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***Artificial Immune
Systems A New
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Intelligence Approach
1st Edition***

Read Free Artificial Immune Systems A New Computational Intelligence Approach 1st Edition

*Investigation of a New
Artificial Immune System
Model Applied to Pattern
Recognition.*

*Computational Intelligence:
An Introduction, Second
Edition offers an in-depth
exploration into the*

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adaptive mechanisms that enable intelligent behaviour in complex and changing environments. The main focus of this text is centred on the computational modelling of biological and natural intelligent systems,

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encompassing swarm

intelligence, fuzzy systems,

artificial neural networks,

artificial immune systems

and evolutionary

computation. Engelbrecht

provides readers with a wide

knowledge of Computational

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*Intelligence (CI) paradigms
and algorithms; inviting
readers to implement and
problem solve real-world,
complex problems within the
CI development framework.
This implementation
framework will enable*

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readers to tackle new problems without any difficulty through a single Java class as part of the CI library. Key features of this second edition include: A tutorial, hands-on based presentation of the

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material. State-of-the-art coverage of the most recent developments in computational intelligence with more elaborate discussions on intelligence and artificial intelligence (AI). New discussion of

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*Darwinian evolution versus
Lamarckian evolution, also
including swarm robotics,
hybrid systems and
artificial immune systems. A
section on how to perform
empirical studies; topics
including statistical*

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*analysis of stochastic
algorithms, and an open
source library of CI
algorithms. Tables,
illustrations, graphs,
examples, assignments, Java
code implementing the
algorithms, and a complete*

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*CI implementation and
experimental framework.*

*Computational Intelligence:
An Introduction, Second
Edition is essential reading
for third and fourth year
undergraduate and
postgraduate students*

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*studying CI. The first
edition has been prescribed
by a number of overseas
universities and is thus a
valuable teaching tool. In
addition, it will also be a
useful resource for
researchers in Computational*

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Intelligence and Artificial Intelligence, as well as engineers, statisticians, operational researchers, and bioinformaticians with an interest in applying AI or CI to solve problems in their domains. Check out

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<http://www.ci.cs.up.ac.za>

*for examples, assignments
and Java code implementing
the algorithms.*

*Recently there has been a
growing interest in the use
of the biological immune
system as a source of*

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*inspiration for solving
complicated computational
problems. The immune system
involves many information-
processing abilities
including pattern
recognition, learning,
memory and inherent*

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distributed parallel processing and for these, and other reasons, it has received a significant amount of interest as a metaphor within computing. This emerging field is known as Artificial Immune Systems

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*(AIS), and applications of
AIS include, machine
learning, fault diagnosis,
computer security,
scheduling, virus detection
and optimisation.
The topic of this monograph
falls within the, so-called,*

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*biologically motivated
computing paradigm, in which
biology provides the source
of models and inspiration
towards the development of
computational intelligence
and machine learning
systems. Specifically,*

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*artificial immune systems
are presented as a valid
metaphor towards the
creation of abstract and
high level representations
of biological components or
functions that lay the
foundations for an*

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*alternative machine learning
paradigm. Therefore, focus
is given on addressing the
primary problems of Pattern
Recognition by developing
Artificial Immune System-
based machine learning
algorithms for the problems*

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*of Clustering,
Classification and One-Class
Classification. Pattern
Classification, in
particular, is studied
within the context of the
Class Imbalance Problem. The
main source of inspiration*

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stems from the fact that the
Adaptive Immune System
constitutes one of the most
sophisticated biological
systems that is
exceptionally evolved in
order to continuously
address an extremely

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*unbalanced pattern
classification problem,
namely, the self / non-self
discrimination process. The
experimental results
presented in this monograph
involve a wide range of
degenerate binary*

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classification problems where the minority class of interest is to be recognized against the vast volume of the majority class of negative patterns. In this context, Artificial Immune Systems are utilized for the

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*development of personalized
software as the core
mechanism behind the
implementation of
Recommender Systems. The
book will be useful to
researchers, practitioners
and graduate students*

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*dealing with Pattern
Recognition and Machine
Learning and their
applications in Personalized
Software and Recommender
Systems. It is intended for
both the expert/researcher
in these fields, as well as*

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*for the general reader in
the field of Computational
Intelligence and, more
generally, Computer Science
who wishes to learn more
about the field of
Intelligent Computing
Systems and its*

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applications. An extensive list of bibliographic references at the end of each chapter guides the reader to probe further into application area of interest to him/her.

August 27 - September 1,

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Computational Intelligence

Immunology

Theory and Applications

Artificial Immune Systems: A

New Computational

Intelligence Approach

A new adaptive learning

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Artificial Immune System (AIS)
based committee machine is
developed in this thesis. The
new proposed approach
efficiently tackles the general
problem of clustering high-
dimensional data. In addition, it

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helps on deriving useful decision and results related to other application domains such classification and prediction. Artificial Immune System (AIS) is a branch of computational intelligence field inspired by the

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biological immune system, and has gained increasing interest among researchers in the development of immune-based models and techniques to solve diverse complex computational or engineering problems. This

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work presents some applications of AIS techniques to health problems, and a thorough survey of existing AIS models and algorithms. The main focus of this research is devoted to building an

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ensemble model integrating different AIS techniques (i.e. Artificial Immune Networks, Clonal Selection, and Negative Selection) for classification applications to achieve better classification results. A new AIS-

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based ensemble architecture
with adaptive learning features
is proposed by integrating
different learning and
adaptation techniques to
overcome individual limitations
and to achieve synergetic

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effects through the combination of these techniques. Various techniques related to the design and enhancements of the new adaptive learning architecture are studied, including a neuro-fuzzy based detector and an

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optimizer using particle swarm optimization method to achieve enhanced classification performance. An evaluation study was conducted to show the performance of the new proposed adaptive learning

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ensemble and to compare it to alternative combining techniques. Several experiments are presented using different medical datasets for the classification problem and findings and outcomes are

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discussed. The new adaptive learning architecture improves the accuracy of the ensemble. Moreover, there is an improvement over the existing aggregation techniques. The outcomes, assumptions and

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limitations of the proposed methods with its implications for further research in this area draw this research to its conclusion.

Artificial immune systems (AIS) is a diverse and maturing area

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of research that bridges the disciplines of immunology and engineering. The scope of AIS ranges from immune-inspired algorithms and engineering solutions in software and hardware, to the understanding of immunology

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through modeling and simulation of immune system concepts. AIS algorithms have been applied to a wide variety of applications, including computer security, fault tolerance, data mining and

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optimization. In addition, theoretical aspects of artificial and real immune systems have been the subject of mathematical and computational models and simulations. The 8th

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International Conference on AIS
(ICARIS 2009) built on the
success of previous years,
providing a forum for a diverse
group of AIS researchers to
present and discuss their latest
results and advances. After two

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years outside Europe, ICARIS 2009 returned to England, the venue for the first ICARIS back in 2002. This year's conference was located in the historic city of York, and was held in St. William's College, the

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conference venue of York
Minster, northern Europe's
largest Gothic cathedral.

Clearly, nature has been very
effective in creating organisms
that are capable of protecting
themselves against a wide

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variety of pathogens such as bacteria, fungi, and parasites.

The powerful information-processing capabilities of the immune system, such as feature extraction, pattern recognition, learning, memory, and its

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distributive nature provide rich metaphors that researchers are finding very useful for the development of computational models. While some of these models are designed to give us a better understanding of the

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immune system, other models are being developed to solve complex real-world problems such as anomaly detection, pattern recognition, data analysis (clustering), function optimization, and computer

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security. Immunological
Computation: Theory and
Applications is devoted to
discussing different
immunological mechanisms and
their relation to information
processing and problem solving.

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This unique volume presents a compendium of up-to-date work related to immunity-based techniques. After presenting the general abstractions of immune elements and processes used in computational models, it then—

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Reviews standard procedures, representations, and matching rules that are used in all immunological computation models Covers the details of one of the earliest and most well-known immune algorithms,

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based on the negative selection (NS) process that occurs in the thymus Examines promising immune models, including those based on danger theory, cytokine network models, and MHC-based models The text

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goes further to describe a wide variety of applications, which include computer security, the detection and analysis of anomalies and faults, robotics, and data mining among others. To enhance understanding of

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this emerging field of study, each chapter includes a summary, review questions, and exercises for readers to practice; as well as issues that will require future research. This book constitutes the

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refereed proceedings of the 9th
International Conference on
Artificial Immune Systems,
ICARIS 2010, held in Edinburgh,
UK, in July 2010. The 23 revised
full papers and extended
immune modeling abstracts

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presented together with 9 PerAda workshop position statements were carefully reviewed and selected from 41 submissions. The papers are organized in topical sections on immune system modeling;

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theoretical artificial immune
systems; and applied artificial
immune systems.

Third International Conference,
ICARIS 2004, Catania, Sicily,
Italy, September 13-16, 2004,
Proceedings

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Handbook of Research on
Artificial Immune Systems and
Natural Computing: Applying
Complex Adaptive Technologies
Applying Complex Adaptive
Technologies
8th International Conference,

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ICARIS 2009, York, UK, August
9-12, 2009, Proceedings

An Introduction

*Nature-Inspired Algorithms have been
gaining much popularity in recent
years due to the fact that many real-
world optimisation problems have*

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become increasingly large, complex and dynamic. The size and complexity of the problems nowadays require the development of methods and solutions whose efficiency is measured by their ability to find acceptable results within a reasonable amount of time, rather

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than an ability to guarantee the optimal solution. This volume 'Nature-Inspired Algorithms for Optimisation' is a collection of the latest state-of-the-art algorithms and important studies for tackling various kinds of optimisation problems. It comprises 18

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chapters, including two introductory chapters which address the fundamental issues that have made optimisation problems difficult to solve and explain the rationale for seeking inspiration from nature. The contributions stand out through their

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novelty and clarity of the algorithmic descriptions and analyses, and lead the way to interesting and varied new applications.

This book constitutes the refereed proceedings of the Third International Conference on Artificial Immune

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Systems, ICARIS 2004, held in Catania, Sicily, Italy, in September 2004. The 34 revised full papers presented were carefully reviewed and selected from 58 submissions. The papers are organized in topical sections on applications of artificial

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*immune systems; conceptual, formal,
and theoretical frameworks; artificial
immune systems for robotics; emerging
metaphors; immunoinformatics;
theoretical and experimental studies;
future applications; networks;
modeling; and distinguishing*

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*properties of artificial immune systems.
This book constitutes the refereed
proceedings of the Second
International Conference on Artificial
Immune Systems, ICARIS 2003, held in
Edinburgh, UK in September 2003. The
27 revised full papers presented were*

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*carefully reviewed and selected from
41 submissions. The book presents the
first coherent account of the state of the
art in artificial immune systems
research. The papers are organized in
topical sections on applications of
artificial immune systems,*

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immunocomputing, emerging metaphors, augmentation of artificial immune systems algorithms, theory of artificial immune systems, and representations and operators. AIS is a generic computational paradigm that can be applied to any

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field, but computer security, being naturally analogous domain to human immune system, is more popular among AIS applications. The particular principles and features of the immune system are used in the development of the intrusion and

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malware detection framework. The authors have presented a concise literature review showing good understanding of the topic area about Artificial Immune Systems (AISs). The book has suitable technical content which the authors described with

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clarity of expression and relevant knowledge. The authors also make good effort in describing the technical concepts in simple and easily to understood language. The proposed two systems IIDS and IPEMDS scheme's are soundly designed with

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*good approaches and solid arguments.
The technical information presented in
this book is interesting and will be
useful to researchers and practitioners.
Anti-Spam Techniques Based on
Artificial Immune System
In Silico Immunology*

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*Artificial Immune Systems and their
Applications in Software*

Personalization

*6th International Conference, ICARIS
2007, Santos, Brazil, August 26-29,
2007, Proceedings*

4th International Conference, ICARIS

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*2005, Banff, Alberta, Canada, August
14-17, 2005, Proceedings*

*The idea of using soccer
game for promoting science
and technology of
artificial intelligence
and robotics was presented*

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in the early 90s of the last century. Researchers in many different scientific fields all over the world recognized this idea as an inspiring challenge. Robot soccer

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*research is
interdisciplinary,
complex, demanding but
most of all, fun and
motivational. Obtained
knowledge and results of
research can easily be*

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*transferred and applied to
numerous applications and
projects dealing with
relating fields such as
robotics, electronics,
mechanical engineering,
artificial intelligence,*

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etc. As a consequence, we are witnesses of rapid advancement in this field with numerous robot soccer competitions and a vast number of teams and team members. The best

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*illustration is numbers
from the RoboCup 2009
world championship held in
Graz, Austria which
gathered around 2300
participants in over 400
teams from 44 nations.*

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*Attendance numbers at various robot soccer events show that interest in robot soccer goes beyond the academic and R
The study of artificial immune systems is a*

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*relatively new field that
tries to exploit the
mechanisms of the natural
immune system (NIS) in
order to develop problem-
solving techniques. In
this book, we have*

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combined the artificial immune system with the genetic algorithms in one hybrid algorithm. The hybrid algorithm used for evolving a fuzzy rule system to solve the well

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*known Wisconsin Breast
Cancer Diagnosis problem
(WBCD). The hybrid
algorithm overcomes both
the GAs and the AIS, so
that it reached the
classification ratio*

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97.36, by only one rule, in the earlier generations than the two other algorithms. The learning and memory acquisition of the hybrid algorithm was verified through its

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*application to a binary
character recognition
problem, the hybrid
algorithm overcomes also
both GAs and AIS and
reached the convergence
point before them.*

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*Artificial Immune Systems:
A New Computational
Intelligence*

*Approach Springer Science &
Business Media*

*"This book offers new
ideas and recent*

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*developments in Natural
Computing, especially on
artificial immune
systems"--Provided by
publisher.*

*Artificial Immune System
Based Algorithms for*

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*Optimization and Self-
tuning Control in Power
Systems*

*5th International
Conference, ICARIS 2006,
Oeiras, Portugal,
September 4-6, 2006,*

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Proceedings
AIRS: a Resource Limited
Artificial Immune
Classifier

An artificial immune
system for a virtualised

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data center

This book constitutes the refereed proceedings of the 5th International Conference on Artificial Immune Systems, ICARIS 2006. The book presents 34 revised full papers, are organized in topical sections on computer simulation of classical

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*immunology, computer simulation of
idiotypic network,
immunoinformatics conceptual
papers, pattern recognition type of
application, optimization type of
application, control and time-series
type of application, danger theory
inspired application, and text mining*

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application.

Immunology: A Short Course, 7th Edition introduces all the critical topics of modern immunology in a clear and succinct yet comprehensive fashion. The authors offer uniquely-balanced coverage of classical and contemporary approaches and basic

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and clinical aspects. The strength of Immunology: A Short Course is in providing a complete review of modern immunology without the burden of excessive data or theoretical discussions. Each chapter is divided into short, self-contained units that address key topics,

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illustrated by uniformly drawn, full-color illustrations and photographs. This new edition of Immunology: A Short Course: • Has been fully revised and updated, with a brand new art program to help reinforce learning • Includes a new chapter on Innate Immunity to reflect the

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growth in knowledge in this area • Highlights important therapeutic successes resulting from targeted antibody therapies • Includes end of chapter summaries and review questions, a companion website at www.wileyimmunology.com/coico featuring interactive flashcards,

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USMLE-style interactive MCQs, figures as PowerPoint slides, and case-based material to help understand clinical applications

The natural immune system embodies a wealth of information processing capabilities that can be exploited as a metaphor for the

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development of artificial immune systems. Chief among these features is the ability to recognize previously encountered substances and to generalize beyond recognition in order to provide appropriate responses to pathogens not seen before.

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Based on the new MOAIS, a constrained MOAIS is proposed to deal with constrained multiobjective optimization problems. An efficient constraint-handling technique is proposed by extending a single-objective constraint-handling technique to multiobjective

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optimization procedure. Comparative studies are performed quantitatively to assess the performance of the constrained MOAIS. Simulation results demonstrate that the constrained MOAIS is highly competitive with other state-of-the-art constrained multiobjective

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algorithms on a number of complex constrained multiobjective optimization test problems. This thesis is devoted to developing an efficient multiobjective optimization algorithm based on artificial immune systems. Multiobjective optimization is a very important research topic

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both in science and engineering since the presence of multiple and often competing objectives is natural in most real-world problems. In most cases, multiobjective optimization problems are difficult to solve because the multiple objectives often conflict across a complex and high-

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dimension search space. Therefore, efficient multiobjective optimization techniques are required to be able to deal with the problem difficulty. This thesis proposes an efficient multiobjective optimization algorithm named MOAIS, which is based on artificial immune systems. A new

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unified architecture is developed in the proposed algorithm by integrating both clonal selection principle and immune network theory. A sensitivity analysis is performed to investigate how the parameters defined in the algorithm affect the performance of the

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algorithm. In addition, comparative studies are made to demonstrate the performance of the proposed algorithm with respect to other advanced multiobjective optimization algorithms. Results show that the proposed algorithm is highly competitive with other state-of-the-

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art multiobjective algorithms in finding a set of well-converged and well-distributed Pareto-optimal solutions on a number of difficult multiobjective test problems. The constrained MOAIS is applied to solving a complex multiobjective cam shape optimization problem for a

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*revolutionary cam drive engine. The
superiority and efficiency of the
constrained MOAIS are
demonstrated through the
engineering application.*

Specknets

*World Congress of Medical Physics
and Biomedical Engineering 2006*

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*7th International Conference, ICARIS
2008, Phuket, Thailand, August
10-13, 2008, Proceedings
Investigation of a New Artificial
Immune System Model Applied to
Pattern Recognition
A Case Study for Artificial Immune
Systems*

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"This book focuses on the technologies and applications of artificial immune systems in malware and spam detection proposed in recent years by the computation intelligence laboratory at Peking University, China. It offers a theoretical perspective and practical

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solutions to graduate students, practitioners, and researchers working in the area of artificial immune system, machine learning, pattern recognition, and computer security"--

This is a pioneering work on the emerging field of artificial immune

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systems-highly distributed systems based on the principles of the natural system. Like artificial neural networks, artificial immune systems can learn new information and recall previously learned information. This book provides an overview of artificial immune systems, explaining its

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applications in areas such as immunological memory, anomaly detection algorithms, and modeling the effects of prior infection on vaccine efficacy.

This book constitutes the refereed proceedings of the 6th International Conference on Artificial Immune

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Systems, ICARIS 2007, held in Santos, Brazil, August 2007. The papers are organized in topical sections on search and optimization, classification and clustering, anomaly detection and negative selection, robotics, control and electronics. Modeling papers, conceptual papers,

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and technical papers and general applications are also included.

This book constitutes the refereed proceedings of the 11th International Conference on Artificial Immune Systems, ICARIS 2012, held in Taormina, Italy, in August 2012. The 19 revised selected papers presented

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were carefully reviewed and selected for inclusion in this book. In addition 4 papers of the workshop on bio and immune inspired algorithms and models for multi-level complex systems are included in this volume. Artificial immune systems (AIS) is a diverse and maturing area of research

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that bridges the disciplines of immunology, biology, medical science, computer science, physics, mathematics and engineering. The scope of AIS ranges from modelling and simulation of the immune system through to immune-inspired algorithms and in silico, in vitro and in

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vivo solutions.

Nature-Inspired Algorithms for
Optimisation

A New Multiobjective Optimization
Algorithm Based on Artificial Immune
Systems and Its Engineering
Application

Artificial Immune System

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Artificial Immune Systems

Application of Artificial Immune
Systems to Computer Security

***This book constitutes
the refereed proceedings
of the 10th
International Conference***

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*on Artificial Immune
Systems, ICARIS 2011,
held in Cambridge, UK,
in July 2011. The 37
revised full papers were
carefully reviewed and
selected from numerous*

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*submissions. The papers
are organized in topical
sections on
immunoinformatics and
computational
immunology; theory of
immunological*

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*computation; and applied
immunological
computation.*

*This book deals with
malware detection in
terms of Artificial
Immune System (AIS), and*

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*presents a number of AIS
Edition
models and immune-based
feature extraction
approaches as well as
their applications in
computer security Covers
all of the current*

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*achievements in computer
security based on immune
principles, which were
obtained by the
Computational
Intelligence Laboratory
of Peking University,*

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*China Includes state-of-
the-art information on
designing and developing
artificial immune
systems (AIS) and AIS-
based solutions to
computer security issues*

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*Presents new concepts
such as immune danger
theory, immune
concentration, and class-
wise information gain
(CIG)*

Email has become an

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*indispensable
communication tool in
daily life. However,
high volumes of spam
waste resources,
interfere with
productivity, and*

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*present severe threats
to computer system
security and personal
privacy. This book
introduces research on
anti-spam techniques
based on the artificial*

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*immune system (AIS) to
identify and filter
spam. It*

*"Artificial immune
systems (AIS) are new
computational
intelligence methods*

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*inspired by various
mechanisms of the
biological immune
system. AIS are adaptive
systems inspired by
theoretical immunology
and its functions,*

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principles and models.

*The work depicted in
this thesis centers on
the applications of AIS
based algorithms for
optimization and self-
tuning control in power*

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systems. The optimization is carried out using an algorithm based on the clonal selection principle and the self-tuning characteristics of

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*control for parameters
are inspired by the
humoral immune response
of the human body. The
work in this thesis is
written in two papers as
follows: Paper 1 - CSA*

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*is used to design
multiple optimal power
system stabilizers
(PSS). The proper tuning
of PSSs has a
significant influence on
its effectiveness in*

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*providing the required
damping under different
operating conditions and
disturbances. CSA is
used to determine the
optimal parameters of
four PSSs in a two area*

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*multi-machine power
system. CSA optimized
PSSs efficiently damp
out the oscillations
introduced in the system
and its damping
performance is slightly*

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*better than that of
particle swarm
optimization (PSO)
optimized PSSs. The main
contribution of CSA is
that it converges faster
and requires fewer*

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*computations than the
standard PSO algorithm.*

*Paper 2 - CSA is used
for optimization of four
benchmark functions in
literature. It is then
used to design an*

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*optimal synchronous
machine excitation
controller which reduces
oscillations introduced
in the terminal voltage
during disturbances.
Immune feedback law is*

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used to incorporate self-tuning characteristics in the optimal controller. The self-tuning optimal excitation controller reduces overshoot and

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*settling time of
oscillations. It also
reduces power losses in
the field circuit, thus,
enhancing its
life"--Abstract, leaf
iv.*

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Artificial Immune

Systems for Job Shop

Scheduling Problems

Artificial Immune

Systems and Their

Applications

Hybrid Artificial Immune

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System

Robot Soccer

A Short Course

This book outlines three emergent disciplines, which are now poised to engineer a paradigm shift from hypothesis- to data-driven research:

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theoretical immunology, immunoinformatics, and Artificial Immune Systems. It details how these disciplines will enable new understanding to emerge from the analysis of complex datasets. Coverage shows how these three are set to

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transform immunological science and
the future of health care.

This book constitutes the refereed
proceedings of the 7th International
Conference on Artificial Immune
Systems, ICARIS 2008, held in Phuket,
Thailand, in August 2008. The 40

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revised full papers presented were carefully reviewed and selected from 67 submissions. The papers are organized in topical sections on computational immunology, applied AIS, and theoretical AIS. Position papers and conceptual papers are also

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included.

These proceedings of the World Congress 2006, the fourteenth conference in this series, offer a strong scientific program covering a wide range of issues and challenges which are currently present in Medical physics

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and Biomedical Engineering. About 2,500 peer reviewed contributions are presented in a six volume book, comprising 25 tracks, joint conferences and symposia, and including invited contributions from well known researchers in this field.

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This book constitutes the refereed proceedings of the 4th International Conference on Artificial Immune Systems, ICARIS 2005, held in Banff, Alberta, Canada, in August 2005. The 37 revised full papers presented were carefully reviewed and selected from

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68 submissions. The papers are organized in topical sections on conceptual, formal, and theoretical frameworks, immunoinformatics, theoretical and experimental studies on artificial immune systems, and applications of artificial immune

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systems.

10th International Conference, ICARIS
2011, Cambridge, UK, July 18-21,
2011. Proceedings

11th International Conference, ICARIS
2012, Taormina, Italy, August 28-31,
2012, Proceedings

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Second International Conference,
ICARIS 2003, Edinburgh, UK,
September 1-3, 2003, Proceedings
Machine Learning Paradigms
... International Conference on
Artificial Immune Systems ...,
Proceedings

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This dissertation,
"Artificial Immune Systems
for Job Shop Scheduling
Problems" by Xueni, Qiu,
□□□, was obtained from The
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by the author. Abstract:

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Effective process scheduling is very important to the modern manufacturing production. This research addresses a classical scheduling problem - the job shop

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scheduling problem from the standpoint of both static and dynamic environment. In this study, the job shop scheduling problem (JSSP) is investigated in three

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aspects: (1) static JSSP that operates under a static scheduling environment with known information about the jobs and machines without unexpected events; (2)

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semi-dynamic JSSP which is developed based on static JSSP but violating the non-operation disruption assumption due to the presence of uncertainties occurring in the dynamic

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scheduling process; (3)
dynamic online JSSP that
operates under a dynamic
operating environment in
which jobs continuously
arrive that are
accompanied by

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unpredictable disruptions, such as machine failures. In the thesis, these three types of JSSP are solved by artificial immune systems (AIS) based algorithms. For static

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JSSP, a hybrid algorithm is proposed based on clonal selection theory and immune network theory of AIS, and particle swarm optimization (PSO). The clonal selection theory

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establishes the framework of the hybrid algorithm, while the immune network theory is applied to increase the diversity of antibody set which represents the solution

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candidates. The proposed framework involves the processes of selection, cloning, hypermutation, memory, and receptor editing. The PSO is designed to optimize the

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hypermutation process of the antibodies to accelerate the search procedure. This hybrid algorithm is tested with benchmark problems of different sizes and is

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compared with other methods. The results demonstrate the efficiency of the proposed algorithm, the effectiveness of PSO, and the contribution of long-lasting memory which

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is one of the key features of AIS. The semi-dynamic JSSP is handled by the rescheduling process. An extended deterministic dendritic cell algorithm (dDCA) is proposed to

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control the rescheduling process under considerations of the stability and efficiency of the scheduling system. The main role of the extended dDCA is to

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quantify the negative effect generated from the unexpected disturbances and to determine the best time to trigger the rescheduling process. This algorithm is tested on

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static benchmark problems with the existence of different kinds of disruptions. The experimental results demonstrate its capability of timely triggering the

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rescheduling process. The dynamic online JSSP is modeled as a multi-objective optimization problem. In this case, the immune network theory of AIS is hybridized with

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priority dispatching rules (PDRs) to establish the idiotypic network model for dispatching rules. This idiotypic network model drives the dispatching rule selection

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process under a dynamic scheduling environment. Based on the job shop situations represented by the antigens, the dispatching rules that perform best under

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specific conditions are selected as the antibodies of the idiotypic network model. Finally, the thesis proposes a generic framework of JSSP that combines the three

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different aspects studied in this research with corresponding scheduling strategies. The scheduling framework for a job shop system consists of four collaborating modules and

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is designed to solve
various scheduling
situations efficiently
under a dynamic operating
environment. DOI:
10.5353/th_b4961757
Subjects: Production

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9th International
Conference, ICARIS 2010,
Edinburgh, UK, July 26-29,
2010, Proceedings
Multilayer Artificial
Immune Systems for
Intrusion and Malware

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Detection
Applications on Breast
Cancer Diagnosis and
Pattern Recognition
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