

סמינר במדעי היסוד

יום חמישי 26.3.2008 בשעה 13:00-14:00 בפיקוס 201

ד"ר ולדימיר בר-לוקיאנוב

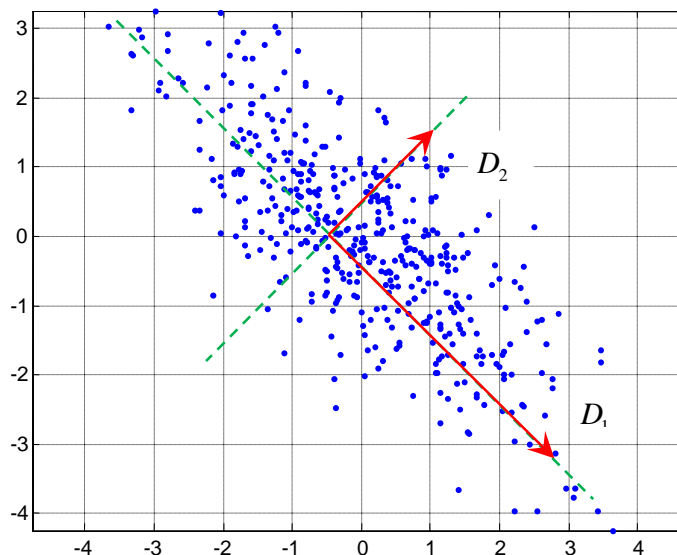
אפקה

Principal Component Analysis (PCA) Basics

תקציר

The Principal Component Analysis (PCA) is a very popular engineering approach, which may be applied to any field dealing with multivariate data. In particular it is widely used in statistical data processing: pattern recognition, feature extraction, image enhancement, multikey searching, dimensionality reduction, data compression and so forth. Given a set of multivariate measurements, the purpose is to find a smaller set of variables with less redundancy – the principle components, which would give as good representation of the given data as possible.

For example, the coordinates of the data on the figure below are correlated – it can be seen that the data points are concentrated along the D_1 direction. The data representation with respect to the D_1, D_2 axes will have uncorrelated coordinates,



which reduce the redundancy (there is no linear relation between coordinates). Moreover, the data representation using only one D_1 coordinate will have relatively small loss, since the deviation from this direction is small enough. In this sense the D_1 coordinate is the principal one.

In the present talk we define the general concept of principal component (PC) and derive a method for PCs finding. Also we consider few

examples of PCA applications in more details to give some impression of PCA approach possibilities.

Related topics:

Karhunen – Loève Expansion (KLE), Factor Analysis (FA), Independent Component Analysis (ICA).

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