✓ **Congratulations! You passed!**

TO PASS 80% or higher

Keep Learning

GRADE
100%

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] Object size gets smaller as objects move farther away in a road scene.

✓ **Correct**
Correct!

- [ ] The objects that are usually of interest to detect are highly variable in shape and color.
- [x] Scene illumination is highly variable on road scenes.

✓ **Correct**
Correct!

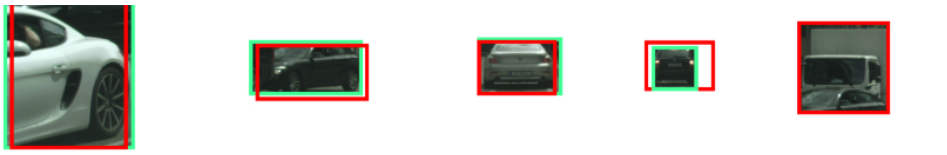
- [ ] Cameras are not reliable to perform detection in outdoor environments.
- [x] Extent of objects is not fully observed.

✓ **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
- ◉ 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
- ◉ Convolutional feature extractor
- ○ Output fully connected layers

- Prior anchor boxes

✓ **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. When training an object detection model, the regression loss has the form: **1 / 1 point**

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

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**

- ☑ 3D object detection

✓ **Correct**
Correct!

- ☐ Drivable space estimation
- ☑ Traffic light state estimation

✓ **Correct**
Correct!

- ☑ Object tracking

✓ **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 **1 / 1 point**

usually assumes gradual change in the camera's pose relative to the scene.

- (●) True
- ( ) False

Correct

Correct!