

Neural Networks And Fuzzy Logic

[#neural networks](#) [#fuzzy logic](#) [#neuro-fuzzy systems](#) [#artificial intelligence](#) [#computational intelligence](#)

Explore the fascinating intersection of Neural Networks and Fuzzy Logic, two powerful paradigms in Artificial Intelligence. This topic delves into how these computational intelligence methods can be combined to create robust and adaptive neuro-fuzzy systems capable of handling complex, uncertain data.

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NEURAL NETWORKS, FUZZY LOGIC AND GENETIC ALGORITHM

This book provides comprehensive introduction to a consortium of technologies underlying soft computing, an evolving branch of computational intelligence. The constituent technologies discussed comprise neural networks, fuzzy logic, genetic algorithms, and a number of hybrid systems which include classes such as neuro-fuzzy, fuzzy-genetic, and neuro-genetic systems. The hybridization of the technologies is demonstrated on architectures such as Fuzzy-Back-propagation Networks (NN-FL), Simplified Fuzzy ARTMAP (NN-FL), and Fuzzy Associative Memories. The book also gives an exhaustive discussion of FL-GA hybridization. Every architecture has been discussed in detail through illustrative examples and applications. The algorithms have been presented in pseudo-code with a step-by-step illustration of the same in problems. The applications, demonstrative of the potential of the architectures, have been chosen from diverse disciplines of science and engineering. This book with a wealth of information that is clearly presented and illustrated by many examples and applications is designed for use as a text for courses in soft computing at both the senior undergraduate and first-year post-graduate engineering levels. It should also be of interest to researchers and technologists desirous of applying soft computing technologies to their respective fields of work.

NEURAL NETWORKS, FUZZY SYSTEMS AND EVOLUTIONARY ALGORITHMS : SYNTHESIS AND APPLICATIONS

The second edition of this book provides a comprehensive introduction to a consortium of technologies underlying soft computing, an evolving branch of computational intelligence, which in recent years, has turned synonymous to it. The constituent technologies discussed comprise neural network (NN), fuzzy system (FS), evolutionary algorithm (EA), and a number of hybrid systems, which include classes such as neuro-fuzzy, evolutionary-fuzzy, and neuro-evolutionary systems. The hybridization of the technologies is demonstrated on architectures such as fuzzy backpropagation network (NN-FS hybrid), genetic algorithm-based backpropagation network (NN-EA hybrid), simplified fuzzy ARTMAP (NN-FS hybrid), fuzzy associative memory (NN-FS hybrid), fuzzy logic controlled genetic algorithm (EA-FS hybrid) and evolutionary extreme learning machine (NN-EA hybrid). Every architecture has been discussed in detail through illustrative examples and applications. The algorithms have been

presented in pseudo-code with a step-by-step illustration of the same in problems. The applications, demonstrative of the potential of the architectures, have been chosen from diverse disciplines of science and engineering. This book, with a wealth of information that is clearly presented and illustrated by many examples and applications, is designed for use as a text for the courses in soft computing at both the senior undergraduate and first-year postgraduate levels of computer science and engineering. It should also be of interest to researchers and technologists desirous of applying soft computing technologies to their respective fields of work.

Neural Networks & Fuzzy Logic

The research presented in this book shows how combining deep neural networks with a special class of fuzzy logical rules and multi-criteria decision tools can make deep neural networks more interpretable – and even, in many cases, more efficient. Fuzzy logic together with multi-criteria decision-making tools provides very powerful tools for modeling human thinking. Based on their common theoretical basis, we propose a consistent framework for modeling human thinking by using the tools of all three fields: fuzzy logic, multi-criteria decision-making, and deep learning to help reduce the black-box nature of neural models; a challenge that is of vital importance to the whole research community.

Explainable Neural Networks Based on Fuzzy Logic and Multi-criteria Decision Tools

Written by one of the foremost experts in the field of neural networks, this is the first book to combine the theories and applications of neural networks and fuzzy systems. The book is divided into three sections: Neural Network Theory, Neural Network Applications, and Fuzzy Theory and Applications. It describes how neural networks can be used in applications such as: signal and image processing, function estimation, robotics and control, analog VLSI and optical hardware design; and concludes with a presentation of the new geometric theory of fuzzy sets, systems, and associative memories.

Neural Networks and Fuzzy Systems

Understand the fundamentals of the emerging field of fuzzy neural networks, their applications and the most used paradigms with this carefully organized state-of-the-art textbook. Previously tested at a number of noteworthy conference tutorials, the simple numerical examples presented in this book provide excellent tools for progressive learning. UNDERSTANDING NEURAL NETWORKS AND FUZZY LOGIC offers a simple presentation and bottom-up approach that is ideal for working professional engineers, undergraduates, medical/biology majors, and anyone with a nonspecialist background. Sponsored by: IEEE Neural Networks Council

Understanding Neural Networks and Fuzzy Logic

Combines the study of neural networks and fuzzy systems with symbolic artificial intelligence (AI) methods to build comprehensive AI systems. Describes major AI problems (pattern recognition, speech recognition, prediction, decision-making, game-playing) and provides illustrative examples. Includes applications in engineering, business and finance.

Foundations of Neural Networks, Fuzzy Systems, and Knowledge Engineering

A practical reference that presents concise and comprehensive reports on the major activities in fuzzy logic and neural networks, with emphasis on the applications and systems of interest to computer engineers. Each of the 31 chapters focuses on the most important activity of a specific topic, and the chapters are organized into three parts: principles and algorithms; applications; and architectures and systems. The applications for fuzzy logic include home appliance design and manufacturing process; those for neural networks include radar, sonar, and speech signal processing, remote sensing, and electrical power systems. Annotation copyright by Book News, Inc., Portland, OR

Fuzzy Logic and Neural Network Handbook

This volume presents new trends and developments in soft computing techniques. Topics include: neural networks, fuzzy systems, evolutionary computation, knowledge discovery, rough sets, and hybrid methods. It also covers various applications of soft computing techniques in economics, mechanics, medicine, automatics and image processing. The book contains contributions from internationally recognized scientists, such as Zadeh, Bubnicki, Pawlak, Amari, Batyrshin, Hirota, Koczy, Kosinski,

Novák, S.-Y. Lee, Pedrycz, Raudys, Setiono, Sincak, Strumillo, Takagi, Usui, Wilamowski and Zurada. An excellent overview of soft computing methods and their applications.

Artificial Neural Networks and Fuzzy Logic

Neural Networks and Fuzzy-Logic Control introduces a simple integrated environment for programming displays and report generation. It includes the only currently available software that permits combined simulation of multiple neural networks, fuzzy-logic controllers, and dynamic systems such as robots or physiological models. The enclosed educational version of DESIRE/NEUNET differs from the full system mainly in the size of its data area and includes a compiler, two screen editors, color graphics, and many ready-to-run examples. The software lets users or instructors add their own help screens and interactive menus. The version of DESIRE/NEUNET included here is for PCs, viz. 286/287, 386/387, 486DX, Pentium, P6, SX with math coprocessor.

Neural Networks and Soft Computing

Artificial neural networks can mimic the biological information-processing mechanism in - a very limited sense. Fuzzy logic provides a basis for representing uncertain and imprecise knowledge and forms a basis for human reasoning. Neural networks display genuine promise in solving problems, but a definitive theoretical basis does not yet exist for their design. Fusion of Neural Networks, Fuzzy Systems and Genetic Algorithms integrates neural net, fuzzy system, and evolutionary computing in system design that enables its readers to handle complexity - offsetting the demerits of one paradigm by the merits of another. This book presents specific projects where fusion techniques have been applied. The chapters start with the design of a new fuzzy-neural controller. Remaining chapters discuss the application of expert systems, neural networks, fuzzy control, and evolutionary computing techniques in modern engineering systems. These specific applications include: direct frequency converters electro-hydraulic systems motor control toaster control speech recognition vehicle routing fault diagnosis Asynchronous Transfer Mode (ATM) communications networks telephones for hard-of-hearing people control of gas turbine aero-engines telecommunications systems design Fusion of Neural Networks, Fuzzy Systems and Genetic Algorithms covers the spectrum of applications - comprehensively demonstrating the advantages of fusion techniques in industrial applications.

Neural Networks and Fuzzy-logic Control on Personal Computers and Workstations

There are many uncertainties in the real world. Fuzzy theory treats a kind of uncertainty called fuzziness, where it shows that the boundary of yes or no is ambiguous and appears in the meaning of words or is included in the subjunctives or recognition of human beings. Fuzzy theory is essential and is applicable to many systems -- from consumer products like washing machines or refrigerators to big systems like trains or subways. Recently, fuzzy theory has been a strong tool for combining new theories (called soft computing) such as genetic algorithms or neural networks to get knowledge from real data. This introductory book enables the reader to understand easily what fuzziness is and how one can apply fuzzy theory to real problems -- which explains why it was a best-seller in Japan.

Neural Network and Fuzzy Logic Applications in C/C++

Computational Intelligence: Synergies of Fuzzy Logic, Neural Networks and Evolutionary Computing presents an introduction to some of the cutting edge technological paradigms under the umbrella of computational intelligence. Computational intelligence schemes are investigated with the development of a suitable framework for fuzzy logic, neural networks and evolutionary computing, neuro-fuzzy systems, evolutionary-fuzzy systems and evolutionary neural systems. Applications to linear and non-linear systems are discussed with examples. Key features: Covers all the aspects of fuzzy, neural and evolutionary approaches with worked out examples, MATLAB® exercises and applications in each chapter Presents the synergies of technologies of computational intelligence such as evolutionary fuzzy neural fuzzy and evolutionary neural systems Considers real world problems in the domain of systems modelling, control and optimization Contains a foreword written by Lotfi Zadeh Computational Intelligence: Synergies of Fuzzy Logic, Neural Networks and Evolutionary Computing is an ideal text for final year undergraduate, postgraduate and research students in electrical, control, computer, industrial and manufacturing engineering.

Fusion of Neural Networks, Fuzzy Systems and Genetic Algorithms

Intelligent Hybrid Systems: Fuzzy Logic, Neural Networks, and Genetic Algorithms is an organized edited collection of contributed chapters covering basic principles, methodologies, and applications of fuzzy systems, neural networks and genetic algorithms. All chapters are original contributions by leading researchers written exclusively for this volume. This book reviews important concepts and models, and focuses on specific methodologies common to fuzzy systems, neural networks and evolutionary computation. The emphasis is on development of cooperative models of hybrid systems. Included are applications related to intelligent data analysis, process analysis, intelligent adaptive information systems, systems identification, nonlinear systems, power and water system design, and many others. Intelligent Hybrid Systems: Fuzzy Logic, Neural Networks, and Genetic Algorithms provides researchers and engineers with up-to-date coverage of new results, methodologies and applications for building intelligent systems capable of solving large-scale problems.

Fuzzy Logic for Beginners

In this monograph, the authors introduce a novel fuzzy rule-base, referred to as the Fuzzy All-permutations Rule-Base (FARB). They show that inferring the FARB, using standard tools from fuzzy logic theory, yields an input-output map that is mathematically equivalent to that of an artificial neural network. Conversely, every standard artificial neural network has an equivalent FARB. The FARB-ANN equivalence integrates the merits of symbolic fuzzy rule-bases and sub-symbolic artificial neural networks, and yields a new approach for knowledge-based neurocomputing in artificial neural networks.

Computational Intelligence

The extensively revised and updated edition provides a logical and easy-to-follow progression through C++ programming for two of the most popular technologies for artificial intelligence--neural and fuzzy programming. The authors cover theory as well as practical examples, giving programmers a solid foundation as well as working examples with reusable code.

Intelligent Hybrid Systems

Motor monitoring, incipient fault detection, and diagnosis are important and difficult topics in the engineering field. These topics deal with motors ranging from small DC motors used in intensive care units to the huge motors used in nuclear power plants. With proper machine monitoring and fault detection schemes, improved safety and reliability can be achieved for different engineering system operations. The importance of incipient fault detection can be found in the cost saving which can be obtained by detecting potential machine failures before they occur. Non-invasive, inexpensive, and reliable fault detection techniques are often preferred by many engineers. A large number of techniques, such as expert system approaches and vibration analysis, have been developed for motor fault detection purposes. Those techniques have achieved a certain degree of success. However, due to the complexity and importance of the systems, there is a need to further improve existing fault detection techniques. A major key to the success in fault detection is the ability to use appropriate technology to effectively fuse the relevant information to provide accurate and reliable results. The advance in technology will provide opportunities for improving existing fault detection schemes. With the maturing technology of artificial neural network and fuzzy logic, the motor fault detection problem can be solved using an innovative approach based on measurements that are easily accessible, without the need for rigorous mathematical models. This approach can identify and aggregate the relevant information for accurate and reliable motor fault detection. This book will introduce the necessary concepts of neural network and fuzzy logic, describe the advantages and challenges of using these technologies to solve motor fault detection problems, and discuss several design considerations and methodologies in applying these techniques to motor incipient fault detection.

Knowledge-Based Neurocomputing: A Fuzzy Logic Approach

This book has been written to solve engineering problems like process control, modelling communication, pattern recognition, speech recognition, etc. It is intended to be an introduction to the subject of artificial neural network and fuzzy logic systems for readers at the junior or senior levels, as well as scientists and engineers. --

C++ Neural Networks and Fuzzy Logic

Gain insight into fuzzy logic and neural networks, and how the integration between the two models makes intelligent systems in the current world. This book simplifies the implementation of fuzzy logic and neural network concepts using Python. You'll start by walking through the basics of fuzzy sets and relations, and how each member of the set has its own membership function values. You'll also look at different architectures and models that have been developed, and how rules and reasoning have been defined to make the architectures possible. The book then provides a closer look at neural networks and related architectures, focusing on the various issues neural networks may encounter during training, and how different optimization methods can help you resolve them. In the last section of the book you'll examine the integrations of fuzzy logics and neural networks, the adaptive neuro fuzzy Inference systems, and various approximations related to the same. You'll review different types of deep neuro fuzzy classifiers, fuzzy neurons, and the adaptive learning capability of the neural networks. The book concludes by reviewing advanced neuro fuzzy models and applications. What You'll Learn Understand fuzzy logic, membership functions, fuzzy relations, and fuzzy inference Review neural networks, back propagation, and optimization Work with different architectures such as Takagi-Sugeno model, Hybrid model, genetic algorithms, and approximations Apply Python implementations of deep neuro fuzzy system Who This book Is For Data scientists and software engineers with a basic understanding of Machine Learning who want to expand into the hybrid applications of deep learning and fuzzy logic.

C++ Neural Networks and Fuzzy Logic

This textbook provides a thorough introduction to the field of learning from experimental data and soft computing. Support vector machines (SVM) and neural networks (NN) are the mathematical structures, or models, that underlie learning, while fuzzy logic systems (FLS) enable us to embed structured human knowledge into workable algorithms. The book assumes that it is not only useful, but necessary, to treat SVM, NN, and FLS as parts of a connected whole. Throughout, the theory and algorithms are illustrated by practical examples, as well as by problem sets and simulated experiments. This approach enables the reader to develop SVM, NN, and FLS in addition to understanding them. The book also presents three case studies: on NN-based control, financial time series analysis, and computer graphics. A solutions manual and all of the MATLAB programs needed for the simulated experiments are available.

Methodologies Of Using Neural Network And Fuzzy Logic Technologies For Motor Incipient Fault Detection

Provides an in-depth and even treatment of the three pillars of computational intelligence and how they relate to one another This book covers the three fundamental topics that form the basis of computational intelligence: neural networks, fuzzy systems, and evolutionary computation. The text focuses on inspiration, design, theory, and practical aspects of implementing procedures to solve real-world problems. While other books in the three fields that comprise computational intelligence are written by specialists in one discipline, this book is co-written by current former Editor-in-Chief of IEEE Transactions on Neural Networks and Learning Systems, a former Editor-in-Chief of IEEE Transactions on Fuzzy Systems, and the founding Editor-in-Chief of IEEE Transactions on Evolutionary Computation. The coverage across the three topics is both uniform and consistent in style and notation. Discusses single-layer and multilayer neural networks, radial-basis function networks, and recurrent neural networks Covers fuzzy set theory, fuzzy relations, fuzzy logic interference, fuzzy clustering and classification, fuzzy measures and fuzzy integrals Examines evolutionary optimization, evolutionary learning and problem solving, and collective intelligence Includes end-of-chapter practice problems that will help readers apply methods and techniques to real-world problems Fundamentals of Computational intelligence is written for advanced undergraduates, graduate students, and practitioners in electrical and computer engineering, computer science, and other engineering disciplines.

Fundamental of Artificial Neural Network and Fuzzy Logic

Neural Fuzzy Systems provides a comprehensive, up-to-date introduction to the basic theories of fuzzy systems and neural networks, as well as an exploration of how these two fields can be integrated to create Neural-Fuzzy Systems. It includes Matlab software, with a Neural Network Toolkit, and a Fuzzy System Toolkit.

Deep Neuro-Fuzzy Systems with Python

The past fifteen years has witnessed an explosive growth in the fundamental research and applications of artificial neural networks (ANNs) and fuzzy logic (FL). The main impetus behind this growth has been

the ability of such methods to offer solutions not amenable to conventional techniques, particularly in application domains involving pattern recognition, prediction and control. Although the origins of ANNs and FL may be traced back to the 1940s and 1960s, respectively, the most rapid progress has only been achieved in the last fifteen years. This has been due to significant theoretical advances in our understanding of ANNs and FL, complemented by major technological developments in high-speed computing. In geophysics, ANNs and FL have enjoyed significant success and are now employed routinely in the following areas (amongst others): 1. Exploration Seismology. (a) Seismic data processing (trace editing; first break picking; deconvolution and multiple suppression; wavelet estimation; velocity analysis; noise identification/reduction; statics analysis; dataset matching/prediction, attenuation), (b) AVO analysis, (c) Chimneys, (d) Compression I dimensionality reduction, (e) Shear-wave analysis, (f) Interpretation (event tracking; lithology prediction and well-log analysis; prospect appraisal; hydrocarbon prediction; inversion; reservoir characterisation; quality assessment; tomography). 2. Earthquake Seismology and Subterranean Nuclear Explosions. 3. Mineral Exploration. 4. Electromagnetic I Potential Field Exploration. (a) Electromagnetic methods, (b) Potential field methods, (c) Ground penetrating radar, (d) Remote sensing, (e) inversion.

Learning and Soft Computing

Provides an up-to-date integration of expert systems with fuzzy logic and neural networks. Includes coverage of simulation models not present in other books. Presents cases and examples taken from the authors' experience in research and applying the technology to real-world situations.

Fundamentals of Computational Intelligence

Neural Networks and Fuzzy Systems: Theory and Applications discusses theories that have proven useful in applying neural networks and fuzzy systems to real world problems. The book includes performance comparison of neural networks and fuzzy systems using data gathered from real systems. Topics covered include the Hopfield network for combinatorial optimization problems, multilayered neural networks for pattern classification and function approximation, fuzzy systems that have the same functions as multilayered networks, and composite systems that have been successfully applied to real world problems. The author also includes representative neural network models such as the Kohonen network and radial basis function network. New fuzzy systems with learning capabilities are also covered. The advantages and disadvantages of neural networks and fuzzy systems are examined. The performance of these two systems in license plate recognition, a water purification plant, blood cell classification, and other real world problems is compared.

Neural Fuzzy Systems

In this book, a new method for hybrid intelligent systems is proposed. The proposed method is based on a granular computing approach applied in two levels. The techniques used and combined in the proposed method are modular neural networks (MNNs) with a Granular Computing (GrC) approach, thus resulting in a new concept of MNNs; modular granular neural networks (MGNNs). In addition fuzzy logic (FL) and hierarchical genetic algorithms (HGAs) are techniques used in this research work to improve results. These techniques are chosen because in other works have demonstrated to be a good option, and in the case of MNNs and HGAs, these techniques allow to improve the results obtained than with their conventional versions; respectively artificial neural networks and genetic algorithms.

Geophysical Applications of Artificial Neural Networks and Fuzzy Logic

Soft computing encompasses various computational methodologies, which, unlike conventional algorithms, are tolerant of imprecision, uncertainty, and partial truth. Soft computing technologies offer adaptability as a characteristic feature and thus permit the tracking of a problem through a changing environment. Besides some recent developments in areas like rough sets and probabilistic networks, fuzzy logic, evolutionary algorithms, and artificial neural networks are core ingredients of soft computing, which are all bio-inspired and can easily be combined synergetically. This book presents a well-balanced integration of fuzzy logic, evolutionary computing, and neural information processing. The three constituents are introduced to the reader systematically and brought together in differentiated combinations step by step. The text was developed from courses given by the authors and offers numerous illustrations as

Fuzzy Engineering Expert Systems with Neural Network Applications

With increasing demands for high precision autonomous control over wide operating envelopes, conventional control engineering approaches are unable to adequately deal with system complexity, nonlinearities, spatial and temporal parameter variations, and with uncertainty. Intelligent Control or self-organising/learning control is a new emerging discipline that is designed to deal with problems. Rather than being model based, it is experiential based. Intelligent Control is the amalgam of the disciplines of Artificial Intelligence, Systems Theory and Operations Research. It uses most recent experiences or evidence to improve its performance through a variety of learning schemas, that for practical implementation must demonstrate rapid learning convergence, be temporally stable, be robust to parameter changes and internal and external disturbances. It is shown in this book that a wide class of fuzzy logic and neural net based learning algorithms satisfy these conditions. It is demonstrated that this class of intelligent controllers is based upon a fixed nonlinear mapping of the input (sensor) vector, followed by an output layer linear mapping with coefficients that are updated by various first order learning laws. Under these conditions self-organising fuzzy logic controllers and neural net controllers have common learning attributes. A theme example of the navigation and control of an autonomous guided vehicle is included throughout, together with a series of bench examples to demonstrate this new theory and its applicability.

Neural Networks and Fuzzy Systems

Illustrating how fuzzy logic and neural networks can be integrated into a model reference control context for real-time control of multivariable systems, this book provides an architecture which accommodates several popular learning/reasoning paradigms.

Hierarchical Modular Granular Neural Networks with Fuzzy Aggregation

AN INDISPENSABLE RESOURCE FOR ALL THOSE WHO DESIGN AND IMPLEMENT TYPE-1 AND TYPE-2 FUZZY NEURAL NETWORKS IN REAL TIME SYSTEMS Delve into the type-2 fuzzy logic systems and become engrossed in the parameter update algorithms for type-1 and type-2 fuzzy neural networks and their stability analysis with this book! Not only does this book stand apart from others in its focus but also in its application-based presentation style. Prepared in a way that can be easily understood by those who are experienced and inexperienced in this field. Readers can benefit from the computer source codes for both identification and control purposes which are given at the end of the book. A clear and an in-depth examination has been made of all the necessary mathematical foundations, type-1 and type-2 fuzzy neural network structures and their learning algorithms as well as their stability analysis. You will find that each chapter is devoted to a different learning algorithm for the tuning of type-1 and type-2 fuzzy neural networks; some of which are: • Gradient descent • Levenberg-Marquardt • Extended Kalman filter In addition to the aforementioned conventional learning methods above, number of novel sliding mode control theory-based learning algorithms, which are simpler and have closed forms, and their stability analysis have been proposed. Furthermore, hybrid methods consisting of particle swarm optimization and sliding mode control theory-based algorithms have also been introduced. The potential readers of this book are expected to be the undergraduate and graduate students, engineers, mathematicians and computer scientists. Not only can this book be used as a reference source for a scientist who is interested in fuzzy neural networks and their real-time implementations but also as a course book of fuzzy neural networks or artificial intelligence in master or doctorate university studies. We hope that this book will serve its main purpose successfully. Parameter update algorithms for type-1 and type-2 fuzzy neural networks and their stability analysis Contains algorithms that are applicable to real time systems Introduces fast and simple adaptation rules for type-1 and type-2 fuzzy neural networks Number of case studies both in identification and control Provides MATLAB® codes for some algorithms in the book

Soft Computing

This book focuses on computational intelligence techniques and their applications -- fast-growing and promising research topics that have drawn a great deal of attention from researchers over the years. It brings together many different aspects of the current research on intelligence technologies such as neural networks, support vector machines, fuzzy logic and evolutionary computation, and covers a wide range of applications from pattern recognition and system modeling, to intelligent control problems and biomedical applications. Fundamental concepts and essential analysis of various computational techniques are presented to offer a systematic and effective tool for better treatment of different

applications, and simulation and experimental results are included to illustrate the design procedure and the effectiveness of the approaches.

Intelligent Control: Aspects Of Fuzzy Logic And Neural Nets

*Introduces cutting-edge control systems to a wide readership of engineers and students *The first book on neuro-fuzzy control systems to take a practical, applications-based approach, backed up with worked examples and case studies *Learn to use VHDL in real-world applications Introducing cutting edge control systems through real-world applications Neural networks and fuzzy logic based systems offer a modern control solution to AC machines used in variable speed drives, enabling industry to save costs and increase efficiency by replacing expensive and high-maintenance DC motor systems. The use of fast micros has revolutionised the field with sensorless vector control and direct torque control. This book reflects recent research findings and acts as a useful guide to the new generation of control systems for a wide readership of advanced undergraduate and graduate students, as well as practising engineers. The authors guide readers quickly and concisely through the complex topics of neural networks, fuzzy logic, mathematical modelling of electrical machines, power systems control and VHDL design. Unlike the academic monographs that have previously been published on each of these subjects, this book combines them and is based round case studies of systems analysis, control strategies, design, simulation and implementation. The result is a guide to applied control systems design that will appeal equally to students and professional design engineers. The book can also be used as a unique VHDL design aid, based on real-world power engineering applications.

Fuzzy logic and neural networks [electronic resource]

In this book a new model for data classification was developed. This new model is based on the competitive neural network Learning Vector Quantization (LVQ) and type-2 fuzzy logic. This computational model consists of the hybridization of the aforementioned techniques, using a fuzzy logic system within the competitive layer of the LVQ network to determine the shortest distance between a centroid and an input vector. This new model is based on a modular LVQ architecture to further improve its performance on complex classification problems. It also implements a data-similarity process for preprocessing the datasets, in order to build dynamic architectures, having the classes with the highest degree of similarity in different modules. Some architectures were developed in order to work mainly with two datasets, an arrhythmia dataset (using ECG signals) for classifying 15 different types of arrhythmias, and a satellite images segments dataset used for classifying six different types of soil. Both datasets show interesting features that makes them interesting for testing new classification methods.

Fuzzy-neural Control

One of the attractions of fuzzy logic is its utility in solving many real engineering problems. As many have realised, the major obstacles in building a real intelligent machine involve dealing with random disturbances, processing large amounts of imprecise data, interacting with a dynamically changing environment, and coping with uncertainty. Neural-fuzzy techniques help one to solve many of these problems. Fuzzy Logic and Intelligent Systems reflects the most recent developments in neural networks and fuzzy logic, and their application in intelligent systems. In addition, the balance between theoretical work and applications makes the book suitable for both researchers and engineers, as well as for graduate students.

Applications and Science of Neural Networks, Fuzzy Systems, and Evolutionary Computation II

Fuzzy Neural Networks for Real Time Control Applications