2 (Conv2D)        (None, 28, 28, 512)       2359808

 block4_conv3 (Conv2D)        (None, 28, 28, 512)       2359808

 block4_conv4 (Conv2D)        (None, 28, 28, 512)       2359808
```

```
block4_pool (MaxPooling2D)  (None, 14, 14, 512)       0
block5_conv1 (Conv2D)       (None, 14, 14, 512)       2359808
block5_conv2 (Conv2D)       (None, 14, 14, 512)       2359808
block5_conv3 (Conv2D)       (None, 14, 14, 512)       2359808
block5_conv4 (Conv2D)       (None, 14, 14, 512)       2359808
block5_pool (MaxPooling2D)  (None, 7, 7, 512)         0
flatten (Flatten)           (None, 25088)             0
fc1 (Dense)                 (None, 4096)              102764544
fc2 (Dense)                 (None, 4096)              16781312
```

```
# extract features from image
features = {} #mapping images to features dictionary
directory = BASE_DIR

for img_name in tqdm(os.listdir(directory)): #going through all images
    # load the image from file
    img_path = directory + '/' + img_name
    image = load_img(img_path, target_size=(224, 224)) #standard size that was used in tra
    # convert image pixels to numpy array
    image = img_to_array(image)
    # reshape data for model
    image = image.reshape((1, image.shape[0], image.shape[1], image.shape[2]))

    #The network expects one or more images as input; that means the input array will neec
    #We only have one sample (one image). We can reshape the array by calling reshape() ar
    #reshapping data for CNN
    # preprocess image for vgg
    image = preprocess_input(image)
    # extract features
    feature = model.predict(image, verbose=0)
    #verbose is set to zero ie silent as I dont need status of progress for each image

    # get image ID #splitting on dot as we dont need the text after '.' ie: .jpg#n where r
    image_id = img_name.split('.')[0]

    # store feature
    features[image_id] = feature
```

```
100%                                                  8091/8091 [09:09<00:00, 13.97it/s]
```

```
# store features in pickle
pickle.dump(features, open(os.path.join(WORKING_DIR, 'featuresvgg19.pkl'), 'wb'))
```

```
# load features from pickle
```

```
with open(os.path.join(WORKING_DIR, 'featuresvgg19.pkl'), 'rb') as f:
    features = pickle.load(f)
```

LOAD CAPTION DATA

```
with open(os.path.join(BASE_DIR, '/content/drive/MyDrive/Aegis/NLP/NLP Project/captions.t>
    #next(f) #initial captions file had title "Image caption". So to remove it, next funct
    captions_doc = f.read() #read all captions
```

```
captions_doc
```

```
'1000268201_693b08cb0e.jpg,\tA child in a pink dress is climbing up a set of stairs
.\n1000268201_693b08cb0e.jpg,\tA girl going into a wooden building .\n1000268201_693
ttle girl climbing into a wooden playhouse .\n1000268201_693b08cb0e.jpg,\tA little g
tairs to her playhouse .\n1000268201_693b08cb0e.jpg,\tA little girl in a pink dress
n cabin .\n1001773457_577c3a7d70.jpg,\tA black dog and a spotted dog are fighting\n1
70.jpg,\tA black dog and a tri-colored dog playing with each other on the road .\n10
0.jpg,\tA black dog and a white dog with brown spots are staring at each other in th
3457_577c3a7d70.jpg,\tTwo dogs of different breeds looking at each other on the road
```

```
# create mapping of image to captions
mapping = {} #dictionary
# process lines
for line in tqdm(captions_doc.split('\n')):
    # split the line by comma(,)
    #token zero is image id and token one is captions
    tokens = line.split(',')

    if len(line) < 2: #incase very short lines like single letter then skip them. Optional
        continue
    image_id, caption = tokens[0], tokens[1:] #from one onwards because it will have multi

    # remove extension from image ID ie : .jpg
    image_id = image_id.split('.')[0]

    # convert caption list to string
    caption = " ".join(caption)

    # create list if needed
    if image_id not in mapping:
        mapping[image_id] = []
    # store the caption
    mapping[image_id].append(caption)
```

```
100%                                                40456/40456 [00:00<00:00, 407392.70it/s]
```

```
len(mapping)
#all 8k images
```

```
8091
```

Preprocess Text Data

```
def clean(mapping):
    for key, captions in mapping.items():
        for i in range(len(captions)):
            # take one caption at a time
            caption = captions[i]

            # preprocessing steps
            # convert to lowercase
            caption = caption.lower()

            # delete digits, special chars, etc.,
            caption = caption.replace('[^A-Za-z]', '')

            # delete additional spaces
            caption = caption.replace('\s+', ' ')

            # add start and end tags to the caption for better understanding and helping m
            #also to remove short words I added the for loop with if condition of length c
            caption = 'startseq ' + " ".join([word for word in caption.split() if len(word

            captions[i] = caption #again assigning caption to caption[i]
```

```
# Captions before preprocessing of text
mapping['1000268201_693b08cb0e']
```

```
['\tA child in a pink dress is climbing up a set of stairs in an entry way .',
 '\tA girl going into a wooden building .',
 '\tA little girl climbing into a wooden playhouse .',
 '\tA little girl climbing the stairs to her playhouse .',
 '\tA little girl in a pink dress going into a wooden cabin .']
```

```
# preprocessing the text using above function
clean(mapping)
# after preprocessing of text
mapping['1000268201_693b08cb0e']
```

```
['startseq child in pink dress is climbing up set of stairs in an entry way
endseq',
 'startseq girl going into wooden building endseq',
 'startseq little girl climbing into wooden playhouse endseq',
```

```
 'startseq little girl climbing the stairs to her playhouse endseq',
 'startseq little girl in pink dress going into wooden cabin endseq']
```

```
all_captions = [] #storing all captions in a single list
for key in mapping:
    for caption in mapping[key]:
        all_captions.append(caption) #entire list of captions
```

```
len(all_captions)
```

```
40455
```

```
all_captions[:10] #example of first 10 captions
```

```
['startseq child in pink dress is climbing up set of stairs in an entry way
endseq',
 'startseq girl going into wooden building endseq',
 'startseq little girl climbing into wooden playhouse endseq',
 'startseq little girl climbing the stairs to her playhouse endseq',
 'startseq little girl in pink dress going into wooden cabin endseq',
 'startseq black dog and spotted dog are fighting endseq',
 'startseq black dog and tri-colored dog playing with each other on the road
endseq',
 'startseq black dog and white dog with brown spots are staring at each other in
the street endseq',
 'startseq two dogs of different breeds looking at each other on the road endseq',
 'startseq two dogs on pavement moving toward each other endseq']
```

```
# tokenize the text
tokenizer = Tokenizer() #tokenizer from keras
tokenizer.fit_on_texts(all_captions)
vocab_size = len(tokenizer.word_index) + 1
```

```
word_2_idx = tokenizer.word_index
```

```
word_2_idx
```

```
idx_2_word = {v: k for k, v in word_2_idx.items()}
```

```
print(idx_2_word)
```

```
{1: 'startseq', 2: 'endseq', 3: 'in', 4: 'the', 5: 'on', 6: 'is', 7: 'and', 8: 'dog'
```

```
#pickle.dump(features, open(os.path.join(WORKING_DIR, 'features.pkl'), 'wb'))

with open(os.path.join(WORKING_DIR, 'word_2_idx_vgg19.pkl'), 'wb') as w2i:
    pickle.dump(word_2_idx, w2i)


with open(os.path.join(WORKING_DIR, 'idx_2_word_vgg19.pkl'), 'wb') as i2w:
    pickle.dump(idx_2_word, i2w)


word_2_idx["dog"]
```

```
8
```

```
idx_2_word[8]
```

```
'dog'
```

```
vocab_size
```

```
8485
```

```
# get maximum length of the caption available
max_length = max(len(caption.split()) for caption in all_captions)
max_length
```

```
34
```

Train Test Split

```
image_ids = list(mapping.keys())
split = int(len(image_ids) * 0.90) #90 percent training data
train = image_ids[:split]
test = image_ids[split:]


split #training data size
```

```
7281
```

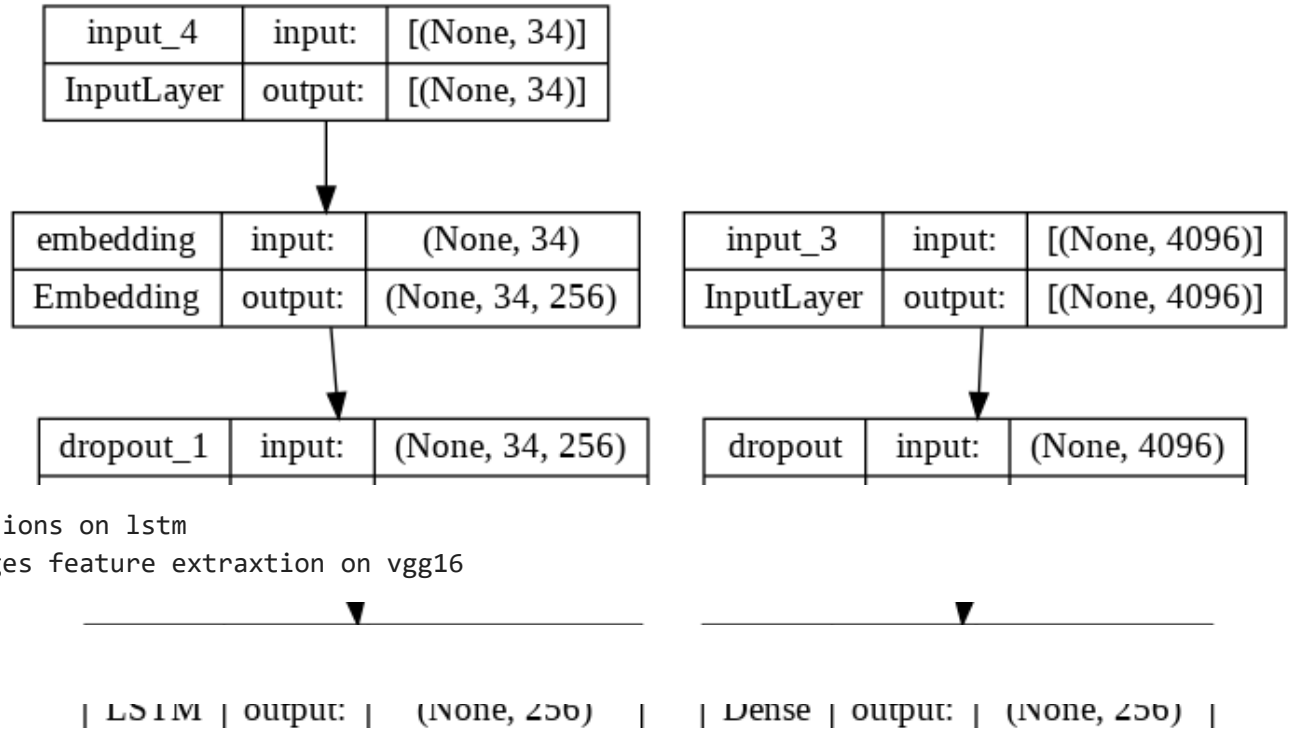
```
# startseq girl going into wooden building endseq
#        X                   y
```

```
# startseq                   girl
# startseq girl              going
# startseq girl going        into
# ...........
# startseq girl going into wooden building      endseq


# create data generator to get data in batch (avoids session crash)
def data_generator(data_keys, mapping, features, tokenizer, max_length, vocab_size, batch_
    # loop over images
    X1, X2, y = list(), list(), list()
    n = 0
    while 1: #infinite loop
        for key in data_keys:
            n += 1
            captions = mapping[key]
            # process each caption
            for caption in captions:
                # encode the sequence
                seq = tokenizer.texts_to_sequences([caption])[0] #list of sequence index
                # split the sequence into X, y pairs (EXAMPLE IN ABOVE CELL)
                for i in range(1, len(seq)):
                    # split into input and output pairs
                    in_seq, out_seq = seq[:i], seq[i] #in out sequence as shown above

                    # pad input sequence
                    #pad_sequences - used for equal distribution of words in sentences fil
                    in_seq = pad_sequences([in_seq], maxlen=max_length)[0]
                    # encode output sequence
                    out_seq = to_categorical([out_seq], num_classes=vocab_size)[0] # [0] t

                    # store the sequences
                    X1.append(features[key][0])
                    X2.append(in_seq)
                    y.append(out_seq)
            if n == batch_size:
                X1, X2, y = np.array(X1), np.array(X2), np.array(y)
                yield [X1, X2], y
                X1, X2, y = list(), list(), list() #reinititalising to prevent memory from
                n = 0
```

MODEL CREATION

```
# encoder model

# image feature layers
inputs1 = Input(shape=(4096,)) #taking input from output of fc 2 dense layer of vgg16
#shape=(4096,) - output length of the features from the VGG model

fe1 = Dropout(0.4)(inputs1) #40 percent dropout rate
```

```
fe2 = Dense(256, activation='relu')(fe1)
#Dropout() - used to add regularization to the data, avoiding over fitting & dropping out
#Dense - single dimension linear layer array

# sequence feature layers
inputs2 = Input(shape=(max_length,))
se1 = Embedding(vocab_size, 256, mask_zero=True)(inputs2) #mask zero as we are padding the
#256 is the size of the vector space in which words will be embedded.
#It defines the size of the output vectors from this layer for each word.
#For example, it could be 32 or 100 or even larger.

se2 = Dropout(0.4)(se1)
se3 = LSTM(256)(se2)

# decoder model
decoder1 = add([fe2, se3])
decoder2 = Dense(256, activation='relu')(decoder1)
outputs = Dense(vocab_size, activation='softmax')(decoder2) #predict output using entire v

model = Model(inputs=[inputs1, inputs2], outputs=outputs) #tie it together
model.compile(loss='categorical_crossentropy', optimizer='adam')
#model.compile() - compilation of the model
#loss=’sparse_categorical_crossentropy’ - loss function for category outputs
#optimizer=’adam’ - automatically adjust the learning rate for the model over the no. of e

# plot the model
plot_model(model, show_shapes=True)
#Model plot shows the concatenation of the inputs and outputs into a single layer
```




```
#captions on lstm
#images feature extraxtion on vgg16
```



```
# train the model
epochs = 20
batch_size = 32
steps = len(train) // batch_size

for i in range(epochs):
    # create data generator
    generator = data_generator(train, mapping, features, tokenizer, max_length, vocab_size
    # fit for one epoch
    model.fit(generator, epochs=1, steps_per_epoch=steps, verbose=1)
    #verbose is set to one ie give the status as I need status of progress for each image

     227/227 [==============================] - 59s 241ms/step - loss: 5.2155
     227/227 [==============================] - 54s 240ms/step - loss: 3.9948
     227/227 [==============================] - 54s 238ms/step - loss: 3.5650
     227/227 [==============================] - 54s 239ms/step - loss: 3.2981
     227/227 [==============================] - 54s 238ms/step - loss: 3.1041
     227/227 [==============================] - 55s 240ms/step - loss: 2.9596
     227/227 [==============================] - 54s 239ms/step - loss: 2.8486
     227/227 [==============================] - 54s 238ms/step - loss: 2.7534
     227/227 [==============================] - 55s 241ms/step - loss: 2.6704
     227/227 [==============================] - 54s 237ms/step - loss: 2.5968
     227/227 [==============================] - 54s 239ms/step - loss: 2.5342
     227/227 [==============================] - 55s 242ms/step - loss: 2.4796
     227/227 [==============================] - 54s 238ms/step - loss: 2.4331
     227/227 [==============================] - 55s 240ms/step - loss: 2.3850
     227/227 [==============================] - 55s 240ms/step - loss: 2.3452
     227/227 [==============================] - 55s 240ms/step - loss: 2.3050
     227/227 [==============================] - 54s 237ms/step - loss: 2.2668
     227/227 [==============================] - 54s 238ms/step - loss: 2.2337
     227/227 [==============================] - 54s 238ms/step - loss: 2.2053
     227/227 [==============================] - 55s 243ms/step - loss: 2.1708


#mapping['2258277193_586949ec62'] #It is a corrupted image file so it is giving an error
```

```
---------------------------------------------------------------------------
KeyError                                  Traceback (most recent call last)
<ipython-input-33-cf3c9c4bd31d> in <module>
----> 1 mapping['2258277193_586949ec62']

KeyError: '2258277193_586949ec62'
```

SEARCH STACK OVERFLOW

```
# save the model
model.save(WORKING_DIR+'/best_model_vgg19.h5')


# save the model
model.save_weights(WORKING_DIR+'/best_model_weights_vgg19.h5')
```

Generate captions for images

```
#helper function
def idx_to_word(integer, tokenizer): #model will give all output as indexes so converting

    for word, index in tokenizer.word_index.items():
        if index == integer:
            return word
    return None


tokenizer.word_index
```

```
{'startseq': 1,
 'endseq': 2,
 'in': 3,
 'the': 4,
 'on': 5,
 'is': 6,
 'and': 7,
 'dog': 8,
 'with': 9,
 'man': 10,
 'of': 11,
 'two': 12,
 'white': 13,
 'black': 14,
 'boy': 15,
 'are': 16,
 'woman': 17,
 'girl': 18,
 'to': 19,
 'wearing': 20,
 'at': 21,
 'people': 22,
 'water': 23,
 'red': 24,
 'young': 25,
```

```
    'brown': 26,
    'an': 27,
    'his': 28,
    'blue': 29,
    'dogs': 30,
    'running': 31,
    'through': 32,
    'playing': 33,
    'while': 34,
    'shirt': 35,
    'down': 36,
    'standing': 37,
    'ball': 38,
    'little': 39,
    'grass': 40,
    'snow': 41,
    'child': 42,
    'person': 43,
    'jumping': 44,
    'over': 45,
    'three': 46,
    'front': 47,
    'sitting': 48,
    'holding': 49,
    'up': 50,
    'field': 51,
    'small': 52,
    'by': 53,
    'large': 54,
    'green': 55,
    'one': 56,
    'group': 57,
    'yellow': 58,
```

```
# generate caption for an image
def predict_caption(model, image, tokenizer, max_length):
    # add start tag for generation process
    in_text = 'startseq'
    # iterate over the max length of sequence
    for i in range(max_length):
        # encode input sequence
        sequence = tokenizer.texts_to_sequences([in_text])[0]

        #pad the sequence
        #pad_sequences - used for equal distribution of words in sentences filling the rem
        sequence = pad_sequences([sequence], max_length)

        # predict next word
        yhat = model.predict([image, sequence], verbose=0)
        #verbose is set to zero ie silent as I dont need status of progress for each image

        # get index with high probability
        yhat = np.argmax(yhat)

        # convert index to word
        word = idx_to_word(yhat, tokenizer)
```

```
        # stop if word not found
        if word is None:
            break
        # append word as input for generating next word
        in_text += " " + word
        # stop if we reach end tag
        if word == 'endseq':
            break

    return in_text

from nltk.translate.bleu_score import corpus_bleu
# validate with test data
actual, predicted = list(), list()

for key in tqdm(test):
    # get actual caption
    captions = mapping[key]
    # predict the caption for image
    y_pred = predict_caption(model, features[key], tokenizer, max_length)
    # split into words
    actual_captions = [caption.split() for caption in captions]
    y_pred = y_pred.split()
    # append to the list
    actual.append(actual_captions)
    predicted.append(y_pred)

# calcuate BLEU score
print("BLEU-1: %f" % corpus_bleu(actual, predicted, weights=(1.0, 0, 0, 0)))
print("BLEU-2: %f" % corpus_bleu(actual, predicted, weights=(0.5, 0.5, 0, 0)))

#BLEU Score is used to evaluate the predicted text against a reference text, in a list of

#The reference text contains all the words appended from the captions data (actual_captior

#A BLEU Score more than 0.4 is considered a good result, for a better score increase the r
```

```
100%                                                    810/810 [06:18<00:00, 2.12it/s]
BLEU-1: 0.537295
BLEU-2: 0.306535
```

```
from PIL import Image #loading image
import matplotlib.pyplot as plt
def generate_caption(image_name):
    # load the image
    # image_name = "1001773457_577c3a7d70.jpg"
    image_id = image_name.split('.')[0]
    img_path = os.path.join(BASE_DIR, image_name)
    image = Image.open(img_path)
    captions = mapping[image_id]
    print('---------------------Actual---------------------')
    for caption in captions:
        print(caption)
```

```
    # predict the caption
    y_pred = predict_caption(model, features[image_id], tokenizer, max_length)
    print('--------------------Predicted--------------------')
    print(y_pred)
    plt.imshow(image)
```

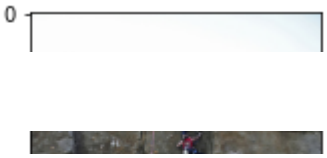
GENERATING OUTPUT AND COMPARING VGG19 AND VGG16 GENERATED CAPTIONS

```
#VGG19
generate_caption("1016887272_03199f49c4.jpg")
```

```
--------------------Actual--------------------
startseq collage of one person climbing cliff endseq
startseq group of people are rock climbing on rock climbing wall endseq
startseq group of people climbing rock while one man belays endseq
startseq seven climbers are ascending rock face whilst another man stands holding th
startseq several climbers in row are climbing the rock while the man in red watches
--------------------Predicted--------------------
startseq collage of people climbing up rock wall endseq
```


```
#VGG16
generate_caption("1016887272_03199f49c4.jpg")
```

```
----------------------Actual----------------------
startseq collage of one person climbing cliff endseq
startseq group of people are rock climbing on rock climbing wall endseq
startseq group of people climbing rock while one man belays endseq
startseq seven climbers are ascending rock face whilst another man stands holding th
startseq several climbers in row are climbing the rock while the man in red watches
---------------------Predicted---------------------
startseq collage of climbers on rock face endseq
```




```
#vgg19
generate_caption("1000268201_693b08cb0e.jpg")
```

```
----------------------Actual----------------------
startseq child in pink dress is climbing up set of stairs in an entry way endseq
startseq girl going into wooden building endseq
startseq little girl climbing into wooden playhouse endseq
startseq little girl climbing the stairs to her playhouse endseq
startseq little girl in pink dress going into wooden cabin endseq
---------------------Predicted---------------------
startseq two people are sitting on wooden bench endseq
```


```
#vgg16
generate_caption("1000268201_693b08cb0e.jpg")
```

```
----------------------Actual----------------------
startseq child in pink dress is climbing up set of stairs in an entry way endseq
startseq girl going into wooden building endseq
startseq little girl climbing into wooden playhouse endseq
startseq little girl climbing the stairs to her playhouse endseq
startseq little girl in pink dress going into wooden cabin endseq
--------------------Predicted--------------------
startseq woman is sitting on bench in front of wooden playhouse endseq
```

```
#vgg19
generate_caption("1002674143_1b742ab4b8.jpg")
```

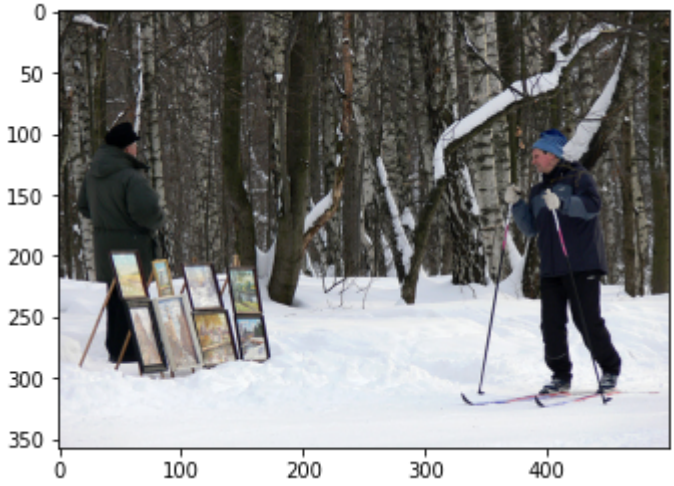
```
----------------------Actual----------------------
startseq little girl covered in paint sits in front of painted rainbow with her hand
startseq little girl is sitting in front of large painted rainbow endseq
startseq small girl in the grass plays with fingerpaints in front of white canvas wi
startseq there is girl with pigtails sitting in front of rainbow painting endseq
startseq young girl with pigtails painting outside in the grass endseq
--------------------Predicted--------------------
startseq little girl is being painting in the rainbow painted rainbow endseq
```


```
#vgg16
generate_caption("1002674143_1b742ab4b8.jpg")
```

```
----------------------Actual----------------------
startseq little girl covered in paint sits in front of painted rainbow with her hand
startseq little girl is sitting in front of large painted rainbow endseq
startseq small girl in the grass plays with fingerpaints in front of white canvas wi
startseq there is girl with pigtails sitting in front of rainbow painting endseq
```

```
#vgg19
generate_caption("101669240_b2d3e7f17b.jpg")
```

```
----------------------Actual----------------------
startseq man in hat is displaying pictures next to skier in blue hat endseq
startseq man skis past another man displaying paintings in the snow endseq
startseq person wearing skis looking at framed pictures set up in the snow endseq
startseq skier looks at framed pictures in the snow next to trees endseq
startseq man on skis looking at artwork for sale in the snow endseq
----------------------Predicted----------------------
startseq man displaying paintings in the snow endseq
```

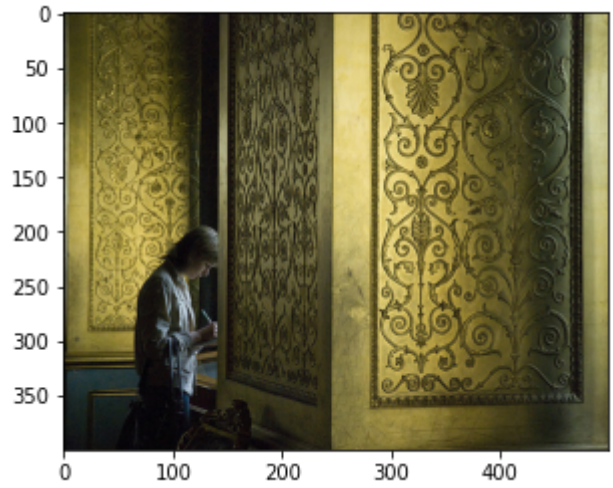



```
#vgg16
generate_caption("101669240_b2d3e7f17b.jpg")
```

```
----------------------Actual----------------------
startseq man in hat is displaying pictures next to skier in blue hat endseq
startseq man skis past another man displaying paintings in the snow endseq
```

```
#vgg19
generate_caption("997338199_7343367d7f.jpg")
```

```
----------------------Actual----------------------
startseq person stands near golden walls endseq
startseq woman behind scrolled wall is writing endseq
startseq woman standing near decorated wall writes endseq
startseq the walls are covered in gold and patterns endseq
startseq woman writing on pad in room with gold decorated walls endseq
--------------------Predicted--------------------
startseq three people are sitting on wooden floor endseq
```

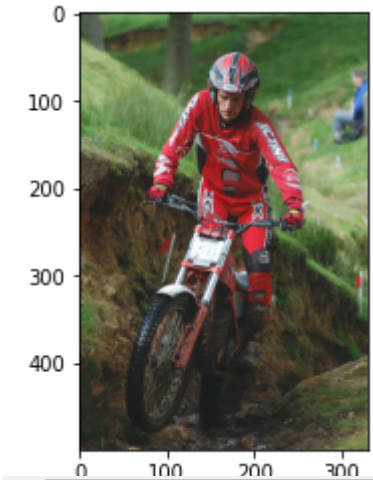



```
#vgg16
generate_caption("997338199_7343367d7f.jpg")
```

```
----------------------Actual----------------------
startseq woman standing near decorated wall writes endseq
```

```
#vgg19
generate_caption("1252396628_eb81d3905b.jpg")
```

```
----------------------Actual----------------------
startseq man in red biker suit on red dirt bike going down muddy road endseq
startseq man in red outfit is riding red motorbike uphill on motocross circuit endse
startseq man in red riding gear riding dirt bike down path endseq
startseq man riding dirt bike up muddy hill endseq
startseq motorcycle racer in red jumpsuit and helmet rides up dirt hill endseq
---------------------Predicted---------------------
startseq man in red uniform riding red motorcycle endseq
```

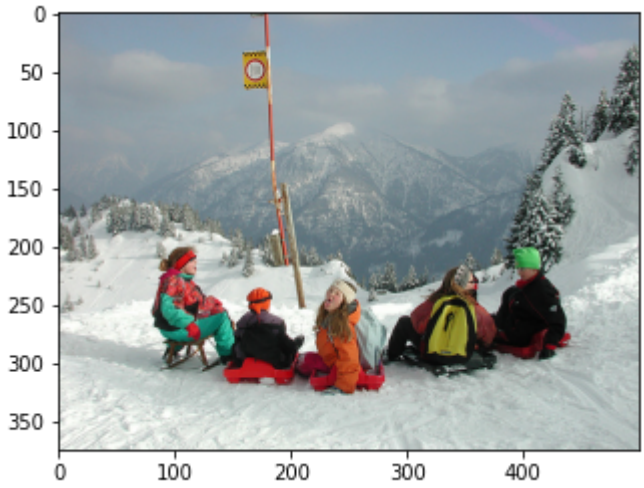



```
#vgg16
generate_caption("1252396628_eb81d3905b.jpg")
```

```
----------------------Actual----------------------
startseq man in red biker suit on red dirt bike going down muddy road endseq
startseq man in red outfit is riding red motorbike uphill on motocross circuit endse
startseq man in red riding gear riding dirt bike down path endseq
startseq man riding dirt bike up muddy hill endseq
startseq motorcycle racer in red jumpsuit and helmet rides up dirt hill endseq
---------------------Predicted---------------------
startseq man in red and red uniform riding bike endseq
```

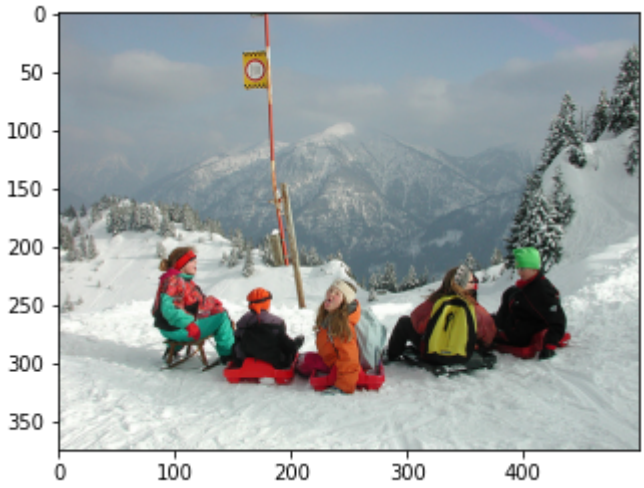
```
#vgg19
generate_caption("99171998_7cc800ceef.jpg")
```

```
----------------------Actual----------------------
startseq group is sitting around snowy crevasse endseq
startseq group of people sit atop snowy mountain endseq
startseq group of people sit in the snow overlooking mountain scene endseq
startseq five children getting ready to sled endseq
startseq five people are sitting together in the snow endseq
--------------------Predicted--------------------
startseq two people are sledding on snow covered mountain endseq
```




```
#vgg16
generate_caption("99171998_7cc800ceef.jpg")
```

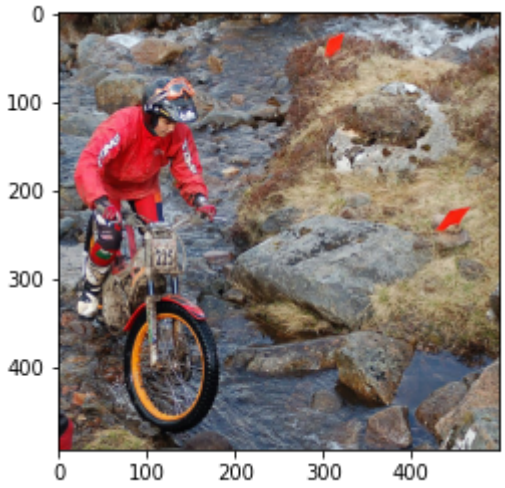
```
----------------------Actual----------------------
startseq group is sitting around snowy crevasse endseq
startseq group of people sit atop snowy mountain endseq
startseq group of people sit in the snow overlooking mountain scene endseq
startseq five children getting ready to sled endseq
startseq five people are sitting together in the snow endseq
--------------------Predicted--------------------
startseq two men ride sled on snowmobile endseq
```




```
#If we add our own image in the 8k dataset with caption then we can presict the caption fo
```

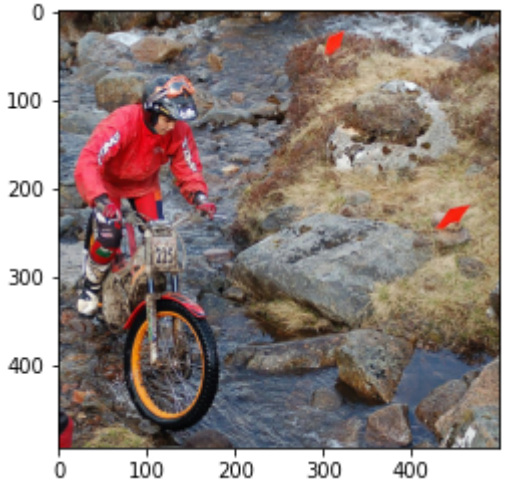
```
#vgg19
generate_caption("143552829_72b6ba49d4.jpg")
```

```
----------------------Actual----------------------
startseq boy in black helmet and red long sleeve shirt rides his motorbike over rock
startseq man on motorcycle steers through swampy terrain endseq
startseq man rides his bike over rocks and creek endseq
startseq motocross bike is being ridden between markers in running stream endseq
startseq person is dirt biking over rocks and water endseq
----------------------Predicted----------------------
startseq man in red and red uniform riding on rocky road endseq
```



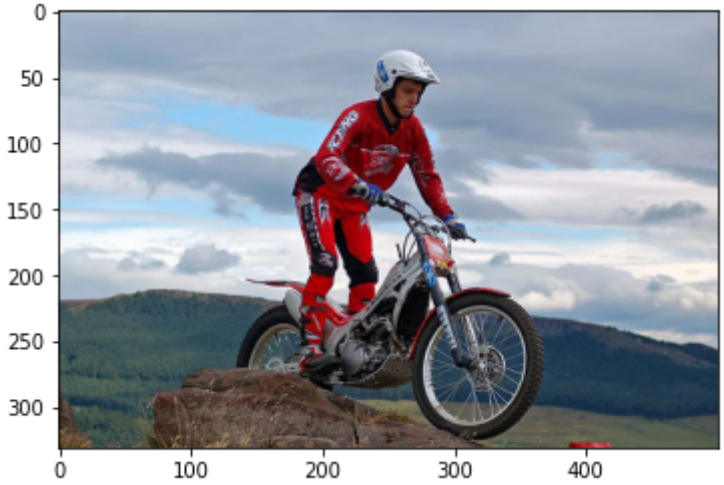

```
#vgg16
generate_caption("143552829_72b6ba49d4.jpg")
```

```
----------------------Actual----------------------
startseq boy in black helmet and red long sleeve shirt rides his motorbike over rock
startseq man on motorcycle steers through swampy terrain endseq
startseq man rides his bike over rocks and creek endseq
startseq motocross bike is being ridden between markers in running stream endseq
startseq person is dirt biking over rocks and water endseq
----------------------Predicted----------------------
startseq man in red shirt and black headband is riding bike through stream endseq
```



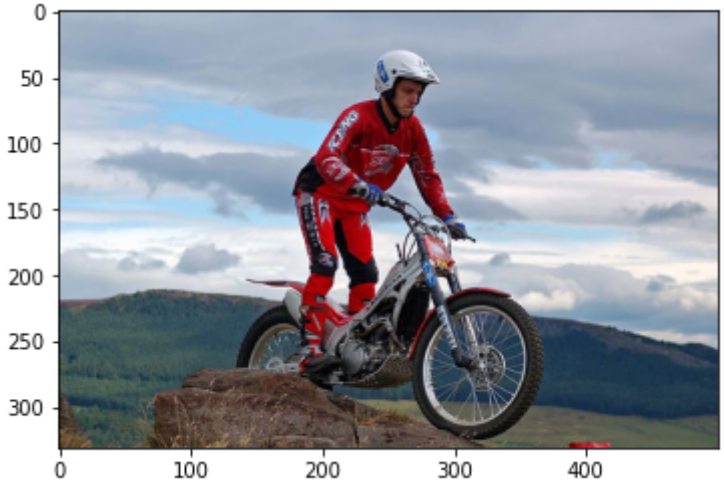
```
#vgg19
generate_caption("216172386_9ac5356dae.jpg")
```

```
----------------------Actual----------------------
startseq bike sits atop rise with mountains in the background endseq
startseq man wearing red uniform and helmet stands on his motorbike endseq
startseq motocross bike is being ridden over rocks endseq
startseq motocross biker about to descend endseq
startseq the motorcyclist has reached the summit endseq
--------------------Predicted--------------------
startseq man in red uniform riding on motorcycle endseq
```



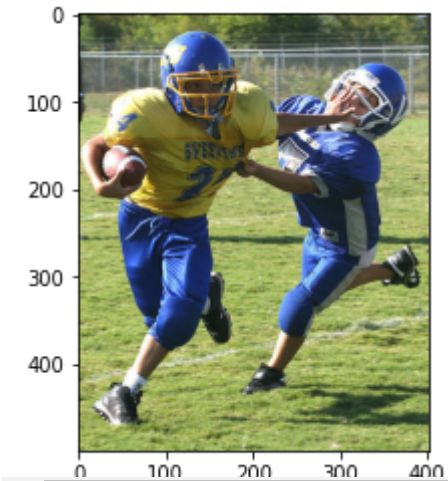

```
#vgg16
generate_caption("216172386_9ac5356dae.jpg")
```

```
----------------------Actual----------------------
startseq bike sits atop rise with mountains in the background endseq
startseq man wearing red uniform and helmet stands on his motorbike endseq
startseq motocross bike is being ridden over rocks endseq
startseq motocross biker about to descend endseq
startseq the motorcyclist has reached the summit endseq
--------------------Predicted--------------------
startseq man in red and black biking gear rides his bike endseq
```



```
#vgg19
generate_caption("2526041608_a9775ab8d7.jpg")
```

```
----------------------Actual----------------------
startseq boy in yellow uniform carrying football is blocking another boy in blue uni
startseq football player in yellow jersey is pushing away another player endseq
startseq the young football player is trying to avoid being tackled endseq
startseq two boys playing football on opposing teams endseq
startseq two young football players wearing blue and yellow uniforms fight for the b
--------------------Predicted--------------------
startseq two men playing football collide endseq
```




```
#vgg16
generate_caption("2526041608_a9775ab8d7.jpg")
```

```
----------------------Actual----------------------
startseq boy in yellow uniform carrying football is blocking another boy in blue uni
startseq football player in yellow jersey is pushing away another player endseq
startseq the young football player is trying to avoid being tackled endseq
startseq two boys playing football on opposing teams endseq
startseq two young football players wearing blue and yellow uniforms fight for the b
--------------------Predicted--------------------
startseq two men in blue and white uniforms are playing in field endseq
```


```
#vgg16
generate_caption("2526041608_a9775ab8d7.jpg")
```

```
---------------------Actual---------------------
startseq boy in yellow uniform carrying football is blocking another boy in blue uni
startseq football player in yellow jersey is pushing away another player endseq
startseq the young football player is trying to avoid being tackled endseq
startseq two boys playing football on opposing teams endseq
startseq two young football players wearing blue and yellow uniforms fight for the b
--------------------Predicted--------------------
startseq two men in blue and white uniforms are playing in field endseq
```

Dataset link

https://github.com/jbrownlee/Datasets/releases/tag/Flickr8k

https://www.kaggle.com/datasets/adityajn105/flickr8k