Machine Learning System Design

TOTAL POINTS 5

1. **You are working on a spam classification system using regularized logistic regression. "Spam" is a positive class (y = 1) and "not spam" is the negative class (y = 0). You have trained your classifier and there are m = 1000 examples in the cross-validation set. The chart of predicted class vs. actual class is:** 1 point

	Actual Class: 1	Actual Class: 0
Predicted Class: 1	85	890
Predicted Class: 0	15	10

For reference:

- **Accuracy = (true positives + true negatives) / (total examples)**
- **Precision = (true positives) / (true positives + false positives)**
- **Recall = (true positives) / (true positives + false negatives)**
- **F_1 score = (2 * precision * recall) / (precision + recall)**

What is the classifier's recall (as a value from 0 to 1)?

Enter your answer in the box below. If necessary, provide at least two values after the decimal point.

0.85

2. **Suppose a massive dataset is available for training a learning algorithm. Training on a lot of data is likely to give good performance when two of the following conditions hold true.** 1 point

Which are the two?

- [ ] When we are willing to include high order polynomial features of x (such as x_1^2, x_2^2, $x_1 x_2$, etc.).
- [x] Our learning algorithm is able to represent fairly complex functions (for example, if we train a neural network or other model with a large number of parameters).
- [ ] The classes are not too skewed.
- [x] A human expert on the application domain can confidently predict y when given only the features x (or more generally, if we have some way to be confident that x contains sufficient information to predict y accurately).

3. **Suppose you have trained a logistic regression classifier which is outputing $h_\theta(x)$.** 1 point

Currently, you predict 1 if $h_\theta(x) \geq \text{threshold}$, and predict 0 if $h_\theta(x) < \text{threshold}$, where currently the threshold is set to 0.5.

Suppose you decrease the threshold to 0.3. Which of the following are true? Check all that apply.

- [ ] The classifier is likely to have unchanged precision and recall, but higher accuracy.
- [ ] The classifier is likely to now have lower recall.
- [x] The classifier is likely to now have lower precision.
- [ ] The classifier is likely to have unchanged precision and recall, and thus the same F_1 score.

4. **Suppose you are working on a spam classifier, where spam emails are positive examples ($y = 1$) and non-spam emails are negative examples ($y = 0$). You have a training set of emails in which 99% of the emails are non-spam and the other 1% is spam. Which of the following statements are true? Check all that apply.** 1 point

- [x] If you always predict non-spam (output $y = 0$), your classifier will have 99% accuracy on the training set, but it will do much worse on the cross validation set because it has overfit the training data.
- [ ] If you always predict non-spam (output $y = 0$), your classifier will have 99% accuracy on the training set, and it will likely perform similarly on the cross validation set.
- [ ] If you always predict non-spam (output $y = 0$), your classifier will have an accuracy of 99%.
- [x] A good classifier should have both a high precision and high recall on the cross validation set.

5. **Which of the following statements are true? Check all that apply.** 1 point

- [ ] If your model is underfitting the training set, then obtaining more data is likely to help.
- [x] On skewed datasets (e.g., when there are

more positive examples than negative examples), accuracy is not a good measure of performance and you should instead use F_1 score based on the precision and recall.

- [ ] After training a logistic regression classifier, you **must** use 0.5 as your threshold for predicting whether an example is positive or negative.
- [x] It is a good idea to spend a lot of time collecting a **large** amount of data before building your first version of a learning algorithm.
- [x] Using a **very large** training set makes it unlikely for model to overfit the training data.

- [x] I understand that submitting work that isn't my own may result in permanent failure of this course or deactivation of my Coursera account.

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