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# Anomaly Detection

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1. For which of the following problems would anomaly detection be a suitable algorithm?  `1 / 1 point`

   ☑ From a large set of primary care patient records, identify individuals who might have unusual health conditions.

   > ✓ **Correct**
   > Since you are just looking for unusual conditions instead of a particular disease, this is a good application of anomaly detection.

   ☐ Given data from credit card transactions, classify each transaction according to type of purchase (for example: food, transportation, clothing).

   ☐ Given an image of a face, determine whether or not it is the face of a particular famous individual.

   ☑ Given a dataset of credit card transactions, identify unusual transactions to flag them as possibly fraudulent.

   > ✓ **Correct**
   > By modeling "normal" credit card transactions, you can then use anomaly detection to flag the unusuals ones which might be fraudulent.

2. Suppose you have trained an anomaly detection system for fraud detection, and your system that flags anomalies when $p(x)$ is less than $\varepsilon$, and you find on the cross-validation set that it mis-flagging far too many good transactions as fradulent. What should you do?  `1 / 1 point`

   ○ Increase $\varepsilon$

   ◉ Decrease $\varepsilon$

   > ✓ **Correct**
   > By decreasing $\varepsilon$, you will flag fewer anomalies, as desired.

3. Suppose you are developing an anomaly detection system to catch manufacturing defects in airplane engines. You model uses  `1 / 1 point`

   $$p(x) = \prod_{j=1}^{n} p(x_j; \mu_j, \sigma_j^2).$$

   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:

   ○ $x_3 = x_1 \times x_2^2$

   ○ $x_3 = (x_1 + x_2)^2$

   ◉ $x_3 = \frac{x_1}{x_2}$

   ○ $x_3 = x_1^2 \times x_2^2$

   > ✓ **Correct**
   > This is correct, as it will take on large values for anomalous examples and smaller values for normal examples.

4. Which of the following are true? Check all that apply.  `1 / 1 point`

   ☑ When developing an anomaly detection system, it is often useful to select an appropriate numerical performance metric to evaluate the effectiveness of the learning algorithm.

   > ✓ **Correct**
   > You should have a good evaluation metric, so you can evaluate changes to the model such as new features.

   ☐ In a typical anomaly detection setting, we have a large number of anomalous examples, and a relatively small number of normal/non-anomalous examples.

   ☐ When evaluating an anomaly detection algorithm on the cross validation set (containing some positive and some negative examples), classification accuracy is usually a good evaluation metric to use.

   ☑ 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.

   > ✓ **Correct**
   > We want to model "normal" examples, so we only use negative examples in training.

5. 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:  `1 / 1 point`
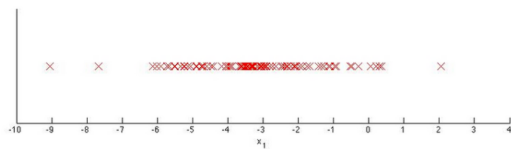


   Suppose you fit the gaussian distribution parameters $\mu_1$ and $\sigma_1^2$ to this dataset. Which of the following values for $\mu_1$ and $\sigma_1^2$ might you get?

   ◉ $\mu_1 = -3, \sigma_1^2 = 4$

   ○ $\mu_1 = -6, \sigma_1^2 = 4$

   ○ $\mu_1 = -3, \sigma_1^2 = 2$

   ○ $\mu_1 = -6, \sigma_1^2 = 2$

   > ✓ **Correct**
   > This is correct, as the data are centered around -3 and tail most of the points lie in [-5, -1].