Feedback — XV. Anomaly Detection

You submitted this quiz on **Thu 20 Jun 2013 1:52 PM PDT (UTC -0700)**. You got a score of **5.00** out of **5.00**.

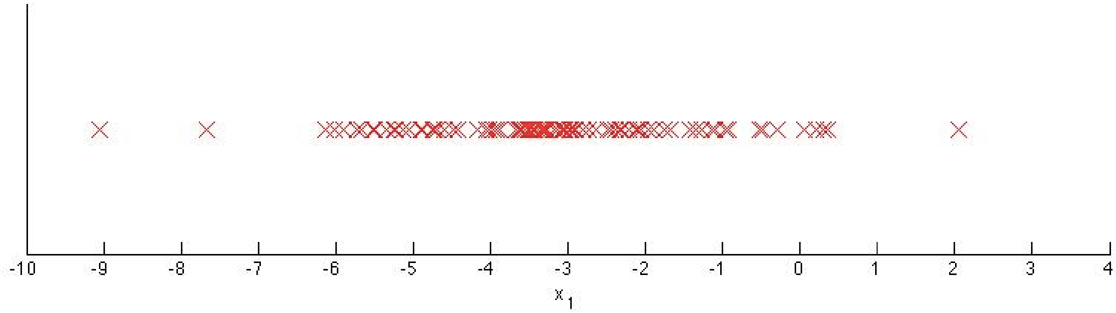
Question 1

For which of the following problems would anomaly detection be a suitable algorithm?

Your Answer		Score	Explanation
☐ Given an image of a face, determine whether or not it is the face of a particular famous individual.	✔	0.25	This problem is more suited to traditional supervised learning, as you want both famous and non-famous images in the training set.
☑ In a computer chip fabrication plant, identify microchips that might be defective.	✔	0.25	The defective chips are the anomalies you are looking for by modeling the properties of non-defective chips.
☑ From a large set of primary care patient records, identify individuals who might have unusual health conditions.	✔	0.25	Since you are just looking for unusual conditions instead of a particular disease, this is a good appliation of anomaly detection.
☐ Given data from credit card transactions, classify each transaction according to type of purchase (for example: food, transportation, clothing).	✔	0.25	Anomaly detection is not appropriate for a traditional classification problem.
Total		1.00 / 1.00	

Question 2

You have a 1-D dataset $\{x^{(1)}, \ldots, x^{(m)}\}$ and you want to detect outliers in the dataset. You first plot the dataset and it looks like this:



Suppose you fit the gaussian distribution parameters μ_1 and σ_1^2 to this dataset. Which of the following values for μ_1 and σ_1^2 might you get?

Your Answer		Score	Explanation
$\mu_1 = -6, \sigma_1^2 = 4$			
$\mu_1 = -3, \sigma_1^2 = 4$	✔	1.00	This is correct, as the data are centered around -3 and tail most of the points lie in [-5, -1].
$\mu_1 = -3, \sigma_1^2 = 2$			
$\mu_1 = -6, \sigma_1^2 = 2$			
Total		1.00 / 1.00	

Question 3

Suppose you have trained an anomaly detection system that flags anomalies when $p(x)$ is less than ε, and you find on the cross-validation set that it has too many false negatives (failing to flag a lot of anomalies). What should you do?

Your Answer		Score	Explanation
Increase ε	✔	1.00	By increasing ε, you will flag more anomalies, as desired.

Decrease ε	
Total	1.00 / 1.00

Question 4

Suppose you are developing an anomaly detection system to catch manufacturing defects in airplane engines. You model uses $p(x) = \prod_{j=1}^{n} p(x_j; \mu_j, \sigma_j^2)$. You have two features x_1 = vibration intensity, and x_2 = heat generated. Both x_1 and x_2 take on values between 0 and 1 (and are strictly greater than 0), and for most "normal" engines you expect that $x_1 \approx x_2$. One of the suspected anomalies is that a flawed engine may vibrate very intensely even without generating much heat (large x_1, small x_2), even though the particular values of x_1 and x_2 may not fall outside their typical ranges of values. What additional feature x_3 should you create to capture these types of anomalies:

Your Answer		Score	Explanation
$x_3 = x_1 \times x_2^2$			
$x_3 = (x_1 + x_2)^2$			
$x_3 = \frac{x_1}{x_2}$	✔	1.00	This is correct, as it will take on large values for anomalous examples and smaller values for normal examples.
$x_3 = x_1^2 \times x_2$			
Total		1.00 / 1.00	

Question 5

Which of the following are true? Check all that apply.

Your Answer		Score	Explanation
If you do not have any labeled data (or	✔	0.25	Only negative examples are used

if all your data has label $y = 0$), then is is still possible to learn $p(x)$, but it may be harder to evaluate the system or choose a good value of ϵ.			in training, but it is good to have some labeled data of both types for cross-validation.
☐ If you are developing an anomaly detection system, there is no way to make use of labeled data to improve your system.	✔	0.25	Labeled data are usefull in cross-validation and testing for evaluating the system and setting the parameter ϵ.
☐ If you have a large labeled training set with many positive examples and many negative examples, the anomaly detection algorithm will likely perform just as well as a supervised learning algorithm such as an SVM.	✔	0.25	Anomaly detection only models the negative examples, whereas an SVM learns to discriminate between positive and negative examples, so the SVM will perform better when you have many positive and negative examples.
☑ In anomaly detection, we fit a model $p(x)$ to a set of negative ($y = 0$) examples, without using any positive examples we may have collected of previously observed anomalies.	✔	0.25	We want to model "normal" examples, so we only use negative examples in training.
Total		1.00 / 1.00	