In this book, a new approach for diagnosis and risk evaluation of arterial hypertension is introduced. The new approach was implemented as a hybrid intelligent system combining modular neural networks and fuzzy systems. The different responses of the hybrid system are combined using fuzzy logic. Finally, two genetic algorithms are used to perform the optimization of the modular neural networks parameters and fuzzy inference system parameters. The experimental results obtained using the proposed method on real patient data 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 physicians interested in applying soft computing techniques, such as neural networks, fuzzy logic, and genetic algorithms, all of them applied in medical diagnosis, but also in general to classification and pattern recognition and similar problems. 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 intelligent techniques are used in the proposed approach. In addition, the main contribution, motivations, application, and a general description of the proposed methods are mentioned.

We present in Chap. 2 the application of fuzzy logic for arterial hypertension classification. A fuzzy system was developed based on the knowledge of medical experts in hypertension classification. Simulation results show the advantages of using fuzzy logic in this real-world problem. This chapter also allows readers to understand better the problem of hypertension.

In Chap. 3, we explain a neuro-fuzzy hybrid model for the diagnosis of high blood pressure or hypertension to provide a diagnosis as accurate as possible based on intelligent computing techniques, such as neural networks and fuzzy logic.

In Chap. 4, we present a detailed explanation of a neuro-fuzzy hybrid model used as a new Artificial Intelligence method to classify high blood pressure (HBP). The neuro-fuzzy hybrid model uses techniques such as neural networks, fuzzy logic, and evolutionary computation. In this case, the genetic algorithms are used for optimizing the structure of the neuro-fuzzy hybrid model.
In Chap. 5, a method to diagnose the blood pressure (systolic pressure, diastolic pressure, and pulse) of a patient is proposed. This method consists of a modular neural network and its response with average integration. The proposed approach consists on applying these methods to find the best architecture of the modular neural network and the lowest prediction error. Simulation results show that the modular network produces a good diagnosis of the blood pressure of a patient.

In Chap. 6, a hybrid intelligent system is presented as a powerful combination of soft computing techniques for reducing the complexity in solving difficult problems. Nowadays, cardiovascular diseases, such as arterial hypertension (high blood pressure), have a high prevalence in the world population. We design in this research work a hybrid model using modular neural networks, and as response integrator, we use fuzzy systems to provide an accurate risk diagnosis of hypertension, so we can prevent future diseases in people based on the systolic pressure, diastolic pressure, and pulse of patients.

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