

Ponente Plenario CAEPIA'16: Conference: Ensemble Approaches to Class Imbalance Learning.

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His papers won the 2001 IEEE Donald G. Fink Prize Paper Award, 2010 and 2015 IEEE Transactions on Evolutionary Computation Outstanding Paper Awards, 2010 BT Gordon Radley Award for Best Author of Innovation (Finalist), 2011 IEEE Transactions on Neural Networks Outstanding Paper Award, and many other best paper awards. He won the prestigious Royal Society Wolfson Research Merit Award in 2012 and the IEEE CIS Evolutionary Computation Pioneer Award in 2013. Over the years, he has collaborated with many industrial partners in his research, including Honda, BT, Thales, Marconi Communications, IBM, Unilever, STMicroelectronics, GSK, Rolls Royce, etc.

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Conference: Ensemble Approaches to Class Imbalance Learning

Many real-world classification problems have unbalanced classes, e.g., in fault detection and software defect prediction, where there are a large number of training examples for the normal class, but few for the abnormal classes. This talk gives an overview of some recent algorithms for dealing with class imbalance in machine learning, including ensemble approaches, sampling methods, evolutionary computation methods, and their combinations. First, we will discuss how diversity influences the classification performance, especially on the minority

class, in ensemble classification algorithms. Then new ensemble algorithms are introduced and evaluated experimentally. Multi-class imbalance will be analysed and considered. The combination of ensemble learning and sampling techniques for dealing with class imbalance will be presented. Finally, we consider a new problem — online class imbalance learning of data streams, where the majority and minority classes are not pre-defined and have to be learned and detected online.

This talk is partially based on the following publications:

S. Wang and X. Yao, "Relationships Between Diversity of Classification Ensembles and Single-Class Performance Measures," *IEEE Transactions on Knowledge and Data Engineering*, 25(1):206-219, January 2013.

S. Wang and X. Yao, "Multi-Class Imbalance Problems: Analysis and Potential Solutions," *IEEE Transactions on Systems, Man and Cybernetics, Part B*, 42(4):1119-1130, August 2012.

M. Lin, K. Tang and X. Yao, "A Dynamic Sampling Approach to Training Neural Networks for Multi-class Imbalance Classification," *IEEE Transactions on Neural Networks and Learning Systems*, 24(4):647-660, April 2013.

U. Bhowan, M. Johnston, M. Zhang and X. Yao, "Evolving Diverse Ensembles using Genetic Programming for Classification with Unbalanced Data," *IEEE Transactions on Evolutionary Computation*, 17(3):368-386, June 2013.

S. Wang, L. L. Minku and X. Yao, "Resampling-Based Ensemble Methods for Online Class Imbalance Learning," *IEEE Transactions on Knowledge and Data Engineering*, 27(5):1356-1368, May 2015.