

Conflict-Based Classification with Parameterized Coalition Thresholds: Unified and Diverse Approaches for Dispersed Data

Jakub Sacewicz¹[0009-0003-1963-7079] and Małgorzata Przybyła-Kasperek^{1,2}[0000-0003-0616-9694]

¹ University of Silesia in Katowice - Institute of Computer Science, Będzińska, 39, 41-200 Sosnowiec, Poland

{jakub.sacewicz,malgorzata.przybyla-kasperek}@us.edu.pl
<https://us.edu.pl/institut/ii/en>

² Constantine the Philosopher University in Nitra, 949 01 Nitra, Slovakia

Abstract. The paper addresses the challenge of classifying dispersed data collected from independent sources. The proposed approach constructs ensembles of random trees for local datasets and applies conflict analysis to identify coalitions of models with similar or diverse predictions. Two strategies for forming global decisions are examined: unified coalitions (grouping models with similar opinions) and diverse coalitions (combining models with differing opinions). Each strategy is evaluated in weighted and unweighted variants, where weights are based on validation accuracy. The key novelty of this work lies in introducing parameterization of the threshold that determines when local models are considered to form a coalition or to be in conflict within Pawlak's conflict model. This parameter is dynamically optimized using a random search procedure, which significantly influences coalition structure and classification performance. To the best of our knowledge, systematic exploration of parameter tuning in conflict-based coalition frameworks (for unified and diverse coalitions) has not been previously addressed. The proposed method is assessed on multiple public datasets and compared with traditional ensemble and optimization strategies, demonstrating improved accuracy and robustness. These findings highlight the importance of adaptive coalition formation and conflict parameter optimization in distributed learning environments.

Keywords: Dispersed data · Conflict analysis · Random trees · Random forests · Ensembles of classifiers · Random search.