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Object Detection For Self-Driving Cars

LATEST SUBMISSION GRADE
100%

1. The object detection problem is defined as the locating objects in the scene, as well as classifying the objects' category. **1 / 1 point**

- (●) True
- ( ) False

✓ **Correct**
Correct!

2. The problem of object detection is non-trivial. Which of the following statements describe reasons for the difficulty in performing object detection? (Check all that apply.) **1 / 1 point**

- [x] Scene illumination is highly variable on road scenes.

✓ **Correct**
Correct!

- [x] Extent of objects is not fully observed.

✓ **Correct**
Correct!

- [ ] The objects that are usually of interest to detect are highly variable in shape and color.

- [ ] Cameras are not reliable to perform detection in outdoor environments.
- [x] Object size gets smaller as objects move farther away in a road scene.

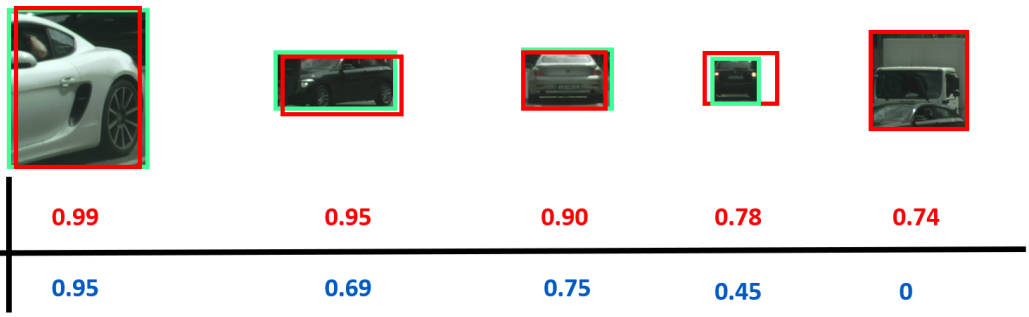
Correct

Correct!

3. You are a self-driving car perception engineer developing an object detector for your self-driving car. You know that for your object detector to be reliable enough to deploy on a self-driving car, it should have a **minimum precision of** 0.99 and a **minimum recall of** 0.9. The precision and recall are to be computed at a **score threshold** of 0.9 and at an **IOU threshold** of 0.7.

2 / 2 points

You compute the IOU of your detector on a frame with ground truth to find out the following:



S_{car}	0.99	0.95	0.90	0.78	0.74
IOU	0.95	0.69	0.75	0.45	0

Assuming that the single frame shown above is sufficient to characterize the performance of the object detector, is your system reliable to be used on a self-driving car?

- [ ] Yes
- [x] No

Correct

Correct!

4. The **width and height** of the output of a convolutional feature extractor are usually an order of magnitude higher than those of its input.

1 / 1 point

- [ ] True

- (●) False

Correct

Correct!

5. The input to a convolutional layer has a **width, height and depth** of 224x224x3 respectively. The convolutional layer has the following properties: **1 / 1 point**

- **Kernel shape:** 3x3x256
- **Stride**: 2
- **Padding**: 3

What is the depth of the output of this convolutional layer?

256

Correct

Correct!

6. When designing convolutional architectures for object detection, max pooling layers are usually placed in which of the following building blocks: **1 / 1 point**

- ( ) Loss function
- ( ) Prior anchor boxes
- ( ) Output fully connected layers
- (●) Convolutional feature extractor

Correct

Correct!

7. 1. What type of output layer is most commonly used in the regression head of a convolutional object detector? **1 / 1 point**

- Softmax Layer
- Linear Layer
- Sigmoidal Layer
- Absolute Value Layer

Correct

Correct!

8. Prior anchor boxes are usually sampled at random in image space before being used in the output layers of an object detector. **1 / 1 point**

- True
- False

Correct

Correct!

9. While training an object detector, the cross entropy is calculated for the negative anchors **only.** **1 / 1 point**

- True
- False

Correct

Correct!

10. **1 / 1 point**

When training an object detection model, the regression loss has the form:

$$L_{reg} = \frac{1}{N_p} \sum_i p_i L_2(b_i, b_i^*)$$

where the L2 norm is computed for every member in the minibatch. For a **positive** minibatch members, the value of P_i is:

1

Correct

Correct!

11. During non-maximum suppression, the output bounding box list is sorted based on the value of every member's: **1 / 1 point**

- Regression loss
- IOU with ground truth
- Softmax output score
- Position in image space

Correct

Correct!

12. In context of self-driving cars, the output of object detectors can be used as a prior to perform which of the following tasks? (Check all that apply.) **1 / 1 point**

- [ ] Drivable space estimation
- [x] Traffic light state estimation

Correct

Correct!

- [x] Object tracking

Correct

Correct!

- [x] 3D object detection

Correct

Correct!

13. One of the main advantages of using the output of 2D object detectors as a prior to 3D object detection is their ability to easily handle occlusion and truncation. **1 / 1 point**

- ( ) True
- (•) False

Correct

Correct!

14. Sudden camera motion is detrimental to the performance of object trackers. This is because tracking usually assumes gradual change in the camera's pose relative to the scene. **1 / 1 point**

- (•) True
- ( ) False

Correct

Correct!