GARAGE

BATCH-24

Environment Preparation

Steps :

Install the wsl using the command wsl --install in commond prompt/ power shell after installing change the version from 1 to version 2 Then install the docker window and signup the docker window before that restart the computer Now install the the gitbash for windows And type the command cvat inorder to open the cvat. the commands are as follows git clone https://github.com/opencv/cvat cd cvat docker-compose up -d winpty docker exec -it cvat_server bash -ic 'python3 ~/manage.py createsuperuser' enter the username and password Make sure the docker window is ruuning parallel. now we can find that cvat is ruuning and is shiwn in docker window. Installation is done .

Data Acquisition

Here the google API is used for Data Acquisition. We generate a key for the data acquistion and start the Acquistion . There are 10 Categories. For each category , we aquire 100 images 12/8/22, 3:19 AM Untitled24 file:///C:/Users/Admin/Downloads/documentation (2).html 2/6 https://colab.research.google.com/drive/1dj_ss4Gk6k9nGV948NC9VP_DKI8Ra8JO#scrollTo=iYLc7IB4

Annotation

Here we take the images and covert them into a dataset having Training and testing data. We Peform Object Segmentation using Deep Extreme Cut (DEXTR). First we create a project in cvat and add the labels to it.

1. The label are named as Wrenches, Screwdrives,shleves, wallpanels,pliers,storage cabinets,workbenches,totes,hammer.
2. then we create a task.
3. Now upload a zip file having a 1000 images
4. Now fit the image in the rectangle and assign the image under correct label

5. Repeat the process for all the 1000 images.
6. make sure each label has a 100 images under it.
7. Now create an coount in roboflow
8. Now convert the fitted images into a MScoco file.
9. Download the zip file.
10. The Zip file is the Dataset
11. It contains test,train,valid and readme file and annotation for the images
12. link for roboflow https://universe.roboflow.com/njit-mhr5p/garage-co4hb 13.link to access the dataset: https://github.com/lc2714/milestone3-

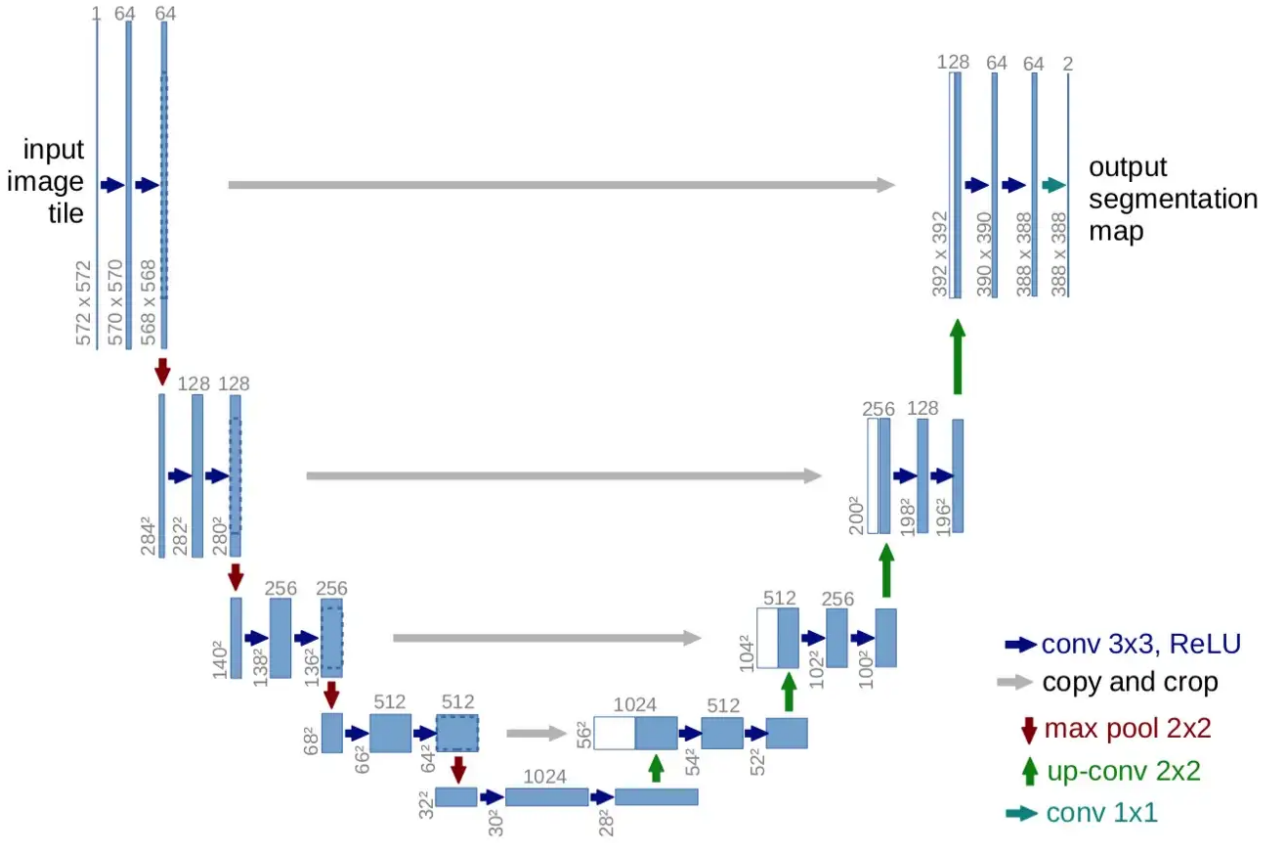
IMPLEMENTATION

Segmentation Here inorder to perform segmentation , we use UNet on garage dataset.

UNet:

UNet, evolved from the traditional convolutional neural network, was first designed and applied in 2015 to process biomedical images. As a general convolutional neural network focuses its task on image classification, where input is an image and output is one label, but in biomedical cases, it requires us not only to distinguish whether there is a disease, but also to localise the area of abnormality.

UNet is dedicated to solving this problem. The reason it is able to localise and distinguish borders is by doing classification on every pixel, so the input and output share the same size




```
# Importing Data From COCO

from pycocotools import coco, cocoeval, _mask
from pycocotools import mask as maskUtils
import array
import numpy as np
import skimage.io as io
import matplotlib.pyplot as plt
import pylab
import os
pylab.rcParams['figure.figsize'] = (8.0, 10.0)
%matplotlib inline
import os
import sys
import random

import numpy as np
import cv2
import tensorflow as tf
from tensorflow.keras.layers import *
from tensorflow.keras.models import *
from tensorflow.keras.optimizers import *


seed = 2019

random.seed = seed
np.random.seed = seed
```

```
class DataGen(tf.keras.utils.Sequence):

  def __init__(self , path_input , path_mask , batch_size = 8 , image_size = 128):

    self.ids = os.listdir(path_input)
    self.path_input = path_input
    self.path_mask = path_mask
    self.batch_size = batch_size
    self.image_size = image_size
    self.on_epoch_end()

  def __load__(self , id_name):

    image_path = os.path.join(self.path_input , id_name)
    mask_path = os.path.join(self.path_mask , id_name)

    image = cv2.imread(image_path , 1) # 1 specifies RGB format
    image = cv2.resize(image , (self.image_size , self.image_size)) # resizing before inse

    mask = cv2.imread(mask_path , -1)
    mask = cv2.resize(mask , (self.image_size , self.image_size))
    mask = mask.reshape((self.image_size , self.image_size , 1))

    #normalize image
    image = image / 255.0
    mask = mask / 255.0

    return image , mask

  def __getitem__(self , index):

    if (index + 1)*self.batch_size > len(self.ids):
      self.batch_size = len(self.ids) - index * self.batch_size

    file_batch = self.ids[index * self.batch_size : (index + 1) * self.batch_size]

    images = []
    masks = []

    for id_name in file_batch :

      _img , _mask = self.__load__(id_name)
      images.append(_img)
      masks.append(_mask)


    images = np.array(images)
    masks = np.array(masks)


    return images , masks


  def on_epoch_end(self):
```

```
        pass


      def __len__(self):

        return int(np.ceil(len(self.ids) / float(self.batch_size)))

    def down_block(
        input_tensor,
        no_filters,
        kernel_size=(3, 3),
        strides=(1, 1),
        padding="same",
        kernel_initializer="he_normal",
        max_pool_window=(2, 2),
        max_pool_stride=(2, 2)
    ):
        conv = Conv2D(
            filters=no_filters,
            kernel_size=kernel_size,
            strides=strides,
            activation=None,
            padding=padding,
            kernel_initializer=kernel_initializer
        )(input_tensor)

        conv = BatchNormalization(scale=True)(conv)

        conv = Activation("relu")(conv)

        conv = Conv2D(
            filters=no_filters,
            kernel_size=kernel_size,
            strides=strides,
            activation=None,
            padding=padding,
            kernel_initializer=kernel_initializer
        )(conv)

        conv = BatchNormalization(scale=True)(conv)

        # conv for skip connection
        conv = Activation("relu")(conv)

        pool = MaxPooling2D(pool_size=max_pool_window, strides=max_pool_stride)(conv)

        return conv, pool


    def bottle_neck(
        input_tensor,
        no_filters,
        kernel_size=(3, 3),
        strides=(1, 1),
        padding="same",
```

```
        kernel_initializer="he_normal"
    ):
        conv = Conv2D(
            filters=no_filters,
            kernel_size=kernel_size,
            strides=strides,
            activation=None,
            padding=padding,
            kernel_initializer=kernel_initializer
        )(input_tensor)

        conv = BatchNormalization(scale=True)(conv)

        conv = Activation("relu")(conv)

        conv = Conv2D(
            filters=no_filters,
            kernel_size=kernel_size,
            strides=strides,
            activation=None,
            padding=padding,
            kernel_initializer=kernel_initializer
        )(conv)

        conv = BatchNormalization(scale=True)(conv)

        conv = Activation("relu")(conv)

        return conv

    def output_block(input_tensor,
        padding="same",
        kernel_initializer="he_normal"
    ):

        conv = Conv2D(
            filters=2,
            kernel_size=(3,3),
            strides=(1,1),
            activation="relu",
            padding=padding,
            kernel_initializer=kernel_initializer
        )(input_tensor)


        conv = Conv2D(
            filters=1,
            kernel_size=(1,1),
            strides=(1,1),
            activation="sigmoid",
            padding=padding,
            kernel_initializer=kernel_initializer
        )(conv)
```

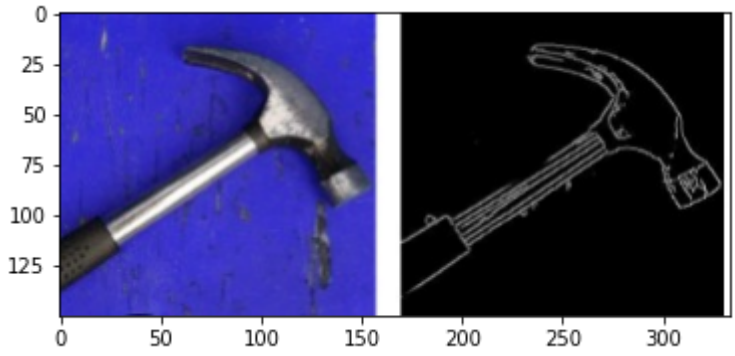
```
    return conv
def UNet(input_shape = (128,128,3)):

    filter_size = [64,128,256,512,1024]

    inputs = Input(shape = input_shape)

    d1 , p1 = down_block(input_tensor= inputs,
                         no_filters=filter_size[0],
                         kernel_size = (3,3),
                         strides=(1,1),
                         padding="same",
                         kernel_initializer="he_normal",
                         max_pool_window=(2,2),
                         max_pool_stride=(2,2))


    d2 , p2 = down_block(input_tensor= p1,
                         no_filters=filter_size[1],
                         kernel_size = (3,3),
                         strides=(1,1),
                         padding="same",
                         kernel_initializer="he_normal",
                         max_pool_window=(2,2),
                         max_pool_stride=(2,2))



    d3 , p3 = down_block(input_tensor= p2,
                         no_filters=filter_size[2],
                         kernel_size = (3,3),
                         strides=(1,1),
                         padding="same",
                         kernel_initializer="he_normal",
                         max_pool_window=(2,2),
                         max_pool_stride=(2,2))



    d4 , p4 = down_block(input_tensor= p3,
                         no_filters=filter_size[3],
                         kernel_size = (3,3),
                         strides=(1,1),
                         padding="same",
                         kernel_initializer="he_normal",
                         max_pool_window=(2,2),
                         max_pool_stride=(2,2))


    b = bottle_neck(input_tensor= p4,
                         no_filters=filter_size[4],
                         kernel_size = (3,3),
                         strides=(1,1),
```

```
                        padding="same",
                        kernel_initializer="he_normal")



    u4 = up_block(input_tensor = b,
                  no_filters = filter_size[3],
                  skip_connection = d4,
                  kernel_size=(3, 3),
                  strides=(1, 1),
                  upsampling_factor = (2,2),
                  max_pool_window = (2,2),
                  padding="same",
                  kernel_initializer="he_normal")

    u3 = up_block(input_tensor = u4,
                  no_filters = filter_size[2],
                  skip_connection = d3,
                  kernel_size=(3, 3),
                  strides=(1, 1),
                  upsampling_factor = (2,2),
                  max_pool_window = (2,2),
                  padding="same",
                  kernel_initializer="he_normal")


    u2 = up_block(input_tensor = u3,
                  no_filters = filter_size[1],
                  skip_connection = d2,
                  kernel_size=(3, 3),
                  strides=(1, 1),
                  upsampling_factor = (2,2),
                  max_pool_window = (2,2),
                  padding="same",
                  kernel_initializer="he_normal")


    u1 = up_block(input_tensor = u2,
                  no_filters = filter_size[0],
                  skip_connection = d1,
                  kernel_size=(3, 3),
                  strides=(1, 1),
                  upsampling_factor = (2,2),
                  max_pool_window = (2,2),
                  padding="same",
                  kernel_initializer="he_normal")



    output = output_block(input_tensor=u1 ,
                        padding = "same",
                        kernel_initializer= "he_normal")

    model = Model(inputs = inputs , outputs = output)
```

```
    return model

model = UNet(input_shape = (128,128,3))
model.compile(optimizer = Adam(lr = 1e-4), loss = 'binary_crossentropy', metrics = ['accur


image_size = 128
epochs = 10
batch_size = 8

train_gen = DataGen(path_input = "/content/train2014" , path_mask = "/content/mask_train_2
val_gen = DataGen(path_input =  "/content/val2014", path_mask =  "/content/mask_val_2014",


train_steps =  len(os.listdir( "/content/train2014"))/batch_size

x, y = val_gen.__getitem__(4)
result = model.predict(x)

result = result > 0.5



fig = plt.figure()
fig.subplots_adjust(hspace=0.4, wspace=0.4)

ax = fig.add_subplot(1, 2, 1)
ax.imshow(np.reshape(y[0]*255, (image_size, image_size)), cmap="gray")

ax = fig.add_subplot(1, 2, 2)
ax.imshow(np.reshape(result[0]*255, (image_size, image_size)), cmap="gray")
```

RESULT

Input Image and Output Image



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