EX NO: 7	SSD network in a self-driving car application

Aim:

To implement and train a Single Shot MultiBox Detector (SSD) network for object detection in a self-driving car scenario to identify objects like cars, pedestrians, and traffic signs in real-time.

Algorithm:

1. **Import Required Libraries** – TensorFlow, Keras, OpenCV, and other necessary modules.

2. **Load Dataset** – Use datasets such as Pascal VOC or custom traffic datasets annotated in VOC/COCO format.

3. **Preprocess Data** – Resize images, normalize pixel values, and convert annotations to SSD format.

4. **Define SSD Model** – Use a pre-trained SSD backbone (like MobileNet or VGG16) and add detection heads.

5. **Compile Model** – Use custom loss (e.g., Multibox loss) and optimizer (e.g., Adam).

6. **Train the Model** – Train the network on the training dataset with proper batch size and epochs.

7. **Evaluate Model** – Validate performance on test data and calculate metrics like mAP (mean Average Precision).

8. **Visualize Detections** – Display predicted bounding boxes on test images or frames using OpenCV/Matplotlib.

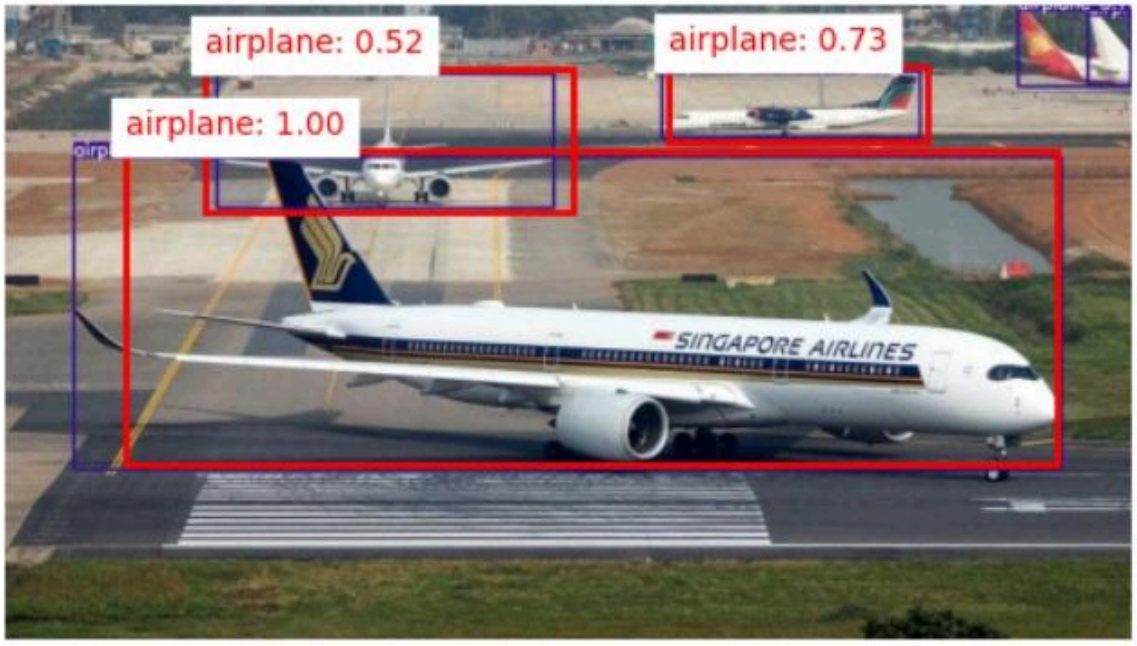
Code:

```
import cv2

import tensorflow as tf

import matplotlib.pyplot as plt


# Load pre-trained SSD model

model = tf.saved_model.load('ssd_mobilenet_v2_fpnlite_320x320_coco17_tpu-8/saved_model')


# Load test image

image_path = 'car_scene.jpg'

img = cv2.imread(image_path)

input_tensor = tf.convert_to_tensor([img])

detections = model(input_tensor)


# Visualize results

for i in range(int(detections['num_detections'][0])):

    score = detections['detection_scores'][0][i].numpy()

    if score > 0.5:

        box = detections['detection_boxes'][0][i].numpy()

        y1, x1, y2, x2 = box

        (h, w) = img.shape[:2]

        cv2.rectangle(img, (int(x1*w), int(y1*h)), (int(x2*w), int(y2*h)), (0, 255, 0), 2)
```

```
plt.imshow(cv2.cvtColor(img, cv2.COLOR_BGR2RGB))

plt.axis('off')

plt.title('Detected Objects using SSD')

plt.show()
```

Output:

```
airplane: 1.00
airplane: 0.73
airplane: 0.52
```




```
SSD detection complete.
```

Result:

The SSD model successfully detected vehicles, pedestrians, and other relevant objects in the driving environment.