Review Test Submission: PCA

User	Richa Singh
Course	(MERGED) ACN 7310.002 - HCS 7310.002 - F18
Test	PCA
Started	8/31/18 11:22 AM
Submitted	8/31/18 6:51 PM
Due Date	9/15/18 8:00 PM
Status	Completed
Attempt Score	118 out of 121 points
Time Elapsed	7 hours, 29 minutes
Instructions	Please read the PCA paper before you take the quiz. You can take your time to finish it after you BEGIN, but noted that you can only submit it ONCE. The test won't be available by Sunday at 8 pm. Please submit the answer by this time. If you haven't submitted your answer by then, the quiz will be considered as no attempt. **IMPORTANT NOTE: The notation in the quiz matches the notation in** Abdi, H., & Williams, L.J. (2010). Principal component analysis. *Wiley Interdisciplinary Reviews: Computational Statistics*, 2, 433-459. **(A77)**
Results Displayed	All Answers, Submitted Answers, Correct Answers, Incorrectly Answered Questions

Question 1

10 out of 10 points

What is a contribution?

Selected Answer: ✓ 2. The variance each observation contributes to the eigenvalue.

Answers:
1. The variance each component contributes to the inertia.
✓ 2. The variance each observation contributes to the eigenvalue.
3. The variance each variable contributes to the eigenvalue.
4. The correlation coefficient of a component and a variable.
5. The variance each variable contributes to the singular value.
6. The variance each observation contributes to the singular value.

Question 2

10 out of 10 points

Which matrix projects the observations onto principal components?

Selected Answer: 4. $\mathbf{Q}$

Answers:
1. $\mathbf{F}$
2. $\mathbf{\Delta}$
3. $\mathbf{X}$
4. $\mathbf{Q}$
5. $\mathbf{P}$

Question 3

10 out of 10 points

Which indicates that the components are orthogonal to one another?

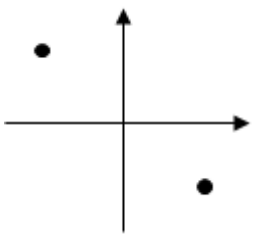
Selected Answers:
1. $\mathbf{F}^T\mathbf{F} = \mathbf{\Delta}^2$
2. $\mathbf{\Delta}$ is a diagonal matrix
3. $\mathbf{Q}$ is the coefficients of the linear combination to compute factor scores
4. $\mathbf{P}^T\mathbf{P} = \mathbf{I}$
5. $\mathbf{Q}^T\mathbf{Q} = \mathbf{I}$

Answers:
1. $\mathbf{F}^T\mathbf{F} = \mathbf{\Delta}^2$
2. $\mathbf{\Delta}$ is a diagonal matrix
3. $\mathbf{Q}$ is the coefficients of the linear combination to compute factor scores
4. $\mathbf{P}^T\mathbf{P} = \mathbf{I}$
5. $\mathbf{Q}^T\mathbf{Q} = \mathbf{I}$

Question 4

10 out of 10 points

When we project two *variables* onto the space of components 1 and 2, and the plot looks like this, what does it imply?



Selected Answer: 2. They are negatively correlated.

Answers:
1. They are likely to have a correlation of 0.
2. They are negatively correlated.
3. They are positively correlated.

4. It does not imply correlation.

Question 5

8 out of 11 points

PCA is a multivariate techniques that analyzes a data table of multiple **[a]** variables. To perform PCA, you need to preprocess the data matrix by **[b]** the columns. In PCA, the data matrix **X** is decomposed to three matrices by singular value decomposition (SVD)—which can be described as **X** = **[c]**—with the constraint that **[d]** = **[e]** = **[f]**. Of the three matrices, the first matrix is the **[g]** and the last matrix is the **[h]**. The second matrix is a diagonal matrix that stores the **[i]**, which are the **[j]** of eigenvalues. The eigenvalues describe the **[k]** of each component.

Specified Answer for: a	✗ dependent
Specified Answer for: b	✓ centering
Specified Answer for: c	✗ P(DELTA)Q'
Specified Answer for: d	✗ PP'
Specified Answer for: e	✗ QQ'
Specified Answer for: f	✓ I
Specified Answer for: g	✗ left singular vectors of X
Specified Answer for: h	✗ right singular vectors of X
Specified Answer for: i	✓ singular values
Specified Answer for: j	✗ squareroot
Specified Answer for: k	✓ variance

Correct Answers for: a		
Evaluation Method	**Correct Answer**	**Case Sensitivity**
✓ *Exact Match*	quantitative	
Correct Answers for: b		
Evaluation Method	**Correct Answer**	**Case Sensitivity**
✓ *Exact Match*	centering	
✓ *Exact Match*	subtracting the mean of	
Correct Answers for: c		
Evaluation Method	**Correct Answer**	**Case Sensitivity**
✓ *Exact Match*	PΔ(Q^T)	
✓ *Exact Match*	Pdelta(Q^T)	
Correct Answers for: d		
Evaluation Method	**Correct Answer**	**Case Sensitivity**
✓ *Exact Match*	(P^T)P	
✓ *Exact Match*	(Q^T)Q	
Correct Answers for: e		
Evaluation Method	**Correct Answer**	**Case Sensitivity**
✓ *Exact Match*	(Q^T)Q	
✓ *Exact Match*	(P^T)P	
✓ *Exact Match*	I	
Correct Answers for: f		

Evaluation Method	Correct Answer	Case Sensitivity
Exact Match	I	
Exact Match	(Q^T)Q	
Correct Answers for: g		
Evaluation Method	**Correct Answer**	**Case Sensitivity**
Exact Match	left singular vectors	
Correct Answers for: h		
Evaluation Method	**Correct Answer**	**Case Sensitivity**
Exact Match	right singular vectors	
Correct Answers for: i		
Evaluation Method	**Correct Answer**	**Case Sensitivity**
Exact Match	singular values	
Correct Answers for: j		
Evaluation Method	**Correct Answer**	**Case Sensitivity**
Exact Match	square root	
Correct Answers for: k		
Evaluation Method	**Correct Answer**	**Case Sensitivity**
Exact Match	variance	

Question 6

10 out of 10 points

What is Λ ?

Selected Answers:
- 1. $\mathbf{F}^T\mathbf{F}$
- 2. The variance of each component
- 5. Eigenvalues
- 7. Δ^2 (delta square)

Answers:
- 1. $\mathbf{F}^T\mathbf{F}$
- 2. The variance of each component
- 3. Loadings
- 4. Contributions
- 5. Eigenvalues
- 6. Singular values
- 7. Δ^2 (delta square)

Question 7

10 out of 10 points

What is a cosine?

Selected Answer: 1. The variance each component contributes to the inertia.

Answers:
- 1. The variance each component contributes to the inertia.
- 2. The variance each observation contributes to the eigenvalue.

3. The variance each variable contributes to the singular value.
4. The variance each variable contributes to the eigenvalue.
5. The correlation coefficient of a component and a variable.
6. The variance each observation contributes to the singular value.

Question 8

10 out of 10 points

What is true in PCA?

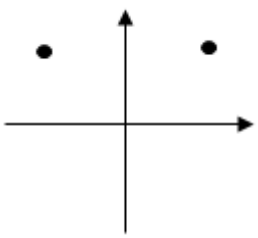
Selected Answers:
- 1. From the result of PCA, component 1 is orthogonal to component 3.
- 2. Similarity between two variables (columns) is interpreted by the angle between them.
- 3. Similarity between two observations (rows) is interpreted by the distance between them.
- 4. It compresses information.
- 5. From the result of PCA, Component 1 is orthogonal to component 2.
- 6. It eliminates noise.

Answers:
- 1. From the result of PCA, component 1 is orthogonal to component 3.
- 2. Similarity between two variables (columns) is interpreted by the angle between them.
- 3. Similarity between two observations (rows) is interpreted by the distance between them.
- 4. It compresses information.
- 5. From the result of PCA, Component 1 is orthogonal to component 2.
- 6. It eliminates noise.

Question 9

10 out of 10 points

When we project two *variables* onto the space of components 1 and 2, and the plot looks like this, what does it imply?



Selected Answer: 1. They are likely to have a correlation of 0.

Answers:
- 1. They are likely to have a correlation of 0.
- 2. They are negatively correlated.
- 3. It doesn't imply correlation.
- 4. They are positively correlated.

Question 10

10 out of 10 points

Which of the following are factor scores?

Selected Answers: 4. $\mathbf{XQ}$
7. $\mathbf{F}$
8. $\mathbf{P\Delta}$

Answers:
1. $\mathbf{F^TF}$
2. $\mathbf{P^TP}$
3. $\mathbf{X}$
4. $\mathbf{XQ}$
5. $\mathbf{P}$
6. $\mathbf{Q}$
7. $\mathbf{F}$
8. $\mathbf{P\Delta}$
9. $\mathbf{FQ^T}$
10. $\mathbf{Q^TQ}$

Question 11

10 out of 10 points

Please match the Greek letter with its meaning.

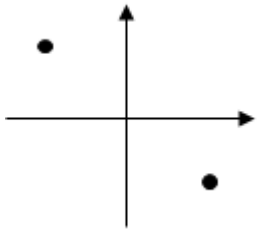
Question	Correct Match	Selected Match
λ	2. eigenvalue	2. eigenvalue
δ	1. singular value	1. singular value
τ	3. contribution	3. contribution

All Answer Choices
1. singular value
2. eigenvalue
3. contribution

Question 12

10 out of 10 points

When we project two *observations* onto the space of components 1 and 2, and the plot looks like this, what does it imply?



Selected Answer: ✔ 2. They are very different.

Answers: 1. They are very similar.

✔ 2. They are very different.

3. It doesn't imply similarity.

Sunday, December 9, 2018 1:35:01 PM CST

← OK