Classification of Aedes Adults Mosquitoes in Two Distinct Groups Based on Fisher Linear Discriminant Analysis and FZOARO Techniques

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Abstract

This paper describes the breeding, feeding and measurement of Aedes mosquitoes based on body size (wing length). Due to similarity in body size measurements, we were constrained on gender recognition. To reveal the gender identity of these mosquitoes, Fisher linear discriminant analysis and FZOARO classification models were considered suitable for prediction and classification. We randomly selected 15 mosquitoes from each group and categorized the body size as small and large and applied the classification procedures. Both classification techniques perform similar. The numerical simulation reveals that 86.67% were classified as male for group one and 80% were correctly classified as female in group two.

Keywords: Fisher linear discriminant analysis; FZOARO; Classification.

1. Introduction

Linear discriminant analysis (LDA) is one of the most widely used dimension reduction technique due to its simplicity and effectiveness. Fisher (Fisher R. A., 1936) introduced his linear discriminant analysis approach to analyze the iris data set. Fisher linear discriminant analysis (FLDA) is a conventional learning model based statistical classifier designed to allocate an unknown observation vector to one of two multivariate Gaussian populations with different mean vectors and common covariance matrix (Sarunas R., & Duin, R. P. W. 1998). Classical Fisher linear discriminant analysis was originally proposed for two groups but it has however been applied and extended to more than two groups (Barker, M., & Rayens, W., 2003; Deirdre, T., Gerard, D., & Thomas, B. M. 2011; Rao, C. R., 1948; Reynes, S. de Souza, 2006). FLDA finds application in real word lower dimensional data set (Belhumeur, P. N., Hespanha, J. P., & Kriengman, D. J. 1997; Cevikalp, H., Neamtu, M., Wilkes, M., & Barkana, A. 2005; Daniel, L. S., & Weng, J. 1996; Jian, Y., Lei, Z., Jing-yu, Y., & Zhang, D. 2011; Liu, C. J., & Wechsler, H. 2000; Ye, J. et al 2004; Yu, H., & Yang, J. 2001). Thus, it performs poorly if the data set has more dimension than the sample size (Alok, S., & Kulid, K. P. 2012; Marcel, K., Hans-Gunter, M., Hans, D. & Dietrich, K. 2002; Zhao, Z., & Tommy, W. S. C. 2012). FZOARO classification approach is a modified version of FLDA that incorporate compensate constant into the discriminant coefficient. It has comparable classification performance with FLDA. The optimality of these techniques lies on classical assumptions of normality and equal variance covariance matrix and the size of the data dimension (Alvin, C. R. 2002; Joseph, F. H., Jr, 1998; Maurice, M. T., & Lohnes, R. P. 1988). In this paper our focus is to apply these techniques to classify and predict laboratory breeded Aedes mosquitoes using their body