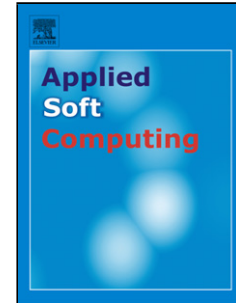# Accepted Manuscript

Title: Extended Belief-Rule-Based System with New Activation Rule Determination and Weight Calculation for Classification Problems

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Extended Belief-Rule-Based System with New Activation Rule Determination and Weight Calculation for Classification Problems

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Highlights

- Summarize the drawbacks of the conventional EBRB system and the causes of these drawbacks.
- Propose a new activation rule determination method for the EBRB classification system.
- Propose a new activation weight calculation method for the EBRB classification system.
- Experiments show the proposed system has a high accuracy and excellent response time.

Abstract: Among many rule-based systems employed to deal with classification problems, the extended belief-rule-based (EBRB) system is an effective and efficient tool and also has potentials in handing both quantitative and qualitative information under uncertainty. Despite many advantages, several drawbacks must be overcome for better applying the conventional EBRB system, including counterintuitive individual matching degrees, insensitivity to the calculation of individual matching degrees, and the inconsistency problem. Accordingly, by constructing the activation region of extended belief rules and revising the calculation formula of activation weights, the new procedures of activation rule determination and weight calculation are proposed to improve the conventional EBRB system, while the original procedures of rule inference and class estimation are retained from the conventional EBRB system. Nineteen classification datasets with different numbers of classes are studied to validate the efficiency and effectiveness of the proposed EBRB classification system compared with existing works. The comparison results demonstrate that the proposed EBRB classification system not only obtains a high accuracy better than the conventional EBRB system, but also has an excellent response time for classification. More importantly, the results derived from multi-class datasets show the significant performance of the proposed EBRB classification system compared with some state of art classification tools.

Keywords: Extended belief-rule-based system; Classification problem; Activation rule determination; Activation weight calculation; Multi-class

1. Introduction

Classification is a common and fundamental problem involved in various theoretical and practical applications, including,