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**Fast Algorithms for the Generalized Foley-Sammon  
Discriminant Analysis.**

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Linear Discriminant Analysis (LDA) is one of the most popular approaches for feature extraction and dimension reduction to overcome the curse of the dimensionality of the high-dimensional data in many applications of data mining, machine learning, and bioinformatics. The undersampled problem, which arises frequently in many modern applications, involves small samples size  $n$  with high number of features  $N$  ( $N > n$ ) and limits the application of the linear discriminant analysis. In this paper, we investigate the generalized Foley-Sammon transform (GFST, [1, 2]) and its regularization (RGFST) for undersampled problems. The optimal linear transformations of RGFST are characterized completely and an equivalent reduced RGFST is established, based on which a global and super-linear convergence algorithm is proposed. Practical implementations including computational complexity and storage of our method are discussed and experimental results on several real world data sets indicate the efficiency of the algorithm and the advantages of RGFST in classification.

# Bibliography

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