


1.

Pertanyaan #1

To help you practice strategies for machine learning, this week we'll present another scenario and ask how you would act. We think this "simulator" of working in a machine learning project will give you an idea of what leading a machine learning project could be like!

You are employed by a startup building self-driving cars. You are in charge of detecting road signs (stop sign, pedestrian crossing sign, construction ahead sign) and traffic signals (red and green lights) in images. The goal is to recognize which of these objects appear in each image. As an example, this image contains a pedestrian crossing sign and red traffic lights.



$$y^{(i)} = \begin{bmatrix} 0 \\ 1 \\ 0 \\ 1 \\ 0 \end{bmatrix} \begin{matrix} \text{"stop sign"} \\ \text{"pedestrian crossing sign"} \\ \text{"construction ahead sign"} \\ \text{"red traffic light"} \\ \text{"green traffic light"} \end{matrix}$$

Your 100,000 labeled images are taken using the front-facing camera of your car. This is also the distribution of data you care most about doing well on. You think you might be able to get a much larger dataset off the internet, which could be helpful for training even if the distribution of internet data is not the same.

Suppose that you came from working with a project for human detection in city parks, so you know that detecting humans in diverse environments can be a difficult problem. What is the first thing you do? Assume each of the steps below would take about an equal amount of time (a few days).

0 / 1 poin

Luaskan

Salah

You did not choose an option.

2.

Pertanyaan #2

Your goal is to detect road signs (stop sign, pedestrian crossing sign, construction ahead sign) and traffic signals (red and green lights) in images. The goal is to recognize which of these objects appear in each image. You plan to use a deep neural network with ReLU units in the hidden layers.

Suppose that you use a sigmoid function for the output layer, and the output  $\hat{y}$  has shape (5, 1). Which of the following best describes the cost function?

0 / 1 poin

Luaskan

Salah

Notice that  $y_{rs}$  indicates the component  $r$  of the example  $s$ .

3.

Pertanyaan #3

You are carrying out error analysis and counting up what errors the algorithm makes. Which of these datasets do you think you should manually go through and carefully examine, one image at a time?

0 / 1 poin

Luaskan

Salah

You did not choose an option.

4.

Pertanyaan #4

After working on the data for several weeks, your team ends up with the following data:

- 100,000 labeled images taken using the front-facing camera of your car.
- 900,000 labeled images of roads downloaded from the internet.

- Each image’s labels precisely indicate the presence of any specific road signs and traffic signals or combinations of them. For example,  $\begin{bmatrix} \text{stop} & \text{red traffic light} \end{bmatrix} = [10010]y(i) = \begin{bmatrix} \text{stop} & \text{red traffic light} & \text{blue traffic light} & \text{yellow traffic light} & \text{green traffic light} \end{bmatrix}$  means the image contains a stop sign and a red traffic light.

When using a non fully labeled image such as  $\begin{bmatrix} ? & ? \end{bmatrix} = [0?1?1]y(i) = \begin{bmatrix} \text{stop} & \text{red traffic light} & \text{blue traffic light} & \text{yellow traffic light} & \text{green traffic light} \end{bmatrix}$ , which of the following strategies is most appropriate to calculate the loss function to train as a multi-task learning problem?

1 / 1 poin  
Luaskan

**Benar**  
Correct. We can't use the components of the labels that are missing but we can use the ones we have to train the model.

5.  
Pertanyaan #5  
The distribution of data you care about contains images from your car’s front-facing camera, which comes from a different distribution than the images you were able to find and download off the internet. Which of the following are true about the train/dev/test split?

1 / 1 poin  
Luaskan

**Benar**  
Great, you got all the right answers.

6.  
Pertanyaan #6  
Assume you’ve finally chosen the following split between of the data:

Dataset:	Contains:	Error of the algorithm:
Training	940,000 images randomly picked from (900,000 internet images + 60,000 car’s front-facing camera images)	8.8%
Training-Dev	20,000 images randomly picked from (900,000 internet images + 60,000 car’s front-facing camera images)	9.1%
Dev	20,000 images from your car’s front-facing camera	14.3%
Test	20,000 images from the car’s front-facing camera	14.8%

You also know that human-level error on the road sign and traffic signals classification task is around 0.5%. Which of the following are True? (Check all that apply).

0 / 1 poin  
Luaskan

**Salah**  
You didn't select all the correct answers

7.  
Pertanyaan #7  
Assume you’ve finally chosen the following split between the data:

Dataset:	Contains:	Error of the algorithm:
Training	940,000 images randomly picked from (900,000 internet images + 60,000 car’s front-facing camera images)	2%
Training-Dev	20,000 images randomly picked from (900,000 internet images + 60,000 car’s front-facing camera images)	2.3%
Dev	20,000 images from your car’s front-facing camera	1.3%
Test	20,000 images from the car’s front-facing camera	1.1%

You also know that human-level error on the road sign and traffic signals classification task is around 0.5%. Based on the information given you conclude that the Bayes error for the dev/test distribution is probably higher than for the train distribution. True/False?

0 / 1 poin

Luaskan

Salah

8.

Pertanyaan #8

You decide to focus on the dev set and check by hand what are the errors due to. Here is a table summarizing your discoveries:

Overall dev set error	15.3%
Errors due to incorrectly labeled data	4.1%
Errors due to foggy pictures	8.0%
Errors due to rain drops stuck on your car’s front-facing camera	2.2%
Errors due to other causes	1.0%

In this table, 4.1%, 8.0%, etc. are a fraction of the total dev set (not just examples of your algorithm mislabeled). For example, about  $8.0/15.3 = 52\%$  of your errors are due to foggy pictures.

The results from this analysis implies that the team’s highest priority should be to bring more foggy pictures into the training set so as to address the 8.0% of errors in that category. True/False?

Additional note: there are subtle concepts to consider with this question, and you may find arguments for why some answers are also correct or incorrect. We recommend that you spend time reading the feedback for this quiz, to understand what issues that you will want to consider when you are building your own machine learning project.

1 / 1 poin

Luaskan

Benar

Correct. This is the correct answer. You should consider the tradeoff between the data accessibility and potential improvement of your model trained on this additional data.

9.

Pertanyaan #9

You decide to focus on the dev set and check by hand what the errors are due to. Here is a table summarizing your discoveries:

Overall dev set error	15.3%
Errors due to incorrectly labeled data	4.1%
Errors due to foggy pictures	3.0%
Errors due to partially occluded elements.	7.2%
Errors due to other causes	1.0%

In this table, 4.1%, 7.2%, etc. are a fraction of the total dev set (not just examples of your algorithm mislabeled). For example, about  $7.2/15.3 = 47\%$  of your errors are due to partially occluded elements.

You find out that there is an anti-reflective film guarantee to eliminate the sun reflection, but it is quite costly. Which of the following gives the best description of what the investment in the film can do to the model?

1 / 1 poin

Luaskan

Benar

Yes. Remember that this 7.2% gives us an estimate for the ceiling of how much the error can be reduced when the cause is fixed.

10.

Pertanyaan #10

You decide to use data augmentation to address foggy images. You find 1,000 pictures of fog off the internet, and “add” them to clean images to synthesize foggy days, like this:

image from  
front-facing camera



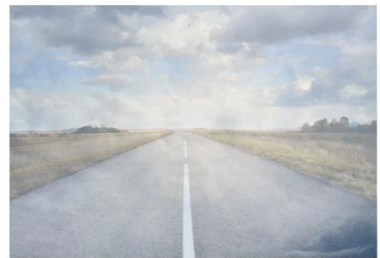
+

foggy image from  
the internet



=

synthesized  
foggy image



Which of the following do you agree with?

**0 / 1 poin**

Luaskan

**Salah**

No. Our objective is to have images that look realistic to the human eye.

**11.**

Pertanyaan #11

After working further on the problem, you've decided to correct the incorrectly labeled data. Your team corrects the labels of the wrongly predicted images on the dev set.

You have to correct the labels of the test so test and dev sets have the same distribution, but you won't change the labels on the train set because most models are robust enough they don't get severely affected by the difference in distributions. True/False?

**1 / 1 poin**

Luaskan

**Benar**

Correct! To successfully train a model, the dev set and test set should come from the same distribution. Also, the deep learning models are robust enough to handle a small change in distributions, but if the errors are systematic they can significantly affect the training of the model.

**12.**

Pertanyaan #12

So far your algorithm only recognizes red and green traffic lights. One of your colleagues in the startup is starting to work on recognizing a yellow traffic light. (Some countries call it an orange light rather than a yellow light; we'll use the US convention of calling it yellow.) Images containing yellow lights are quite rare, and she doesn't have enough data to build a good model. She hopes you can help her out using transfer learning.

What do you tell your colleague?

**1 / 1 poin**

Luaskan

**Benar**

Yes. You have trained your model on a huge dataset, and she has a small dataset. Although your labels are different, the parameters of your model have been trained to recognize many characteristics of road and traffic images which will be useful for her problem. This is a perfect case for transfer learning, she can start with a model with the same architecture as yours, change what is after the last hidden layer and initialize it with your trained parameters.

**13.**

Pertanyaan #13

Another colleague wants to use microphones placed outside the car to better hear if there are other vehicles around you. For example, if there is a police vehicle behind you, you would be able to hear their siren. However, they don't have much to train this audio system. How can you help?

**1 / 1 poin**

Luaskan

**Benar**

Yes. The problem he is trying to solve is quite different from yours. The different dataset structures make it probably impossible to use transfer learning or multi-task learning.

**14.**

Pertanyaan #14

To recognize a stop sign you use the following approach: First, we localize any traffic sign in an image. After that, we determine if the sign is a stop sign or not. We are using multi-task learning. True/False?

**1 / 1 poin**

Luaskan

**Benar**

Correct. Multi-task learning is about joining several tasks that can benefit from each other.

**15.**

Pertanyaan #15

An end-to-end approach doesn't require that we hand-design useful features, it only requires a large enough model. True/False?

**1 / 1 poin**

Luaskan

**Benar**

Correct. This is one of the major characteristics of deep learning models, that we don't need to hand-design the features.