

Rank-Based Chain-Mode Ensemble for Binary Classification

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Abstract : In the field of machine learning, the ensemble has been employed as a common methodology to improve the performance upon multiple base classifiers. However, the true predictions are often canceled out by the false ones during consensus due to a phenomenon called “curse of correlation” which is represented as the strong interferences among the predictions produced by the base classifiers. In addition, the existing practices are still not able to effectively mitigate the problem of imbalanced classification. Based on the analysis on our experiment results, we conclude that the two problems are caused by some inherent deficiencies in the approach of consensus. Therefore, we create an enhanced ensemble algorithm which adopts a designed rank-based chain-mode consensus to overcome the two problems. In order to evaluate the proposed ensemble algorithm, we employ a well-known benchmark data set NSL-KDD (the improved version of dataset KDDCup99 produced by University of New Brunswick) to make comparisons between the proposed and 8 common ensemble algorithms. Particularly, each compared ensemble classifier uses the same 22 base classifiers, so that the differences in terms of the improvements toward the accuracy and reliability upon the base classifiers can be truly revealed. As a result, the proposed rank-based chain-mode consensus is proved to be a more effective ensemble solution than the traditional consensus approach, which outperforms the 8 ensemble algorithms by 20% on almost all compared metrics which include accuracy, precision, recall, F1-score and area under receiver operating characteristic curve.

Keywords : consensus, curse of correlation, imbalance classification, rank-based chain-mode ensemble

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