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Try again

1. Problem Statement 1 / 1 point

This example is adapted from a real production application, but with details disguised to protect confidentiality.

You are a famous researcher in the City of Peacetopia. The people of Peacetopia have a common characteristic: they are afraid of birds. To save them, you have **to build an algorithm that will detect any bird flying over Peacetopia** and alert the population.

The City Council gives you a dataset of 10,000,000 images of the sky above Peacetopia, taken from the city's security cameras. They are labeled:

- y = 0: There is no bird on the image
- y = 1: There is a bird on the image

Your goal is to build an algorithm able to classify new images taken by security cameras from Peacetopia.

There are a lot of decisions to make:

- What is the evaluation metric?
- How do you structure your data into train/dev/test sets?

Metric of success

The City Council tells you that they want an algorithm that

1. Has high accuracy.
2. Runs quickly and takes only a short time to classify a new image.
3. Can fit in a small amount of memory, so that it can run in a small processor that the city will attach to many different security cameras.

Note: Having three evaluation metrics makes it harder for you to quickly choose between two different algorithms, and will slow down the speed with which your team can iterate. True/False?

- (•) True
- ( ) False

Expand

Correct

2. After further discussions, the city narrows down its criteria to: 1 / 1 point

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- "We **need** an algorithm that can let us know a bird is flying over Peacetopia as accurately as possible."
- "We *want* the trained model to take no more than 10 sec to classify a new image."
- "We *want* the model to fit in 10MB of memory."

If you had the three following models, which one would you choose?

Test Accuracy	Runtime	Memory size
98%	9 sec	9MB

Test Accuracy	Runtime	Memory size
99%	13 sec	9MB

Test Accuracy	Runtime	Memory size
97%	1 sec	3MB

Test Accuracy	Runtime	Memory size
97%	3 sec	2MB

Expand

Correct
Correct! This model has the highest test accuracy, the prominent criteria you are looking for, compared with other models, and also has a runtime <10 seconds and memory size < 10MB.

3. Based on the city's requests, which of the following would you say is true? 1 / 1 point

- Accuracy is a satisfying metric; running time and memory size are an optimizing metric.
- Accuracy is an optimizing metric; running time and memory size are satisfying metrics.
- Accuracy, running time and memory size are all optimizing metrics because you want to do well on all three.
- Accuracy, running time and memory size are all satisfying metrics because you have to do sufficiently well on all three for your system to be acceptable.

Expand

Correct

4. With 10,000,000 data points, what is the best option for train/dev/test splits? 1 / 1 point

- train - 60%, dev - 10%, test - 30%
- train - 60%, dev - 30%, test - 10%
- train - 95%, dev - 2.5%, test - 2.5%
- train - 33.3%, dev - 33.3%, test - 33.3%

Expand

Correct
Yes. The size of the data set allows for bias and variance evaluation with smaller data sets.

5. Now that you've set up your train/dev/test sets, the City Council comes across another 1,000,000 images from social media and offers them to you. These images are different from the distribution of images the City Council had originally given you, but you think it could help your algorithm. Which of the following is the best use of that additional data? 0 / 1 point

- ○ Add it to the dev set to evaluate how well the model generalizes across a broader set.
- ○ Add it to the training set.
- ◉ Split it among train/dev/test equally.
- ○ Do not use the data. It will change the distribution of any set it is added to.

Expand

✗ **Incorrect**
No. This would add noise because the images are not from the same cameras which will be used in production.

6. One member of the City Council knows a little about machine learning and thinks you should add the 1,000,000 citizens' data images proportionately to the train/dev/test sets. You object because: **0 / 1 point**

- ○ If we add the images to the test set then it won't reflect the distribution of data expected in production.
- ○ The training set will not be as accurate because of the different distributions.
- ◉ The 1,000,000 citizens' data images do not have a consistent x-->y mapping as the rest of the data.
- ○ The additional data would significantly slow down training time.

Expand

✗ **Incorrect**
No. The important issue is mixing distributions.

7. You train a system, and its errors are as follows (error = 100%-Accuracy): **1 / 1 point**

Training set error	4.0%
Dev set error	4.5%

This suggests that one good avenue for improving performance is to train a bigger network so as to drive down the 4.0% training error. Do you agree?

- ◉ No, because there is insufficient information to tell.
- ○ Yes, because having a 4.0% training error shows you have a high bias.
- ○ No, because this shows your variance is higher than your bias.
- ○ Yes, because this shows your bias is higher than your variance.

Expand

✓ **Correct**

8. If your goal is to have "human-level performance" be a proxy (or estimate) for Bayes error, how would you define "human-level performance"? **0 / 1 point**

- ○ The performance of the head of the City Council.
- ○ The performance of their volunteer amateur ornithologists.
- ◉ The performance of the average citizen of Peacetopia.
- ○ The best performance of a specialist (ornithologist) or possibly a group of specialists.

Expand

Incorrect
No.

9. Which of the below shows the optimal order of accuracy from worst to best? **0 / 1 point**

- (•) The learning algorithm's performance -> human-level performance -> Bayes error.
- ( ) Human-level performance -> the learning algorithm's performance -> Bayes error.
- ( ) The learning algorithm's performance -> Bayes error -> human-level performance.
- ( ) Human-level performance -> Bayes error -> the learning algorithm's performance.

Expand

Incorrect
No. in an optimal scenario, your algorithm's performance would be better than HLP but it can never be better than BE.

10. Which of the following best expresses how to evaluate the next steps in your project when your results for human-level performance, train, and dev set error are 0.1%, 2.0%, and 2.1% respectively? **0 / 1 point**

- (•) Port the code to the target devices to evaluate if your model meets or exceeds the satisficing metrics.
- ( ) Keep tuning until the train set accuracy is equal to human-level performance because it is the optimizing metric.
- ( ) Based on differences between the three levels of performance, prioritize actions to decrease bias and iterate.
- ( ) Evaluate the test set to determine the magnitude of the variance.

Expand

Incorrect
No. The model performance still shows an opportunity for significant improvement.

11. You also evaluate your model on the test set, and find the following: **0 / 1 point**

Human-level performance	0.1%
Training set error	2.0%
Dev set error	2.1%
Test set error	7.0%

What does this mean? (Check the two best options.)

- [x] You should get a bigger test set.

! This should not be selected

- [ ] You have underfitted to the dev set.
- [x] You should try to get a bigger dev set.

✓ Correct

- [x] You have overfit to the dev set.

✓ Correct

Expand

Incorrect
You chose the extra incorrect answers.

12. After working on this project for a year, you finally achieve: Human-level performance, 0.10%, Training set error, 0.05%, Dev set error, 0.05%. Which of the following are likely? (Check all that apply.) **0 / 1 point**

- [x] Pushing to even higher accuracy will be slow because you will not be able to easily identify sources of bias.

Correct
Yes. Exceeding human performance means you are close to Bayes error.

- [ ] The model has recognized emergent features that humans cannot. (Chess and Go for example)
- [ ] This result is not possible since it should not be possible to surpass human-level performance.
- [ ] There is still avoidable bias.

Expand

Incorrect
You didn't select all the correct answers

13. Your system is now very accurate but has a higher false negative rate than the City Council of Peacetopia would like. What is your best next step? **0 / 1 point**

- ( ) Pick false negative rate as the new metric, and use this new metric to drive all further development.
- ( ) Reset your "target" (metric) for the team and tune to it.
- ( ) Expand your model size to account for more corner cases.
- (•) Look at all the models you've developed during the development process and find the one with the lowest false negative error rate.

Expand

Incorrect
No. You must maintain accuracy and include false negatives.

14. You've handily beaten your competitor, and your system is now deployed in Peacetopia and is protecting the citizens from birds! But over the last few months, a new species of bird has been slowly migrating into the area, so the performance of your system slowly degrades because your model is being tested on a new type of data. There are only 1,000 images of the new species. The city expects a better system from you within the next 3 months. Which of these should you do first? **1 / 1 point**

- ( ) Put them into the dev set to evaluate the bias and re-tune.
- (•) Augment your data to increase the images of the new bird.
- ( ) Add hidden layers to further refine feature development.
- ( ) Add the new images and split them among train/dev/test.

Expand

Correct
Yes. A sufficient number of images is necessary to account for the new species.

15. The City Council thinks that having more Cats in the city would help scare off birds. They are so happy with your work on the Bird detector that they also hire you to build a Cat detector. You have a huge dataset of 100,000,000 cat images. Training on this data takes about two weeks. Which of the statements do you agree with? (Check all that agree.)

0 / 1 point

- [x] Lowering the number of images will reduce training time and likely allow for an acceptable tradeoff between iteration speed and accuracy.

  ✓ **Correct**
  Yes. There is a sweet spot that allows development at a reasonable rate without significant accuracy loss.

- [ ] This significantly impacts iteration speed.
- [x] Reducing the model complexity will allow the use of the larger data set but preserve accuracy.

  ! **This should not be selected**
  No. Fewer layers could result in lower accuracy that is not offset by the lower training time.

Expand

⊗ **Incorrect**
You didn't select all the correct answers