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Why is PCA called an unsupervised learning algorithm?

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6 Answers

Leonid Boytsov, PhD Natural Language Processing, Carnegie Mellon University (2018)
Updated May 5, 2018

You need to read about supervised vs unsupervised learning in details. In short, the supervised algorithm works for labeled data. That is, you have a set of labeled training points. For example, in the classification task, each training point is labeled by a point class. Labels are normally assigned by a human, i.e., by a **supervisor**.

An unsupervised learning algorithm (such as clustering or PCA) finds some patterns and regularities without direct supervision of a human, i.e, by itself. In particular, PCA finds (mutually orthogonal) directions of greatest variance.

Despite unsupervised algorithms have no human supervision, often times they use techniques from the domain of the supervised learning. In particular, unsupervised learning is often reduced to the supervised learning by creating artificial training data and selecting a loss function.

For example, in the case of the autoencoder every data point can be a training point whereas the loss function is the Euclidean distance between an original and a reconstructed data point.

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Robin Wieruch, Software Engineer for JavaScript, React, Node
Answered Dec 7, 2017

In unsupervised learning, there is no label (y variable), there are only features (x variables). In order to have a PCA running on your training set, there doesn't need to be the label y. See it as column reduction of your unlabelled training set.

However, it can be used as preprocessing for supervised learning where you have a labelled training set. There you split up your training set into unlabelled training set (X) and labels. You run PCA on the unlabelled training set (unsupervised again!) and match your reduced variables x afterward again with your labels (y). Basically you are using a... (more)

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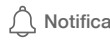More Related Questions

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In a supervised setting such as Classification or Regression, one observes both a set of input variables(say X1, .. Xn) and response or output variables (Y). However, in a un-supervised setting the goal is to identify "meaningful" informative patterns in the given data

PCA (Principal Component Analysis) helps in producing low dimensional representation of the dataset by identifying a set of linear combination of features which have maximum variance and are mutually un-correlated. This linear dimensionality technique could be helpful in understanding latent interaction between the varia... (more)

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Delton Myalil, B. Tech Computer Science, Government College of Engineering, Kannur (2015)　　　　　　　👤+
Answered Sep 8, 2018

In supervised learning, there will always be a teacher - in our case, let us consider something like regression - here, the teacher is the dependent variable y. DepVar tells the algo (through MSE or other measures of error) that what you learned is right or inching towards the correct prediction. That is why it is called supervised learning.

In unsupervised learning, there is no teacher. PCA ie Principal Component Analysis just applies a linear transformation to the input and arrives at an output. Hence it can be said that PCA is unsupervised.

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Matthew Lai, Research Engineer @ Google DeepMind　　　　👤+
Answered Apr 3, 2015

Because you don't give it "answers".

See definition of unsupervised training.

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Shehroz Khan, ML Researcher, Postdoc @U of Toronto　　　　👤+
Answered Apr 3, 2015

PCA is a unsupervised feature transformation method. It is unsupervised because it does not use class labels.

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