Mask_RCNN official library - https://github.com/matterport/Mask_RCNN

Coco Dataset - https://cocodataset.org/

Import Libraries

In [1]:
```
import sys
import random
import math
import os
import numpy as np
import skimage.io
import matplotlib
import matplotlib.pyplot as plt

from mrcnn.config import Config
from mrcnn import utils
import mrcnn.model as modellib
from mrcnn import visualize

# Root directory of the project
ROOT_DIR = os.path.abspath("../")
sys.path.append(os.path.join(ROOT_DIR, "Mask_RCNN/samples/coco/"))  # T
o find local version
import coco
from pycocotools.coco import COCO
```

```
/home/farhat/anaconda3/envs/mask/lib/python3.6/site-packages/tensorflo
w/python/framework/dtypes.py:516: FutureWarning: Passing (type, 1) or
'1type' as a synonym of type is deprecated; in a future version of nump
y, it will be understood as (type, (1,)) / '(1,)type'.
```

```
  _np_qint8 = np.dtype([("qint8", np.int8, 1)])
/home/farhat/anaconda3/envs/mask/lib/python3.6/site-packages/tensorflo
w/python/framework/dtypes.py:517: FutureWarning: Passing (type, 1) or
'1type' as a synonym of type is deprecated; in a future version of nump
y, it will be understood as (type, (1,)) / '(1,)type'.
  _np_quint8 = np.dtype([("quint8", np.uint8, 1)])
/home/farhat/anaconda3/envs/mask/lib/python3.6/site-packages/tensorflo
w/python/framework/dtypes.py:518: FutureWarning: Passing (type, 1) or
'1type' as a synonym of type is deprecated; in a future version of nump
y, it will be understood as (type, (1,)) / '(1,)type'.
  _np_qint16 = np.dtype([("qint16", np.int16, 1)])
/home/farhat/anaconda3/envs/mask/lib/python3.6/site-packages/tensorflo
w/python/framework/dtypes.py:519: FutureWarning: Passing (type, 1) or
'1type' as a synonym of type is deprecated; in a future version of nump
y, it will be understood as (type, (1,)) / '(1,)type'.
  _np_quint16 = np.dtype([("quint16", np.uint16, 1)])
/home/farhat/anaconda3/envs/mask/lib/python3.6/site-packages/tensorflo
w/python/framework/dtypes.py:520: FutureWarning: Passing (type, 1) or
'1type' as a synonym of type is deprecated; in a future version of nump
y, it will be understood as (type, (1,)) / '(1,)type'.
  _np_qint32 = np.dtype([("qint32", np.int32, 1)])
/home/farhat/anaconda3/envs/mask/lib/python3.6/site-packages/tensorflo
w/python/framework/dtypes.py:525: FutureWarning: Passing (type, 1) or
'1type' as a synonym of type is deprecated; in a future version of nump
y, it will be understood as (type, (1,)) / '(1,)type'.
  np_resource = np.dtype([("resource", np.ubyte, 1)])
/home/farhat/anaconda3/envs/mask/lib/python3.6/site-packages/tensorboar
d/compat/tensorflow_stub/dtypes.py:541: FutureWarning: Passing (type,
1) or '1type' as a synonym of type is deprecated; in a future version o
f numpy, it will be understood as (type, (1,)) / '(1,)type'.
  _np_qint8 = np.dtype([("qint8", np.int8, 1)])
/home/farhat/anaconda3/envs/mask/lib/python3.6/site-packages/tensorboar
d/compat/tensorflow_stub/dtypes.py:542: FutureWarning: Passing (type,
1) or '1type' as a synonym of type is deprecated; in a future version o
f numpy, it will be understood as (type, (1,)) / '(1,)type'.
  _np_quint8 = np.dtype([("quint8", np.uint8, 1)])
/home/farhat/anaconda3/envs/mask/lib/python3.6/site-packages/tensorboar
d/compat/tensorflow_stub/dtypes.py:543: FutureWarning: Passing (type,
1) or '1type' as a synonym of type is deprecated; in a future version o
```

```
f numpy, it will be understood as (type, (1,)) / '(1,)type'.
  _np_qint16 = np.dtype([("qint16", np.int16, 1)])
/home/farhat/anaconda3/envs/mask/lib/python3.6/site-packages/tensorboar
d/compat/tensorflow_stub/dtypes.py:544: FutureWarning: Passing (type,
1) or '1type' as a synonym of type is deprecated; in a future version o
f numpy, it will be understood as (type, (1,)) / '(1,)type'.
  _np_quint16 = np.dtype([("quint16", np.uint16, 1)])
/home/farhat/anaconda3/envs/mask/lib/python3.6/site-packages/tensorboar
d/compat/tensorflow_stub/dtypes.py:545: FutureWarning: Passing (type,
1) or '1type' as a synonym of type is deprecated; in a future version o
f numpy, it will be understood as (type, (1,)) / '(1,)type'.
  _np_qint32 = np.dtype([("qint32", np.int32, 1)])
/home/farhat/anaconda3/envs/mask/lib/python3.6/site-packages/tensorboar
d/compat/tensorflow_stub/dtypes.py:550: FutureWarning: Passing (type,
1) or '1type' as a synonym of type is deprecated; in a future version o
f numpy, it will be understood as (type, (1,)) / '(1,)type'.
  np_resource = np.dtype([("resource", np.ubyte, 1)])
Using TensorFlow backend.
```

In [2]:
```
def get_ax(rows=1, cols=1, size=16):
    """Return a Matplotlib Axes array to be used in
    all visualizations in the notebook. Provide a
    central point to control graph sizes.

    Adjust the size attribute to control how big to render images
    """
    _, ax = plt.subplots(rows, cols, figsize=(size*cols, size*rows))
    return ax
```

Path Specified

In [3]:
```
# Directory to save logs and trained model
MODEL_DIR = os.path.join(ROOT_DIR, "logs")

# Local path to trained weights file
COCO_MODEL_PATH = os.path.join(ROOT_DIR, "pretrained/mask_rcnn_coco.h5"
```

```
)

# Download COCO trained weights from Releases if needed
if not os.path.exists(COCO_MODEL_PATH):
    utils.download_trained_weights(COCO_MODEL_PATH)

# Directory of images to run detection on
IMAGE_DIR = os.path.join(ROOT_DIR, "data/test_images")
```

Configuration

In [4]:
```
class InferenceConfig(coco.CocoConfig):
  #class InferenceConfig(coco.CocoConfig):
    # Set batch size to 1 since we'll be running inference on
    # one image at a time. Batch size = GPU_COUNT * IMAGES_PER_GPU
    GPU_COUNT = 1
    IMAGES_PER_GPU = 1

config = InferenceConfig()
config.display()
```

```
Configurations:
BACKBONE                       resnet101
BACKBONE_STRIDES               [4, 8, 16, 32, 64]
BATCH_SIZE                     1
BBOX_STD_DEV                   [0.1 0.1 0.2 0.2]
COMPUTE_BACKBONE_SHAPE         None
DETECTION_MAX_INSTANCES        100
DETECTION_MIN_CONFIDENCE       0.7
DETECTION_NMS_THRESHOLD        0.3
FPN_CLASSIF_FC_LAYERS_SIZE     1024
GPU_COUNT                      1
GRADIENT_CLIP_NORM             5.0
IMAGES_PER_GPU                 1
IMAGE_CHANNEL_COUNT            3
IMAGE_MAX_DIM                  1024
IMAGE_META_SIZE                93
```

```
IMAGE_MIN_DIM                  800
IMAGE_MIN_SCALE                0
IMAGE_RESIZE_MODE              square
IMAGE_SHAPE                    [1024 1024    3]
LEARNING_MOMENTUM              0.9
LEARNING_RATE                  0.001
LOSS_WEIGHTS                   {'rpn_class_loss': 1.0, 'rpn_bbox_loss':
1.0, 'mrcnn_class_loss': 1.0, 'mrcnn_bbox_loss': 1.0, 'mrcnn_mask_los
s': 1.0}
MASK_POOL_SIZE                 14
MASK_SHAPE                     [28, 28]
MAX_GT_INSTANCES               100
MEAN_PIXEL                     [123.7 116.8 103.9]
MINI_MASK_SHAPE                (56, 56)
NAME                           coco
NUM_CLASSES                    81
POOL_SIZE                      7
POST_NMS_ROIS_INFERENCE        1000
POST_NMS_ROIS_TRAINING         2000
PRE_NMS_LIMIT                  6000
ROI_POSITIVE_RATIO             0.33
RPN_ANCHOR_RATIOS              [0.5, 1, 2]
RPN_ANCHOR_SCALES              (32, 64, 128, 256, 512)
RPN_ANCHOR_STRIDE              1
RPN_BBOX_STD_DEV               [0.1 0.1 0.2 0.2]
RPN_NMS_THRESHOLD              0.7
RPN_TRAIN_ANCHORS_PER_IMAGE    256
STEPS_PER_EPOCH                1000
TOP_DOWN_PYRAMID_SIZE          256
TRAIN_BN                       False
TRAIN_ROIS_PER_IMAGE           200
USE_MINI_MASK                  True
USE_RPN_ROIS                   True
VALIDATION_STEPS               50
WEIGHT_DECAY                   0.0001
```

Model with pretrained weights

In [5]:
```
model = modellib.MaskRCNN(mode="inference", config=config, model_dir=ROOT_DIR)
# Load weights trained on MS-COCO
from keras.engine import saving
model.load_weights(COCO_MODEL_PATH, by_name=True)
if not os.path.exists(COCO_MODEL_PATH):
    utils.download_trained_weights(COCO_MODEL_PATH)
```

```
WARNING:tensorflow:From /home/farhat/anaconda3/envs/mask/lib/python3.6/site-packages/keras/backend/tensorflow_backend.py:514: The name tf.placeholder is deprecated. Please use tf.compat.v1.placeholder instead.

WARNING:tensorflow:From /home/farhat/anaconda3/envs/mask/lib/python3.6/site-packages/keras/backend/tensorflow_backend.py:71: The name tf.get_default_graph is deprecated. Please use tf.compat.v1.get_default_graph instead.

WARNING:tensorflow:From /home/farhat/anaconda3/envs/mask/lib/python3.6/site-packages/keras/backend/tensorflow_backend.py:4076: The name tf.random_uniform is deprecated. Please use tf.random.uniform instead.

WARNING:tensorflow:From /home/farhat/anaconda3/envs/mask/lib/python3.6/site-packages/keras/backend/tensorflow_backend.py:3900: The name tf.nn.max_pool is deprecated. Please use tf.nn.max_pool2d instead.

WARNING:tensorflow:From /home/farhat/anaconda3/envs/mask/lib/python3.6/site-packages/keras/backend/tensorflow_backend.py:1982: The name tf.image.resize_nearest_neighbor is deprecated. Please use tf.compat.v1.image.resize_nearest_neighbor instead.

WARNING:tensorflow:From /home/farhat/anaconda3/envs/mask/lib/python3.6/site-packages/mask_rcnn-2.1-py3.6.egg/mrcnn/model.py:341: The name tf.log is deprecated. Please use tf.math.log instead.

WARNING:tensorflow:From /home/farhat/anaconda3/envs/mask/lib/python3.6/site-packages/mask_rcnn-2.1-py3.6.egg/mrcnn/model.py:399: add_dispatch_support.<locals>.wrapper (from tensorflow.python.ops.array_ops) is depr
```

```
ecated and will be removed in a future version.
Instructions for updating:
Use tf.where in 2.0, which has the same broadcast rule as np.where
WARNING:tensorflow:From /home/farhat/anaconda3/envs/mask/lib/python3.6/
site-packages/mask_rcnn-2.1-py3.6.egg/mrcnn/model.py:423: calling crop_
and_resize_v1 (from tensorflow.python.ops.image_ops_impl) with box_ind
is deprecated and will be removed in a future version.
Instructions for updating:
box_ind is deprecated, use box_indices instead
WARNING:tensorflow:From /home/farhat/anaconda3/envs/mask/lib/python3.6/
site-packages/mask_rcnn-2.1-py3.6.egg/mrcnn/model.py:720: The name tf.s
ets.set_intersection is deprecated. Please use tf.sets.intersection ins
tead.

WARNING:tensorflow:From /home/farhat/anaconda3/envs/mask/lib/python3.6/
site-packages/mask_rcnn-2.1-py3.6.egg/mrcnn/model.py:722: The name tf.s
parse_tensor_to_dense is deprecated. Please use tf.sparse.to_dense inst
ead.

WARNING:tensorflow:From /home/farhat/anaconda3/envs/mask/lib/python3.6/
site-packages/mask_rcnn-2.1-py3.6.egg/mrcnn/model.py:772: to_float (fro
m tensorflow.python.ops.math_ops) is deprecated and will be removed in
a future version.
Instructions for updating:
Use `tf.cast` instead.
```

COCO Class names - total 80 classes

In [6]:

```
class_names = ['BG', 'person', 'bicycle', 'car', 'motorcycle', 'airplan
e',
               'bus', 'train', 'truck', 'boat', 'traffic light',
               'fire hydrant', 'stop sign', 'parking meter', 'bench',
'bird',
               'cat', 'dog', 'horse', 'sheep', 'cow', 'elephant', 'bea
r',
               'zebra', 'giraffe', 'backpack', 'umbrella', 'handbag',
'tie',
```

```
               'suitcase', 'frisbee', 'skis', 'snowboard', 'sports bal
l',
               'kite', 'baseball bat', 'baseball glove', 'skateboard',
               'surfboard', 'tennis racket', 'bottle', 'wine glass', 'c
up',
               'fork', 'knife', 'spoon', 'bowl', 'banana', 'apple',
               'sandwich', 'orange', 'broccoli', 'carrot', 'hot dog',
'pizza',
               'donut', 'cake', 'chair', 'couch', 'potted plant', 'bed'
,
               'dining table', 'toilet', 'tv', 'laptop', 'mouse', 'remo
te',
               'keyboard', 'cell phone', 'microwave', 'oven', 'toaster'
,
               'sink', 'refrigerator', 'book', 'clock', 'vase', 'scisso
rs',
               'teddy bear', 'hair drier', 'toothbrush']
```

Loading image and prediction

In [7]:
```
# Load a random image from the images folder
file_name = random.choice(os.listdir(IMAGE_DIR))
# file_name = "a.jpeg"
image = skimage.io.imread(os.path.join(IMAGE_DIR, file_name))

import matplotlib.pyplot as plt
plt.figure(figsize=(16,16))
plt.imshow(image)
```

Out[7]:
```
<matplotlib.image.AxesImage at 0x7f5d342ff080>
```

Prediction

In [8]:
```
# Run detection
results = model.detect([image], verbose=1)

# Visualize results
r = results[0]
visualize.display_instances(image, r['rois'], r['masks'], r['class_ids'
],
                            class_names, r['scores'])
from collections import Counter
print(f'Total detected objects - {len(r["class_ids"])}')
```

```
print(f'Total unique objects - {len(np.unique(r["class_ids"]))}')
print("---------------------------------")
bla = [print(f'{class_names[id]} - {num}') for id,num in Counter(r['cla
ss_ids']).items()]
```

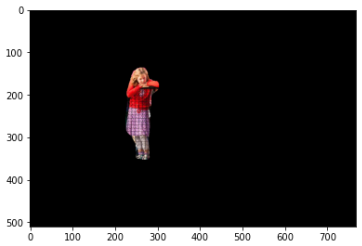
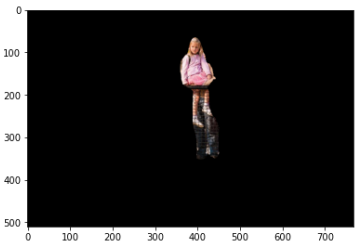
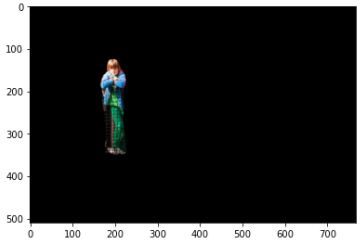
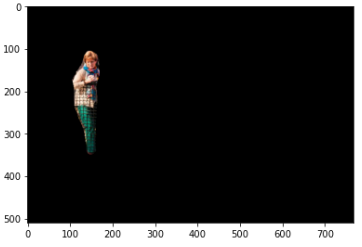
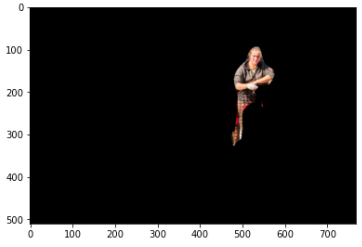
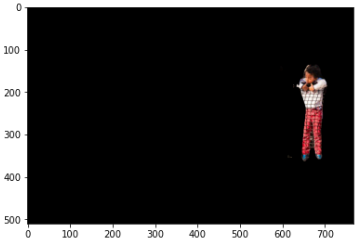
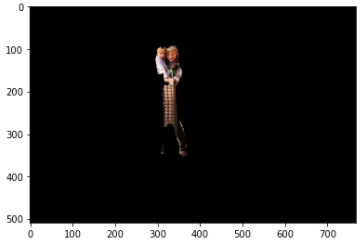
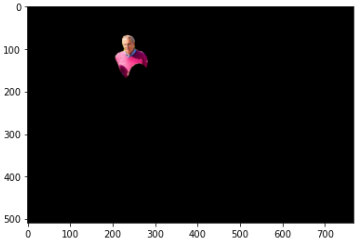
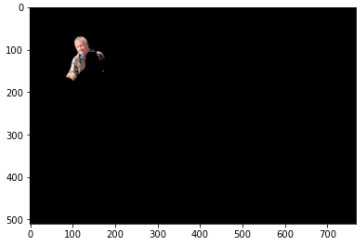
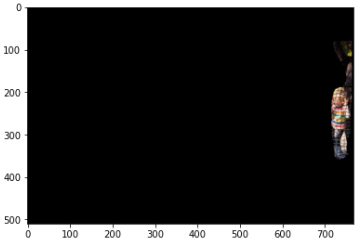
```
Processing 1 images
image                    shape: (510, 767, 3)         min:    0.00000
  max:  255.00000  uint8
molded_images            shape: (1, 1024, 1024, 3)    min: -123.70000
  max:  151.10000  float64
image_metas              shape: (1, 93)               min:    0.00000
  max: 1024.00000  float64
anchors                  shape: (1, 261888, 4)        min:   -0.35390
  max:    1.29134  float32
```


```
Total detected objects - 26
```

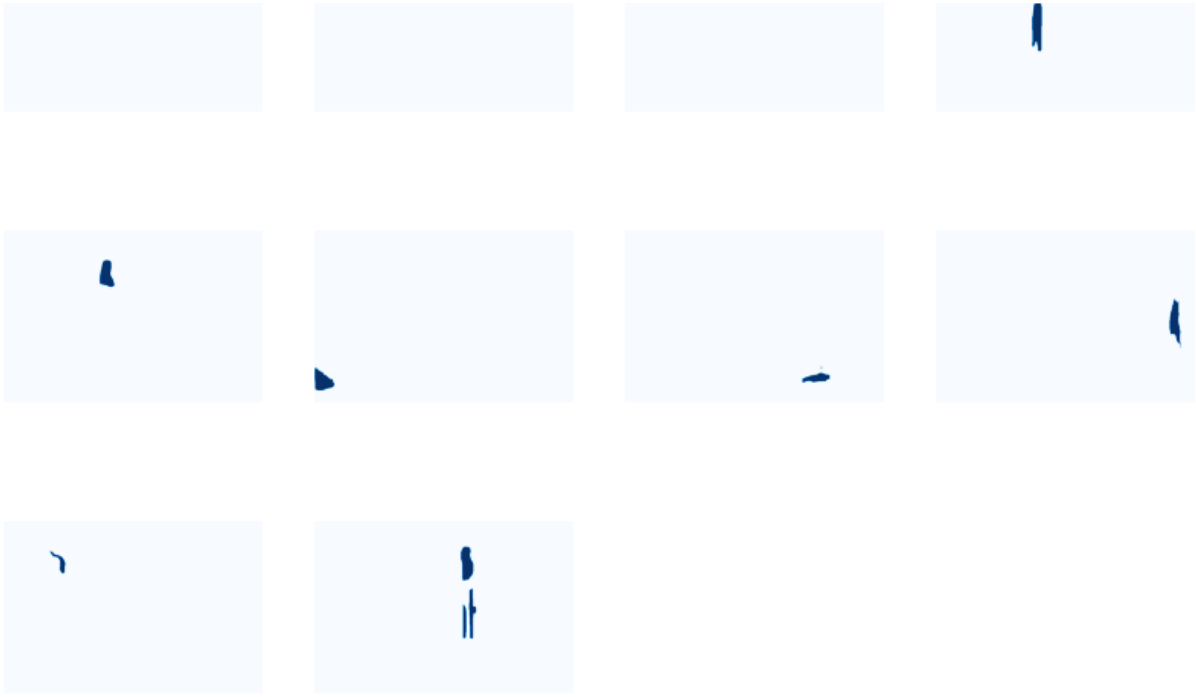
```
Total unique objects - 2
--------------------------------
person - 20
bird - 6
```

Showing Masks

In [9]:
```
import matplotlib.pyplot as plt
ids = np.where(r['class_ids']==class_names.index("person"))[0]
ids = ids if(len(ids)<6) else ids[:10]
plt.figure(figsize=(30,30))
columns = 2
for i, id in enumerate(ids):
    mask = r['masks'][:, :, id] * 1
    mask =np.moveaxis(np.stack([mask, mask, mask]), 0, 2)
    masked_image = image * mask
    plt.subplot(len(ids) / columns + 1, columns, i + 1)
    plt.imshow(masked_image)
```

In [11]:
```
from mrcnn.visualize import display_images
import mrcnn.model as modellib
display_images(np.transpose(r['masks'], [2, 0, 1]), cmap="Blues")
```



Save outputs

In [10]:
```
import matplotlib.pyplot as plt
import cv2
import shutil
out_dir = os.path.join(ROOT_DIR, "output/mask")
if not os.path.exists(out_dir): os.makedirs(out_dir)
else:
    shutil.rmtree(out_dir)
    os.makedirs(out_dir)
for i, id in enumerate(r['class_ids']):
    mask = r['masks'][:, :, i] * 1
    mask =np.moveaxis(np.stack([mask, mask, mask]), 0, 2)
    masked_image = image * mask
    bla = cv2.imwrite(f'{out_dir}/{i+1}_{class_names[id]}.jpg', masked_
image)
```

In [ ]:

In [ ]:

In [ ]: