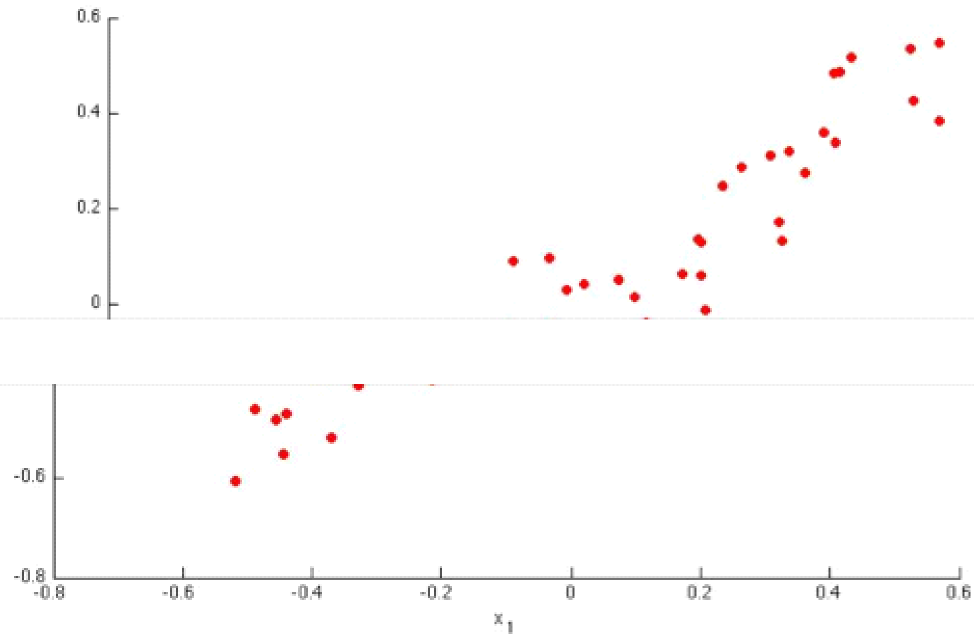
W8-2 Principal Component Analysis | Coursera

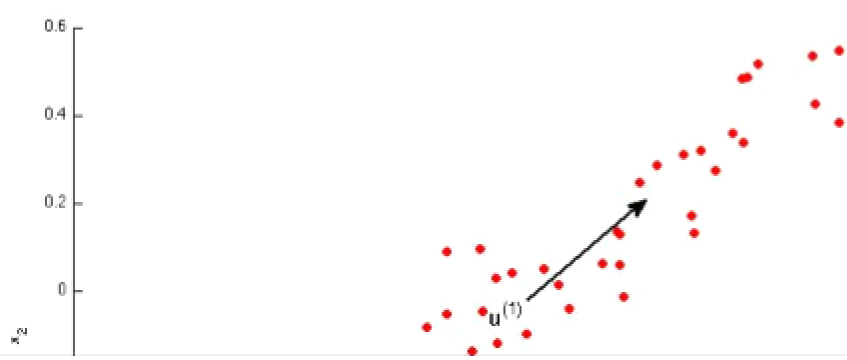
Saturday, September 17, 2016 11:44 AM

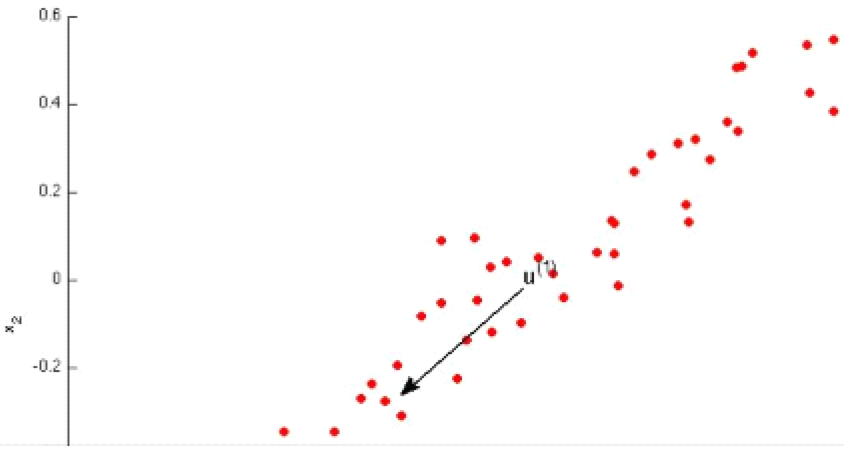
Right: 1,2,3,5

1. Consider the following 2D dataset:



Which of the following figures correspond to possible values that PCA may return for $u^{(1)}$ (the first eigenvector / first principal component)? Check all that apply (you may have to check more than one figure).





1 point

2. Which of the following is a reasonable way to select the number of principal components k?

(Recall that n is the dimensionality of the input data and m is the number of input examples.)

- (selected) Choose k to be the smallest value so that at least 99% of the variance is retained.
- Choose k to be the smallest value so that at least 1% of the variance is retained.

3. Suppose someone tells you that they ran PCA in such a way that "95% of the variance was retained." What is an equivalent statement to this?

- $\frac{\frac{1}{m}\sum_{i=1}^{m}||x^{(i)}-x_{\text{approx}}^{(i)}||^2}{\frac{1}{m}\sum_{i=1}^{m}||x^{(i)}||^2} \geq 0.05$
- (selected) $\frac{\frac{1}{m}\sum_{i=1}^{m}||x^{(i)}-x_{\text{approx}}^{(i)}||^2}{\frac{1}{m}\sum_{i=1}^{m}||x^{(i)}||^2} \leq 0.05$
- $\frac{\frac{1}{m}\sum_{i=1}^{m}||x^{(i)}-x_{\text{approx}}^{(i)}||^2}{\frac{1}{m}\sum_{i=1}^{m}||x^{(i)}||^2} \geq 0.95$

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

- [x] PCA is susceptible to local optima; trying multiple random initializations may help.
- [ ] Given only $z^{(i)}$ and U_{reduce}, there is no way to reconstruct any reasonable approximation to $x^{(i)}$.
- [ ] Even if all the input features are on very similar scales, we should still perform mean normalization (so that each feature has zero mean) before running PCA.
- [x] Given input data $x \in \mathbb{R}^n$, it makes sense to run PCA only with values of k that satisfy $k \leq n$. (In particular, running it with $k = n$ is possible but not helpful, and $k > n$ does not make sense.)

5. Which of the following are recommended applications of PCA? Select all that apply.

- [x] Data visualization: Reduce data to 2D (or 3D) so that it can be plotted.
- [ ] To get more features to feed into a learning algorithm.
- [ ] Clustering: To automatically group examples into coherent groups.
- [x] Data compression: Reduce the dimension of your input data $x^{(i)}$, which will be used in a supervised learning algorithm (i.e., use PCA so that your supervised learning algorithm runs faster).