

1135-VN-3225

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With large data sets becoming more prevalent, there is an increased demand for dimension reduction techniques. One approach to this problem is to select a subset of original samples using the discrete empirical interpolation method (DEIM), preserving the interpretability of the dimension-reduced data set. However, the number of DEIM-selected samples is limited to be no more than the rank of the original data matrix. While this is not an issue for many data sets, there are a number of settings in which this can limit the algorithm's potential for selecting a subset that contains representatives from each class present in the data. In the presented work, we address this issue through an extension of the DEIM algorithm that allows for the selection of a subset with size greater than the matrix rank. (Received September 27, 2017)