

# Ungraded: Kernel PCA and MDS

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Practice Assignment • 10 min

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Next item →

1. Given the data visualized below with the classes represented by different colors, should PCA or kernel PCA be used, and why?

1 / 1 point



- ☐ PCA because the data is clearly separable when projected onto a lower dimension.
- ☐ Either is fine because the two classes are clearly separable.
- ☐ Neither because the data cannot be projected onto a lower dimension.
- ☒ Kernel PCA because the data is not linearly separable.

Correct! If the data is projected directly onto a lower dimension, the different classes cannot be clearly separated with a single plane. Hence, we use a kernel function to map it to a higher dimension first, before applying PCA.

2. How does the goal of MDS (Multidimensional Scaling) compare to PCA?

1 / 1 point

- ☐ Both MDS and PCA try to maintain geometric distances between data points.
- ☐ PCA tries to maintain geometric distances between data points, whereas MDS tries to preserve variance within data.
- ☐ Both MDS and PCA try to preserve variance within data.
- ☒ MDS tries to maintain geometric distances between data points, whereas PCA tries to preserve variance within data.

Correct! Although both are dimensionality reduction techniques, MDS will not strive to maintain the variance within the original data.

3. (True/False) If the number of components is equal to the dimension of the original features, kernel PCA will reconstruct the data, returning the original.

1 point

☒ True

Incorrect. Please review Practice lab: Kernel PCA.

☐ False

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# Graded: Module 5 Quiz

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Next item →

1. What is the main difference between kernel PCA and linear PCA?

1 / 1 point

- ☐ The objective of linear PCA is to decrease the dimensionality of the space whereas the objective of Kernel PCA is to increase the dimensionality of the space.
- ☒ Kernel PCA tend to uncover non-linearity structure within the dataset by increasing the dimensionality of the space thanks to the kernel trick.
- ☐ Kernel PCA and Linear PCA are both Linear dimensionality reduction algorithm but they use a different optimization method.
- ☐ Kernel PCA tend to preserve the geometric distances between the points while reducing the dimensionality of the space.

✔ Correct

Correct! When you use these kernel functions and map the higher-dimensional space, you're able to uncover nonlinear structures within your data set.

2. (True/False) Multi-Dimensional Scaling (MDS) focuses on maintaining the geometric distances between points.

1 / 1 point

- ☒ True
- ☐ False

✔ Correct

Correct! You can find more information in the video *Kernel Principal Component Analysis and Multidimensional Scaling*.

3. Which of the following data types is more suitable for Kernel PCA than PCA?

1 / 1 point

- ☒ Data where the classes are not linearly separable.
- ☐ Data with linearly separable classes.
- ☐ Data that do not need to be mapped to a higher dimension to distinguish categories.
- ☐ None; they can be used interchangeably.

✔ Correct

Correct! With kernel PCA, we are able to identify nonlinear features by mapping to a higher dimension prior to applying PCA.

4. By applying MDS, you are able to:

1 / 1 point

- ☒ Find embeddings for points so that their distance is the most similar to the original distance.
- ☐ Preserve variance within the original data.
- ☐ Attain higher dimensions for the features.
- ☐ Maximize distance between data points in a lower dimension.

✔ Correct

Correct! The goal of MDS is to find embeddings that minimize the "Stress" cost function and mimic the original distance relationship the most.

5. Which one of the following hyperparameters is NOT considered when using GridSearchCV for Kernel PCA?

1 / 1 point

- ☒ n\_clusters
- ☐ n\_components
- ☐ gamma
- ☐ kernels

✔ Correct

Correct! "n\_clusters" is not a hyperparameter for Kernel PCA and thus cannot be incorporated.