

Preface

In this book, a new model of modular neural network based on a granular approach, the combination of their responses, and the optimization by hierarchical genetic algorithms are introduced. The new model of modular neural networks is applied to human recognition, and for this four databases of biometric measures are used; face, iris, ear, and voice. The different responses are combined using type-1 and interval type-2 fuzzy logic. Finally, two hierarchical genetic algorithms are used to perform the optimization of the granular modular neural networks parameters and fuzzy inference system parameters. The experimental results obtained using the proposed method show that when the optimization is used, the results can be better than without optimization.

This book is intended to be a reference for scientists and engineers interested in applying soft computing techniques, such as neural networks, fuzzy logic, and genetic algorithms; all of them apply to human recognition, but also in general to pattern recognition and hybrid intelligent systems and similar ones. We consider that this book can also be used to find novel ideas for new lines of research, or to continue the lines of research proposed by authors of the book.

In Chap. 1, a brief introduction to the book is presented, where the intelligence techniques that are used, the main contribution, motivations, application, and a general description of the proposed methods are mentioned.

We present in Chap. 2 the background and theory required to understand the methods and ideas presented later in the book. In this chapter some concepts such as modular neural network, fuzzy logic, genetic algorithm, granular computing, and a brief description of the application used for testing our proposed method are explained. This chapter allows readers to understand better the different techniques used in the proposed method.

In Chap. 3, we explain the proposed method, where the new model is detailed by explaining each step needed to achieve our proposed method. In addition, the parameters, equations, and figures are presented to describe deeply our main idea. First, the two proposed granulation methods are described with their optimizations,

and second, the combination of responses are described with its respective optimization using hierarchical genetic algorithms.

In Chap. 4, we present a detailed explanation of how the proposed method is applied to human recognition, and the different databases that are used in the experiments are described in a detailed fashion.

We show the experimental results achieved in this research work in Chap. 5, where the different performed tests are described and the best results are shown for each database. The non-optimized tests show the corresponding modular granular neural networks architectures; meanwhile the optimized results show the best results and the graphical convergences of the best optimizations.

In Chap. 6, we offer our general conclusions and future works of this research work. In a general way, a new model of modular granular neural networks is introduced, where the combination of responses is performed using fuzzy logic, and its optimization is also developed to improve the results.

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