Quiz, 15 questions

## **✓** Congratulations! You passed!

Next Item



1/1 points

1.

## **Problem Statement**

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 labelled:

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

# Bird recognition in the city of Peacetopia (case study)

15/15 points (100%)

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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 the following 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.

<u>Note</u>: 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?





1/1 points

2.

After further discussions, the city narrows down its criteria to:

# Bird recognition in the threadity of Peacetopia (2008 & Still by Peacetopia 15/15 points (100%)

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as accurately as possible."

- "We want the trained model to take no more than 10sec 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
97%	1 sec	3МВ

Test Accuracy	Runtime	Memory size
99%	13 sec	9MB

Test Accuracy	Runtime	Memory size
97%	3 sec	2MB

Test Accuracy	Runtime	Memory size
98%	9 sec	9MB

#### Correct

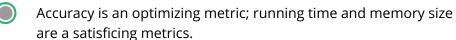
Correct! As soon as the runtime is less than 10 seconds you're good. So, you may simply maximize the test accuracy after you made sure the runtime is <10sec.



1/1 points

3.

Based on the city's requests, which of the following would you say is true?



#### Correct

Quiz, 15 questions		Accuracy, running t	ic. Peacetopia (ca ime and memory size to do well on all three.	are all optimizing metrics	<b>15/15 points (100%)</b> s
		•	o do sufficiently well o	are all satisficing metrics in all three for your	
	<b>~</b>	1 / 1 points			
	4.				
	Struc	turing your			
	Struc Before i	mplementing your	<b>r data</b> algorithm, you need to if these do you think is		
	Struc Before i	mplementing your	algorithm, you need to		
	Struc Before i	mplementing your o	algorithm, you need to	the best choice?	
	Struc Before i	mplementing your ov/test sets. Which o	algorithm, you need to if these do you think is Dev	the best choice?  Test	
	Struc Before i	mplementing your a v/test sets. Which o Train 6,000,000	algorithm, you need to if these do you think is Dev 3,000,000	Test 1,000,000	
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	Struc Before i	mplementing your a v/test sets. Which o Train 6,000,000	Dev  Dev  Dev	Test 1,000,000 Test	
	Struc Before i	mplementing your a v/test sets. Which o Train 6,000,000 Train 6,000,000	Dev 3,000,000  Dev 1,000,000	Test 1,000,000  Test 3,000,000  Test	

Yes.

5.

# After setting up your train/dev/test sets, the City Council comes across Bird recognition in the citizens (100%)

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of Peacetopia are so scared of birds that they volunteered to take pictures of the sky and label them, thus contributing these additional 1,000,000 images. These images are different from the distribution of images the City Council had originally given you, but you think it could help your algorithm.

You should not add the citizens' data to the training set, because this will cause the training and dev/test set distributions to become different, thus hurting dev and test set performance. True/False?

True
False

#### Correct

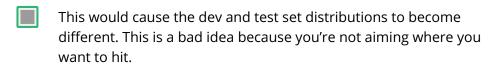
Adding this data to the training set will change the training set distribution. However, it is not a problem to have different training and dev distribution. On the contrary, it would be very problematic to have different dev and test set distributions.



1/1 points

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 to the test set. You object because:



Correct

L	The 1,000,000 citizens' data images do not have a consistent x>y
	mapping as the rest of the data (similar to the New York
	City/Detroit housing prices example from lecture).

**Un-selected** is correct

# A bigger test set will slow down the speed of iterating because of the computational expense of evaluating models on the test set. Bird recognition in the city of Peacetopia (case study)

15/15 points (100%)

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**Un-selected is correct** 

The test set no longer reflects the distribution of data (security cameras) you most care about.

#### Correct



1/1 points

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

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?

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

#### Correct



1/1 points

You ask a few people to label the dataset so as to find out what is human-level performance. You find the following levels of accuracy:

Bird recognition in the city of Peacetopia (case study)

15/15 points (100%)

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Bird watching expert #1	0.3% error
Bird watching expert #2	0.5% error
Normal person #1 (not a bird watching expert)	1.0% error
Normal person #2 (not a bird watching expert)	1.2% error

If your goal is to have "human-level performance" be a proxy (or estimate) for Bayes error, how would you define "human-level performance"?

for Bay	es error, how would you define "human-level performance"?
	0.0% (because it is impossible to do better than this)
	0.3% (accuracy of expert #1)
Corr	ect
	0.4% (average of 0.3 and 0.5)
	0.75% (average of all four numbers above)



1/1 points

9.

Which of the following statements do you agree with?

A learning algorithm's performance can be better than humanlevel performance but it can never be better than Bayes error.

#### Correct

A learning algorithm's performance can never be better than human-level performance but it can be better than Bayes error
A learning algorithm's performance can never be better than human-level performance nor better than Bayes error.

A learning algorithm's performance can be better than human-level performance and better than Bayes error.

## Bird recognition in the city of Peacetopia (case study)

15/15 points (100%)

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1/1 points

10.

You find that a team of ornithologists debating and discussing an image gets an even better 0.1% performance, so you define that as "human-level performance." After working further on your algorithm, you end up with the following:

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

Based on the evidence you have, which two of the following four options seem the most promising to try? (Check two options.)

	Train a bigger model to try to do better on the training set.
Corre	ect
	Get a bigger training set to reduce variance.
Un-selected is correct	
	Try increasing regularization.
Un-selected is correct	

Try decreasing regularization.

Correct

You also evaluate your model on the test set, and find the following: Bird recognition in the city of Peacetopia (case study)

15/15 points (100%)

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

Tes	t set error	7.0%
What c	does this mean? (Check the two best options	.)
	You should get a bigger test set.	
Un-s	elected is correct	
	You have underfit to the dev set.	
Un-s	elected is correct	
	You have overfit to the dev set.	
Corr	ect	
	You should try to get a bigger dev set.	
Corr	ect	



1/1 points

12.

After working on this project for a year, you finally achieve:

# Bird recognition in the city of Peacetopia (case study)

15/15 points (100%)

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Training set error	0.05%
Dev set error	0.05%

Training Set error		0.05%	
Dev set error		0.05%	
What can you conclude? (Check all that apply.)			
	With only 0.09% further progress table to close the remaining gap to		ould quickly be
Un-selected is correct			
	It is now harder to measure avoidable slower going forward.	able bias, thus pı	rogress will be
Corre	ect		
	If the test set is big enough for the accurate, this implies Bayes error		
Corre	ect		
Un-se	This is a statistical anomaly (or munoise) since it should not be possil performance.  elected is correct		



1/1 points It turns out Peacetopia has hired one of your competitors to build a system as well. Your system and your competitor both deliver systems with about

## Bird recognitionaria the guitty of Peace topia (case study) has higher 15/15 points (100%)

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accuracy! However, when Peacetopia tries out your and your competitor's systems, they conclude they actually like your competitor's system better, because even though you have higher overall accuracy, you have more false negatives (failing to raise an alarm when a bird is in the air). What should you do?

Look at all the models you've developed during the development
process and find the one with the lowest false negative error rate

- Ask your team to take into account both accuracy and false negative rate during development.
- Rethink the appropriate metric for this task, and ask your team to tune to the new metric.

#### Correct

Pick false negative rate as the new metric, and use this new metric to drive all further development.



1/1 points

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

Bird recognitions in the peits of Peacetopian (caise totaldy the area, so the 115/15 points (100%)

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performance of your system slowly degrades because your data is being tested on a new type of data.



You have only 1,000 images of the new species of bird. The city expects a better system from you within the next 3 months. Which of these should you do first?



Use the data you have to define a new evaluation metric (using a new dev/test set) taking into account the new species, and use that to drive further progress for your team.



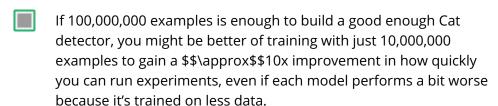
Put the 1,000 images into the training set so as to try to do better on these birds.
Try data augmentation/data synthesis to get more images of the new type of bird.
Add the 1,000 images into your dataset and reshuffle into a new train/dev/test split.

15.

# Bird recognition in the thity of Peacetopiat (case study) help scare off points (100%)

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birds. They are so happy with your work on the Bird detector that they also hire you to build a Cat detector. (Wow Cat detectors are just incredibly useful aren't they.) Because of years of working on Cat detectors, you have such a huge dataset of 100,000,000 cat images that training on this data takes about two weeks. Which of the statements do you agree with? (Check all that agree.)



#### Correct

Buying faster computers could speed up your teams' iteration speed and thus your team's productivity.

#### Correct

Having built a good Bird detector, you should be able to take the same model and hyperparameters and just apply it to the Cat dataset, so there is no need to iterate.

#### **Un-selected** is correct

Needing two weeks to train will limit the speed at which you can iterate.

#### Correct

