Thomaz C. E., Gillies D. F. and Feitosa R. Q.
"A New Covariance Estimate for Bayesian Classifiers in Biometric Recognition"
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Abstract—In many biometric pattern recognition problems, the number of training examples per class is limited and consequently the sample group covariance matrices often used in parametric and non-parametric Bayesian classifiers are poorly estimated or singular. Thus, a considerable amount of effort has been devoted to the design of other covariance estimators, for use in limited sample and high dimensional classification problems. In this paper, a new covariance estimate, called the Maximum Entropy Covariance Selection (MECS) method, is proposed. It is based on combining covariance matrices under the principle of maximum uncertainty. In order to evaluate the MECS effectiveness in biometric problems, experiments on face, facial expression, and fingerprint classification were carried out and compared with popular covariance estimates, including the Reguralized Discriminant Analysis (RDA) and Leave-One-Out Covariance (LOOC) for the parametric classifier, and the Van Ness and Toeplitz covariance estimates for the non-parametric classifier. The results show that in image recognition applications whenever the sample group covariance matrices are poorly estimated or ill posed, the MECS method is faster and usually more accurate than the aforementioned approaches in both parametric and non-parametric Bayesian classifiers.