



International Conference on Trends and Perspectives
in Linear Statistical Inference
&
21st International Workshop on Matrices and Statistics
16 - 20 July, 2012



- Home
- Young Scientists Awards**
- Announcement
- Invited Speakers
- Participants
- Special Sessions
- Call for Papers**
- Committees
- Organizers
- Program
- Fees
- Deadlines
- Travel
- Previous Conferences
- Related Conferences
- Contact

The International Conference on Trends and Perspectives in Linear Statistical Inference, LinStat'2012, and the 21st International Workshop on Matrices and Statistics, IWMS 2012, will be held on 16-20 July 2012 at Będlewo near Poznań. Będlewo is the Mathematical Research and Conference Center of the Polish Academy of Sciences. This is the follow-up of the 2008 and 2010 edition held in Będlewo, Poland and in Tomar, Portugal. The conference will be held directly after the 8th World Congress in Probability and Statistics, 9-14 July 2012 in Istanbul, <http://www.worldcong2012.org/>.



The purpose of the meeting is to bring together researchers sharing an interest in a variety of aspects of statistics and its applications as well as matrix analysis and its applications to statistics, and offer them a possibility to discuss current developments in these subjects. The conference will mainly focus on a number of topics. The topics that have been selected so far include estimation, prediction and testing in linear models, robustness of relevant statistical methods, estimation of variance components appearing in linear models, generalizations to nonlinear models, design and analysis of experiments, including optimality and comparison of linear experiments, and applications of matrix methods in statistics.

The work of young scientists is highly appreciated. The list of Invited Speakers is opened by the winners of the Young Scientists Awards of LinStat'2010. The Scientific Committee will award the best presentation and best poster. The awarded will be Invited Speakers at the next edition of LinStat.

© Katarzyna Filipiak 2011

- Carlos Cuevas-Covarrubias (Mexico):
Mutual Principal Components, reduction of dimensionality in statistical classification

Mutual Principal Components, reduction of dimensionality in statistical classification

Carlos Cuevas-Covarrubias

Anahuac University, Mexico

Abstract

Linear discriminant analysis (LDA) and principal components analysis (PCA) are two fundamental tools of multivariate statistics. Given a p -dimensional random variable \mathbf{X} , PCA finds its optimal representation in a lower dimensional space. LDA assumes that the sample space of \mathbf{X} is partitioned into two different categories. Given \mathbf{x} , a particular realization of \mathbf{X} , LDA lets us infer whether \mathbf{x} comes from one category or the other. We present an original combination of PCA and LDA where the area under the ROC curve appears as the link between both methods; we call this *Mutual Principal Components*. Our objective is to represent \mathbf{X} in terms of a small number of non correlated factors and maximum separability. Assuming that \mathbf{X} is distributed according to a Gaussian mixture, a parametric approach selects those components with maximum contribution to the area under the ROC curve of an optimal linear discriminant function. A distribution free alternative shows that this principle is equivalent to maximize the square cosine between this discriminant function and the vector space generated by the columns of the resulting principal components transformation matrix.

Keywords

Classification, Linear score, ROC curve, PCA, Reduction of dimensionality.

References

- [1] Anderson, T.W. and R.R. Bahadur (1962). Classification into two multivariate normal distributions with different covariance matrices. *Ann. Math. Statist.* 33, 420–431.
- [2] Anderson, T.W. (1984). *An Introduction to Multivariate Statistical Analysis* (2nd ed). John Wiley and Sons.
- [3] Chang, W.C. (1983). Using Principal Components before separating a mixture of two multivariate normal distributions. *Appl. Statist.* 32(3), 267–275.
- [4] Krzanowski, W.J. and D.J. Hand (2009). *ROC Curves for Continuous Data*. CRC Press.

Participación en congreso internacional

Dr. Carlos Cuevas Covarrubias

- International Conference on Trends and Perspectives in Linear Statistical Inference and the 21st International Workshop on Matrices and Statistics
- Bedlewo, Poznań, Poland.

Resumen en Inglés

- Mutual Principal Components, reduction of dimensionality in statistical classification
- Carlos Cuevas-Covarrubias
- Anahuac University, Mexico
- Abstract
- Linear discriminant analysis (LDA) and principal components analysis (PCA) are two fundamental tools of multivariate statistics. Given
- a p -dimensional random variable X , PCA finds its optimal representation in a lower dimensional space. LDA assumes that the sample space of X is partitioned into two different categories. Given x , a particular realization of X , LDA lets us infer whether x comes from one category or the other. We present an original combination of PCA and LDA where the area under the ROC curve appears as the link between both methods; we call this Mutual Principal Components. Our objective is to represent X in terms of a small number of non correlated factors and maximum separability. Assuming that X is distributed according to a Gaussian mixture, a parametric approach selects those components with maximum contribution to the area under the ROC curve of an optimal linear discriminant function. A distribution free alternative shows that this principle is equivalent to maximize the square cosine between this discriminant function and the vector space generated by the columns of the resulting principal components transformation matrix.
- Keywords Classification, Linear score, ROC curve, PCA, Reduction of dimensionality.
- References
- [1] Anderson, T.W. and R.R. Bahadur (1962). Classification into two multivariate normal distributions with different covariance matrices. *Ann. Math. Statist.* 33, 420-431.
- [2] Anderson, T.W. (1984). *An Introduction to Multivariate Statistical Analysis* (2nd ed). John Wiley and Sons.
- [3] Chang, W.C. (1983). Using Principal Components before separating a mixture of two multivariate normal distributions. *Appl. Statist.* 32(3), 267-275.
- [4] Krzanowski, W.J. and D.J. Hand (2009). *ROC Curves for Continuous Data*. CRC Press.
- Disponible en <http://linstat2012.au.poznan.pl/Abs/Cuevas.pdf>

Resumen en Español

Componentes Principales Mutuas, reducción de la dimensionalidad en clasificación estadística.

El Análisis Lineal Discriminante (ALD) y el Análisis de Componentes Principales (ACP) son dos técnicas fundamentales de análisis multivariado. Dado un vector de dimensión p , el ACP define su mejor representación en un espacio de dimensión reducida. Por otro lado, el ALD asume que el espacio muestral de este vector aleatorio está particionado en dos coategorías; dada una realización del vector, LDA infiere la categoría de origen. En este trabajo analizamos una combinación original del LDA y el ACP en donde el área bajo la curva ROC aparece como elemento de unión entre las dos técnicas. Hemos llamado a esta técnica "Componentes Principales Mutuas". El objetivo es representar al vector aleatorio bajo estudio en términos de un número reducido de factores no correlacionados. Suponiendo que el Vector se distribuye conforme a una Mixtura Gaussiana, utilizamos un enfoque paramétrico que selecciona a aquellos componentes con máxima contribución al área bajo la curva ROC de la función lineal discriminante. Presentamos además una alternativa libre de distribución equivalente a maximizar el coseno del ángulo que forma esta función discriminante con el espacio vectorial generado por las columnas de la matriz de transformación resultante.

Palabras clave: Clasificación, Índice lineal, Curva ROC, ACP, Reducción de dimensionalidad.