Congratulations! You passed!

Next item

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1. Suppose you are running a sliding window detector to find text in images. Your input images are 1000x1000 pixels. You will run your sliding windows detector at two scales, 10x10 and 20x20 (i.e., you will run your classifier on lots of 10x10 patches to decide if they contain text or not; and also on lots of 20x20 patches), and you will "step" your detector by 2 pixels each time. About how many times will you end up running your classifier on a single 1000x1000 test set image?

- 100,000
- 250,000
- [x] 500,000

Correct
With a stride of 2, you will run your classifier approximately 500 times for each dimension. Since you run the classifier twice (at two scales), you will run it 2 * 500 * 500 = 500,000 times.

- 1,000,000

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2. Suppose that you just joined a product team that has been developing a machine learning application, using $m = 1,000$ training examples. You discover that you have the option of hiring additional personnel to help collect and label data. You estimate that you would have to pay each of the labellers $10 per hour, and that each labeller can label 4 examples per minute. About how much will it cost to hire labellers to label 10,000 new training examples?

- $10,000
- [x] $400

Correct
On labeller can label $4 \times 60 = 240$ examples in one hour. It will thus take him $10,000/240 \approx 40$ hours to complete 10,000 examples. At $10 an hour, this is $400.

- $600
- $250

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3. What are the benefits of performing a ceiling analysis? Check all that apply.

- [ ] If we have a low-performing component, the ceiling analysis can tell us if that component has a high bias problem or a high variance problem.

Un-selected is correct

- [x] It helps us decide on allocation of resources in terms of which component in a machine learning pipeline to spend more effort on.

Correct
The ceiling analysis reveals which parts of the pipeline have the most room to improve the performance of the overall system.

- [x] It can help indicate that certain components of a system might not be worth a significant amount of work improving, because even if it had perfect performance its impact on the overall system may be small.

Correct
An unpromising component will have little effect on overall performance when it is replaced with ground truth.

- [ ] It is a way of providing additional training data to the algorithm.

Un-selected is correct

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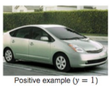
4. Suppose you are building an object classifier, that takes as input an image, and recognizes that image as either containing a car ($y = 1$) or not ($y = 0$). For example, here are a positive example and a negative example:



Positive example ($y = 1$)

Negative example ($y = 0$)

After carefully analyzing the performance of your algorithm, you conclude that you need more positive ($y = 1$) training examples. Which of the following might be a good way to get additional positive examples?

- [x] Apply translations, distortions, and rotations to the images already in your training set.

Correct
These geometric distortions are likely to occur in real-world images, so they are a good way to generate additional data.

- Select two car images and average them to make a third example.
- Take a few images from your training set, and add random, gaussian noise to every pixel.
- Make two copies of each image in the training set; this immediately doubles your training set size.

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5. Suppose you have a PhotoOCR system, where you have the following pipeline:

You have decided to perform a ceiling analysis on this system, and find the following:

Component	Accuracy
Overall System	70%
Text Detection	72%
Character Segmentation	82%
Character Recognition	100%

Which of the following statements are true?

- [x] There is a large gain in performance possible in improving the character recognition system.

Correct
Plugging in ground truth character recognition gives an 18% improvement over running the character recognition system on ground truth character segmentation. Thus there is a good deal of room for overall improvement by improving character recognition.

- [x] Performing the ceiling analysis shown here requires that we have ground-truth labels for the text detection, character segmentation and the character recognition systems.

Correct
At each step, we provide the system with the ground-truth output of the previous step in the pipeline. This requires ground truth for every step of the pipeline.

- [ ] The least promising component to work on is the character recognition system, since it is already obtaining 100% accuracy.

Un-selected is correct

- [ ] The most promising component to work on is the text detection system, since it has the lowest performance (72%) and thus the biggest potential gain.

Un-selected is correct