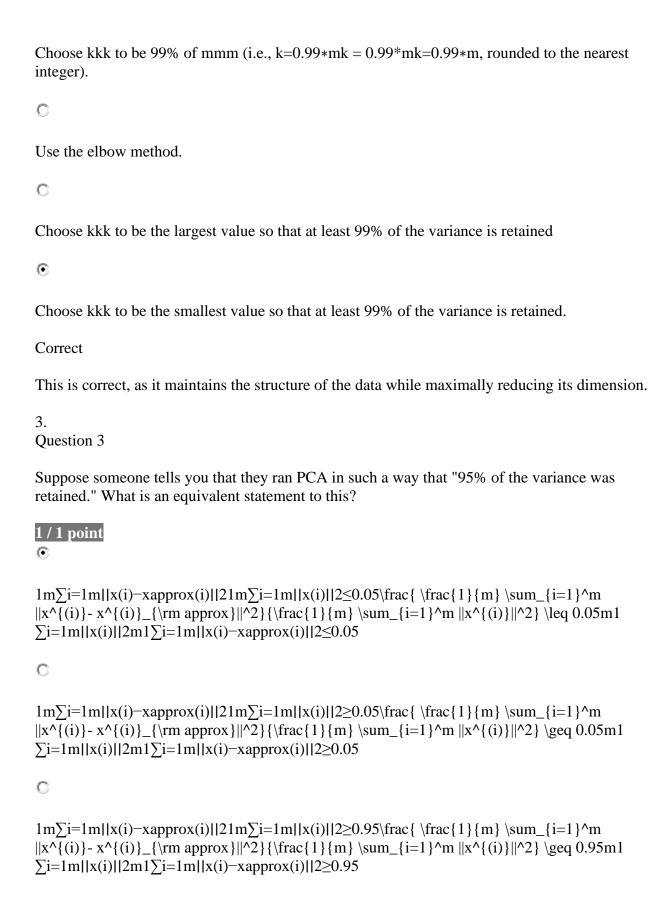
Principal Component Analysis

Latest Submission Grade

100% 1.
Question 1
Consider the following 2D dataset:
Which of the following figures correspond to possible values that PCA may return for $u(1)u^{(1)}u(1)$ (the first eigenvector / first principal component)? Check all that apply (you may have to check more than one figure).
1 / 1 point ▼
Correct
The maximal variance is along the $y = x$ line, so this option is correct.
Correct
The maximal variance is along the $y = x$ line, so the negative vector along that line is correct for the first principal component.
2. Question 2
Which of the following is a reasonable way to select the number of principal components kkk?
(Recall that nnn is the dimensionality of the input data and mmm is the number of input examples.)
1 / 1 point C



0

 $1m \sum_{i=1}^{i=1} ||x(i)|| 21m \sum_{i=1}^{i=1} ||x(i)-xapprox(i)|| 2 \geq 0.95 \\ ||x^{(i)}||^2 {\frac{1}{m} \sum_{i=1}^{m} ||x^{(i)}-x^{(i)}-x^{(i)}|} \\ ||x^{(i)}||^2 ||x^{(i)}-xapprox(i)|| 2m \sum_{i=1}^{i=1} ||x(i)|| 2 \geq 0.95 \\ ||x^{(i)}-xapprox(i)|| 2m \sum_{i=1}^{i=1} ||x(i)-xapprox(i)|| 2 \geq 0.95 \\ ||x^{(i)}-xapprox(i)|| 2 \geq 0.95 \\ ||x^{(i)}-xapprox(i)||$

Correct

This is the correct formula.

4.

Question 4

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



Given only $z(i)z^{(i)}z(i)$ and $UreduceU_{\text{rm reduce}}$ Ureduce, there is no way to reconstruct any reasonable approximation to $x(i)x^{(i)}x(i)$.

PCA is susceptible to local optima; trying multiple random initializations may help.

V

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.

Correct

If you do not perform mean normalization, PCA will rotate the data in a possibly undesired way.

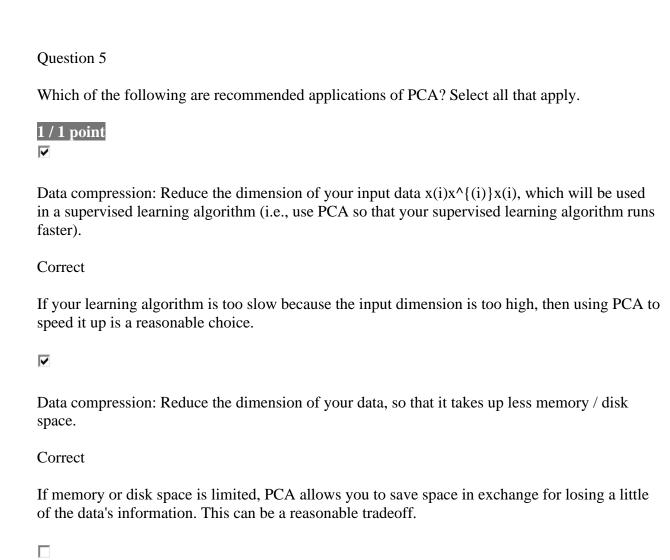
✓

Given input data $x \in Rnx \in Rnx \in Rnx \in Rnx \in Rnx \in Rn$, it makes sense to run PCA only with values of kkk that satisfy $k \le nk \le nk$. (In particular, running it with k = nk = nk = n is possible but not helpful, and k > nk > nk > n does not make sense.)

Correct

The reasoning given is correct: with k=nk=nk=n, there is no compression, so PCA has no use.

5.



As a replacement for (or alternative to) linear regression: For most learning applications, PCA and linear regression give substantially similar results.

Data visualization: To take 2D data, and find a different way of plotting it in 2D (using k=2).