Dimension Reduction Quiz

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1. What is the main goal of dimension reduction in machine learning? **1 / 1 point**

- To increase the dimensionality of the dataset for better model performance.
- To remove outliers from the dataset to improve model accuracy.
- (selected) To reduce the number of features while preserving the most important information in the data.
- To create new features based on the existing ones to improve model interpretability.

Correct
Correct! The main goal of dimension reduction is to decrease the number of features while retaining essential information.

2. What is the primary advantage of dimension reduction in machine learning? **1 / 1 point**

- It reduces the risk of overfitting by increasing the number of features.
- It increases the computational complexity of the model by introducing new features.
- It allows the model to memorize the training data by introducing new features.
- (selected) It simplifies the model and improves its interpretability and efficiency.

Correct
Correct! Dimension reduction simplifies the model by reducing the number of features, making it more interpretable and efficient.

3. Which of the following dimension reduction techniques is particularly effective for handling highly correlated features? **1 / 1 point**

- (selected) Principal Component Analysis (PCA)
- t-Distributed Stochastic Neighbor Embedding (t-SNE)
- Linear Discriminant Analysis (LDA)
- Autoencoders

Correct
Correct! PCA is particularly effective at handling highly correlated features by transforming them into uncorrelated principal components.

4. In Principal Component Analysis (PCA), what are the principal components? **1 / 1 point**

- The original features in the dataset.
- (selected) The new orthogonal (uncorrelated) axes obtained by projecting the data onto them.
- The most important features selected based on their correlation with the target variable.
- The features selected based on their importance in a supervised learning task.

Correct
Correct! The principal components are new orthogonal axes that capture the maximum variance in the data when the data is projected onto them.

5. What is the significance of the first principal component in PCA? **1 / 1 point**

- The first principal component represents the features with the lowest variance in the data.
- The first principal component represents the features with the highest correlation with the target variable.
- (selected) The first principal component captures the most significant amount of variance in the data.
- The first principal component is always equal to the mean of all features in the dataset.

Correct
Correct! The first principal component captures the maximum variance in the data when the data is projected onto it.

6. What does the explained variance ratio represent in PCA analysis? **1 / 1 point**

- The ratio of the number of principal components to the original features in the dataset.
- (selected) The proportion of variance in the data explained by each principal component.
- The number of data points in the dataset that are accurately predicted by the principal components.
- The statistical significance of the principal components in predicting the target variable.

Correct
Correct! The explained variance ratio represents the proportion of variance explained by each principal component.

7. What is the effect of dimension reduction on the computational complexity of machine learning models? **1 / 1 point**

- Dimension reduction increases the computational complexity of models due to the additional processing required.
- Dimension reduction has no impact on the computational complexity of models.
- (selected) Dimension reduction decreases the computational complexity of models by reducing the number of features.
- Dimension reduction significantly increases the computational complexity of models when applied to high-dimensional datasets.

Correct
Correct! Dimension reduction reduces the number of features, resulting in decreased computational complexity.

8. What is the primary disadvantage of using PCA for dimension reduction? **1 / 1 point**

- PCA is computationally expensive and requires significant processing power.
- PCA requires the number of principal components to be specified in advance.
- PCA can introduce multicollinearity between principal components and impact model performance.
- (selected) PCA may not preserve the interpretability of the original features in the reduced data.

Correct
Correct! PCA creates new orthogonal features, making the interpretability of the original features less straightforward.

9. What does it mean when the explained variance ratio of a principal component is close to zero? **1 / 1 point**

- (selected) The principal component contains redundant information with other components.
- The principal component explains all the variance in the data.
- The principal component is uncorrelated with the other components in the dataset.
- The principal component has no impact on the overall dimension reduction process.

Correct
Correct! A low explained variance ratio indicates that the principal component contains little unique information and may be redundant.

10. Which of the following statements is true regarding the number of principal components to retain in PCA? **1 / 1 point**

- The number of principal components to retain should be equal to the number of features in the original dataset.
- (selected) The number of principal components to retain should be determined by the maximum explained variance ratio.
- The number of principal components to retain should be specified by the maximum eigenvalues.
- The number of principal components to retain should be set to a fixed value (e.g., 3 or 4) for all datasets.

Correct
Correct! The number of principal components to retain is often determined by selecting those with significant explained variance ratios.