

READ FREE ARTIFICIAL NEURAL NETWORK APPLICATIONS IN GEOTECHNICAL ENGINEERING

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Artificial Neural Network Applications In Geotechnical Engineering Introduction

Artificial Neural Networks for Civil Engineers

This monograph provides researchers with an understanding of the potential of artificial neural networks for solving civil engineering related problems, and guidance on how to develop successful implementations for a broad range of problems. Fundamental issues in the selection, development, and use of neural networks, as well as example applications to each of the various disciplines in civil engineering are presented. An introduction to neural networks is provided, along with a classification of the various forms of neural networking systems available (architectures, modes of operation, and methods of development).

Applications of Artificial Intelligence in Mining and Geotechnical Engineering

Applications of Artificial Intelligence in Mining, Geotechnical and Geoengineering provides recent advances in mining, geotechnical and geoengineering, as well as applications of artificial intelligence in these areas. It serves as the first book on applications of artificial intelligence in mining, geotechnical and geoengineering, providing an opportunity for researchers, scholars, engineers, practitioners and data scientists from all over the world to understand current developments and applications. Topics covered include slopes, open-pit mines, quarries, shafts, tunnels, caverns, underground mines, metro systems, dams and hydro-electric stations, geothermal energy, petroleum engineering, and radioactive waste disposal. In the geotechnical and geoengineering aspects, topics of specific interest include, but are not limited to, foundation, dam, tunneling, geohazard, geoenvironmental and petroleum engineering, rock mechanics, geotechnical engineering, soil mechanics and foundation engineering, civil engineering, hydraulic engineering, petroleum engineering, engineering geology, etc. Guides readers through the process of gathering, processing, and analyzing datasets specifically tailored for mining, geotechnical, and engineering challenges. Examines the evolution and practical implementation of artificial intelligence models in predicting, forecasting, and optimizing solutions for mining, geotechnical, and engineering problems. Offers cutting-edge methodologies to address the most demanding and complex issues encountered in the fields of mining, geotechnical studies, and engineering.

Artificial Neural Networks for Civil Engineers

Artificial neural networks represent a broad and rapidly developing technology featuring new systems and novel ways of applying established systems. This monograph illustrates advanced methods and recent developments in applying artificial neural network concepts in civil engineering.

Geophysical Applications of Artificial Neural Networks and Fuzzy Logic

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.

CIGOS 2019, Innovation for Sustainable Infrastructure

This book presents selected articles from the 5th International Conference on Geotechnics, Civil Engineering Works and Structures, held in Ha Noi, focusing on the theme “Innovation for Sustainable Infrastructure”, aiming to not only raise awareness of the vital importance of sustainability in infrastructure development but to also highlight the essential roles of innovation and technology in planning and building sustainable infrastructure. It provides an international platform for researchers, practitioners, policymakers and entrepreneurs to present their recent advances and to exchange knowledge and experience on various topics related to the theme of “Innovation for Sustainable Infrastructure”.

Artificial Intelligence in Mechatronics and Civil Engineering

Recent studies highlight the application of artificial intelligence, machine learning, and simulation techniques in engineering. This book covers the successful implementation of different intelligent techniques in various areas of engineering focusing on common areas between mechatronics and civil engineering. The power of artificial intelligence and machine learning techniques in solving some examples of real-life problems in engineering is highlighted in this book. The implementation process to design the optimum intelligent models is discussed in this book.

A Primer on Machine Learning Applications in Civil Engineering

Machine learning has undergone rapid growth in diversification and practicality, and the repertoire of techniques has evolved and expanded. The aim of this book is to provide a broad overview of the available machine-learning techniques that can be utilized for solving civil engineering problems. The fundamentals of both theoretical and practical aspects are discussed in the domains of water resources/hydrological modeling, geotechnical engineering, construction engineering and management, and coastal/marine engineering. Complex civil engineering problems such as drought forecasting, river flow forecasting, modeling evaporation, estimation of dew point temperature, modeling compressive strength of concrete, ground water level forecasting, and significant wave height forecasting are also included. Features Exclusive information on machine learning and data analytics applications with respect to civil engineering Includes many machine learning techniques in numerous civil engineering disciplines Provides ideas on how and where to apply machine learning techniques for problem solving Covers water resources and hydrological modeling, geotechnical engineering, construction engineering and management, coastal and marine engineering, and geographical information systems Includes MATLAB® exercises

Handbook of Neural Computation

Handbook of Neural Computation explores neural computation applications, ranging from conventional fields of mechanical and civil engineering, to electronics, electrical engineering and computer science. This book covers the numerous applications of artificial and deep neural networks and their uses in learning machines, including image and speech recognition, natural language processing and risk analysis. Edited by renowned authorities in this field, this work is comprised of articles from reputable industry and academic scholars and experts from around the world. Each contributor presents a specific research issue with its recent and future trends. As the demand rises in the engineering and medical industries for neural networks and other machine learning methods to solve different types of operations, such as data prediction, classification of images, analysis of big data, and intelligent decision-making, this book provides readers with the latest, cutting-edge research in one comprehensive text. Features high-quality research articles on multivariate adaptive regression splines, the minimax probability machine, and more Discusses machine learning techniques, including classification, clustering, regression, web mining, information retrieval and natural language processing Covers supervised, unsupervised, reinforced, ensemble, and nature-inspired learning methods

Application of Soft Computing, Machine Learning, Deep Learning and Optimizations in Geoenvironment and Geoscience

This book summarizes the application of soft computing techniques, machine learning approaches, deep learning algorithms and optimization techniques in geoenvironment including tunnelling, excavation, pipelines, etc. and geoscience including the geohazards, rock and soil properties, etc. The book features state-of-the-art studies on use of SC,ML,DL and optimizations in Geoenvironment and Geoscience. Considering these points and understanding, this book will be compiled with highly focussed chapters that will discuss the application of SC,ML,DL and optimizations in Geoenvironment and Geoscience. Target audience: (1) Students of UG, PG, and Research Scholars: Several applications of SC,ML,DL and optimizations in Geoenvironment and Geoscience can help students to enhance their knowledge in this domain. (2) Industry Personnel and Practitioner: Practitioners from different fields can be able to implement standard and advanced SC,ML,DL and optimizations for solving critical problems of civil engineering.

Big Data in Engineering Applications

This book presents the current trends, technologies, and challenges in Big Data in the diversified field of engineering and sciences. It covers the applications of Big Data ranging from conventional fields of mechanical engineering, civil engineering to electronics, electrical, and computer science to areas in pharmaceutical and biological sciences. This book consists of contributions from various authors from all sectors of academia and industries, demonstrating the imperative application of Big Data for the decision-making process in sectors where the volume, variety, and velocity of information keep increasing. The book is a useful reference for graduate students, researchers and scientists interested in exploring the potential of Big Data in the application of engineering areas.

MARS Applications in Geotechnical Engineering Systems

This book presents the application of a comparatively simple nonparametric regression algorithm, known as the multivariate adaptive regression splines (MARS) surrogate model, which can be used to approximate the relationship between the inputs and outputs, and express that relationship mathematically. The book first describes the MARS algorithm, then highlights a number of geotechnical applications with multivariate big data sets to explore the approach's generalization capabilities and accuracy. As such, it offers a valuable resource for all geotechnical researchers, engineers, and general readers interested in big data analysis.

Information Technology in Geo-Engineering

Information technology continues to evolve and remains central to all aspects of geo-engineering. Key issues are the effective use and re-use of data, particularly within Building Information Modelling (BIM) frameworks; the use of smart monitoring; artificial intelligence and data processing techniques. All these contribute to improvements in design processes, greater construction efficiency and more cost-effective maintenance. This book presents the proceedings of the 2nd International Conference on Information Technology in Geo-Engineering (ICITG 2014), held in Durham, United Kingdom, in July 2014. Topics of the conference cover the full range of information technology applications in geotechnical and geo-environmental engineering, as well as engineering geology. The focus of the papers in this book is on geotechnical data, specifically dealing with issues related to data standards and data exchange. The wider issues of managing data and data sharing through global web portals are also addressed. Also included are papers on artificial intelligence applications, and the use of expert (knowledge-based) systems, artificial neural networks and data mining techniques, particularly as applied to the identification of properties of geo-materials. The use of web-based materials for education, data processing techniques, and the numerical modeling of tunnels, piles and anchors are also discussed. This book will be of interest to the geo-engineering community and is the second in a series of proceedings designed to keep practitioners and researchers abreast of the developments in information technology which relate to their work.

From Fundamentals to Applications in Geotechnics

The work of geotechnical engineers contributes to the creation of safe, economic and pleasant spaces to live, work and relax all over the world. Advances are constantly being made, and the expertise of the profession becomes ever more important with the increased pressure on space and resources. This book presents the proceedings of the 15th Pan-American Conference on Soil Mechanics and Geotechnical Engineering (XV PCSMGE), held in Buenos Aires, Argentina, in November 2015. This conference, held every four years, is an important opportunity for international experts, researchers, academics, professionals and geo-engineering companies to meet and exchange ideas and research findings in the areas of soil mechanics, rock mechanics, and their applications in civil, mining and environmental engineering. The articles are divided into nine sections: transportation geotechnics; in-situ testing; geo-engineering for energy and sustainability; numerical modeling in geotechnics; foundations and ground improvement; unsaturated soil behavior; embankments, dams and tailings; excavations and tunnels; and geo-risks, and cover a wide spectrum of issues from fundamentals to applications in geotechnics. This book will undoubtedly represent an essential reference for academics, researchers and practitioners in the field of soil mechanics and geotechnical engineering. In this proceedings, approximately 65% of the contributions are in English, and 35% of the contributions are in Spanish or Portuguese.

Research Anthology on Artificial Neural Network Applications

Artificial neural networks (ANNs) present many benefits in analyzing complex data in a proficient manner. As an effective and efficient problem-solving method, ANNs are incredibly useful in many different fields. From education to medicine and banking to engineering, artificial neural networks are a growing phenomenon as more realize the plethora of uses and benefits they provide. Due to their complexity, it is vital for researchers to understand ANN capabilities in various fields. The Research Anthology on Artificial Neural Network Applications covers critical topics related to artificial neural networks and their multitude of applications in a number of diverse areas including medicine, finance, operations research, business, social media, security, and more. Covering everything from the applications and uses of artificial neural networks to deep learning and non-linear problems, this book is ideal for computer scientists, IT specialists, data scientists, technologists, business owners, engineers, government agencies, researchers, academicians, and students, as well as anyone who is interested in learning more about how artificial neural networks can be used across a wide range of fields.

Artificial Intelligence and Machine Learning Techniques for Civil Engineering

In recent years, artificial intelligence (AI) has drawn significant attention with respect to its applications in several scientific fields, varying from big data handling to medical diagnosis. A tremendous transformation has taken place with the emerging application of AI. AI can provide a wide range of solutions to address many challenges in civil engineering. *Artificial Intelligence and Machine Learning Techniques for Civil Engineering* highlights the latest technologies and applications of AI in structural engineering, transportation engineering, geotechnical engineering, and more. It features a collection of innovative research on the methods and implementation of AI and machine learning in multiple facets of civil engineering. Covering topics such as damage inspection, safety risk management, and information modeling, this premier reference source is an essential resource for engineers, government officials, business leaders and executives, construction managers, students and faculty of higher education, librarians, researchers, and academicians.

Artificial Neural Networks in Hydrology

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Background and Motivation The basic notion of artificial neural networks (ANNs), as we understand them today, was perhaps first formalized by McCulloch and Pitts (1943) in their model of an artificial neuron. Research in this field remained somewhat dormant in the early years, perhaps because of the limited capabilities of this method and because there was no clear indication of its potential uses. However, interest in this area picked up momentum in a dramatic fashion with the works of Hopfield (1982) and Rumelhart et al. (1986). Not only did these studies place artificial neural networks on a firmer mathematical footing, but also opened the door to a host of potential applications for this computational tool. Consequently, neural network computing has progressed rapidly along all fronts: theoretical development of different learning algorithms, computing capabilities, and applications to diverse areas from neurophysiology to the stock market. Initial studies on artificial neural networks were prompted by a desire to have computers mimic human learning. As a result, the jargon associated with the technical literature on this subject is replete with expressions such as excitation and inhibition of neurons, strength of synaptic connections, learning rates, training, and network experience. ANNs have also been referred to as neurocomputers by people who want to preserve this analogy.

Proceedings of the 5th Indian Young Geotechnical Engineers Conference (5IYGEC)

Extended Abstracts of Research Papers Published in 5IYGEC: The 5th Indian Young Geotechnical Engineers Conference, organized by Indian Geotechnical Society to commemorate Silver Jubilee of IGS, Baroda Chapter.

Metaheuristics in Water, Geotechnical and Transport Engineering

Due to an ever-decreasing supply in raw materials and stringent constraints on conventional energy sources, demand for lightweight, efficient and low cost structures has become crucially important in modern engineering design. This requires engineers to search for optimal and robust design options to address design problems that are often large in scale and highly nonlinear, making finding solutions challenging. In the past two decades, metaheuristic algorithms have shown promising power, efficiency and versatility in solving these difficult optimization problems. This book examines the latest developments of metaheuristics and their applications in water, geotechnical and transport engineering offering practical case studies as examples to demonstrate real world applications. Topics cover a range of areas within engineering, including reviews of optimization algorithms, artificial intelligence, cuckoo search, genetic programming, neural networks, multivariate adaptive regression, swarm intelligence, genetic algorithms, ant colony optimization, evolutionary multiobjective optimization with diverse applications in engineering such as behavior of materials, geotechnical design, flood control, water distribution and signal networks. This book can serve as a supplementary text for design courses and computation in engineering as well as a reference for researchers

and engineers in metaheuristics, optimization in civil engineering and computational intelligence. Provides detailed descriptions of all major metaheuristic algorithms with a focus on practical implementation
Develops new hybrid and advanced methods suitable for civil engineering problems at all levels Appropriate for researchers and advanced students to help to develop their work

Handbook of Genetic Programming Applications

This contributed volume, written by leading international researchers, reviews the latest developments of genetic programming (GP) and its key applications in solving current real world problems, such as energy conversion and management, financial analysis, engineering modeling and design, and software engineering, to name a few. Inspired by natural evolution, the use of GP has expanded significantly in the last decade in almost every area of science and engineering. Exploring applications in a variety of fields, the information in this volume can help optimize computer programs throughout the sciences. Taking a hands-on approach, this book provides an invaluable reference to practitioners, providing the necessary details required for a successful application of GP and its branches to challenging problems ranging from drought prediction to trading volatility. It also demonstrates the evolution of GP through major developments in GP studies and applications. It is suitable for advanced students who wish to use relevant book chapters as a basis to pursue further research in these areas, as well as experienced practitioners looking to apply GP to new areas. The book also offers valuable supplementary material for design courses and computation in engineering.

Innovations in Computer Science and Engineering

This book includes high-quality, peer-reviewed research papers from the 6th International Conference on Innovations in Computer Science & Engineering (ICICSE 2018), held at Guru Nanak Institutions, Hyderabad, India from August 17 to 18, 2018. The book discusses a wide variety of industrial, engineering and scientific applications of the emerging techniques and offers a platform for researchers from academia and industry to present their original work and exchange ideas, information, techniques and applications in the field of computer science.

Proceeding of the 3rd International Conference on Geotechnical Engineering for Disaster Mitigation and Rehabilitation 2011 Combined with the 5th International Conference on Geotechnical and Highway Engineering - Practical Applications, Challenges and Opportunities

Development of probabilistic, deterministic and maximum considered earthquake maps for design of earthquake resistance infrastructures in Indonesia / M. Irsyam [und weitere] -- Mechanistic-based approach for sustainable pavement foundation design and construction / A.G. Correia (Portugal) -- The geotechnical subsurface and environmental aspects in relation with Sunda Straits Bridge planning / Purnomo (Indonesia) -- Seismic analysis of Moshampa Earth-Dam (Iran) as a case study / M.J. Sharahi (Iran) -- Padang liquefaction due to September 30th 2009 earthquake / A. Hakam and E. Suhelmidawati (Indonesia) -- Prediction of water retention curves of soils from their grain-size distribution curve / M. Aytakin (Bahrain) and E. Turker (Turkey) -- Large scale shaking table test on dynamic damage behavior for subway station structure under near-fault and far-field ground motions at liquefiable foundation / C. Guo-Xing [und weitere] -- Numerical prediction of landslide impact on submarine pipelines / L.-L. Li, F. Yuan and Z. Guo (China) -- DEM simulations and experiments of reinforcement rockfill material permanent deformation / G. Yang and H. Liu (China) -- Experimental study on dynamic strength and residual deformation of tailings material / J. Jie, Y. Xiangjuan and C. Shi (China) -- Dynamic centrifuge shaking table tests and numerical simulation of an unconfined sandy foundation / L. Jingbo [und weitere] -- Shaking table test on ground liquefaction effect of soil-subway station structure under near-fault and far-field ground motions / Z. Xi [und weitere] -- Shear strength characteristics of the waste fibers reinforced lime-rice husk ash stabilized clay / A.S. Muntohar (Indonesia) -- Design and stability of pond ash railway embankment / V.G. Havanagi, A.K. Sinha and S.

Mathur (India) -- Numerical analysis of seismic behaviour of single pile in three layered liquefiable soil / A.J. Naeeni, H. Matinmanesh and A.H. Yousefzadeh (Iran) -- Dynamic impact of dry granular flow on retaining wall - Regression formula for point of action of critical impact force / Y.-J. Jiang and I. Towhata (Japan) -- Coupled analysis of seepage and deformation of River Levee / R. Uzuoka [und weitere] -- Effect of relict joint on the mass permeability of residual soil / N. Gofar, A. Kassim and L.M. Lee (Malaysia) -- Experiment investigation of submarine slide simulation model / Z.F. Haza and I.S.H. Harahap (Malaysia) -- The effect of blast design in a controlled blasting / E.T. Mohamad [und weitere] -- Surface and groundwater contamination due to mining of tin and iron - A case study in Johor, Malaysia / B. Panahi [und weitere] -- Squeezing potential evaluation of tunnel in tropical area / V. Ghiasi [und weitere] -- Effects of fines and fines type on undrained behaviour of sandy soils under critical state soil mechanics framework / M.M. Rahman and S.-C.R. Lo (Australia) -- Behaviour of a 13-m high gabions wall and a solution for its stabilization / A.M.G. Santos-Ferreira, E. Dias and C. Santos (Portugal) -- Two-surface viscoplastic sand model for disaster mitigation / W. Higgins [und weitere] -- The strength of loose oil-containing sand under cyclic loading / I.-H. Ho (USA) -- Effect of variation of the determined parameter on numerical analysis for seismic performance evaluation / T. Mikami [und weitere]

4th International Conference on Artificial Intelligence and Applied Mathematics in Engineering

As general, this book is a collection of the most recent, quality research papers regarding applications of Artificial Intelligence and Applied Mathematics for engineering problems. The papers included in the book were accepted and presented in the 4th International Conference on Artificial Intelligence and Applied Mathematics in Engineering (ICAIAME 2022), which was held in Baku, Azerbaijan (Azerbaijan Technical University) between May 20 and 22, 2022. Objective of the book content is to inform the international audience about the cutting-edge, effective developments and improvements in different engineering fields. As a collection of the ICAIAME 2022 event, the book gives consideration for the results by especially intelligent system formations and the associated applications. The target audience of the book is international researchers, degree students, practitioners from industry, and experts from different engineering disciplines.

Unsaturated Soils: Research and Applications

These volumes contain the contributions to the Second European Conference on Unsaturated Soils, E-UNSAT 2012, held in Napoli, Italy, in June 2012. The event is the second of a series of European conferences, and follows the first successful one, organised in Durham, UK, in 2008. The conference series is supported by Technical Committee 106 of the International Society of Soil Mechanics and Geotechnical Engineering on Unsaturated Soils. The published contributions were selected after a careful peer-review process. A collection of more than one hundred papers is included, addressing the three thematic areas experimental, including advances in testing techniques and soil behaviour, modelling, covering theoretical and constitutive issues together with numerical and physical modelling, and engineering, focusing on approaches, case histories and geo-environmental themes. The areas of application of the papers embrace most of the geotechnical problems related to unsaturated soils. Increasing interest in geo-environmental problems, including chemical coupling, marks new perspectives in unsaturated soil mechanics. This book will provide a valuable up-to-date reference across the subject for both researchers and practitioners.

Proceedings of the 16th International Conference on Soil Mechanics and Geotechnical Engineering

The 16th ICSMGE responds to the needs of the engineering and construction community, promoting dialog and exchange between academia and practice in various aspects of soil mechanics and geotechnical engineering. This is reflected in the central theme of the conference 'Geotechnology in Harmony with the Global Environment'. The proceedings of the conference are of great interest for geo-engineers and

researchers in soil mechanics and geotechnical engineering. Volume 1 contains 5 plenary session lectures, the Terzaghi Oration, Heritage Lecture, and 3 papers presented in the major project session. Volumes 2, 3, and 4 contain papers with the following topics: Soil mechanics in general; Infrastructure and mobility; Environmental issues of geotechnical engineering; Enhancing natural disaster reduction systems; Professional practice and education. Volume 5 contains the report of practitioner/academic forum, 20 general reports, a summary of the sessions and workshops held during the conference.

Sustainability Issues for the Deep Foundations

This volume presents some advances in the analysis and design of deep foundations. It contains 21 technical papers covering various aspects of analysis and design of deep foundations based on full-scale field testing, numerical modeling and analytical solutions. They present results and findings from research as well as practical-oriented studies on deep foundations that are of interest to civil/geotechnical engineering community. The topics cover a wide spectrum of applications that include evaluation of the axial and lateral capacity of piles, pile group effects, evaluation of the increase in pile capacity with time (or pile setup), influence of excavation on pile capacity, study the behavior of pile raft caisson foundations, evaluation of the bearing capacity and settlement of piles from cone penetration tests, etc. The volume is based on the best contributions to the 2nd GeoMEast International Congress and Exhibition on Sustainable Civil Infrastructures, Egypt 2018 – The official international congress of the Soil-Structure Interaction Group in Egypt (SSIGE).

Unsaturated Soils: Research and Applications

These volumes contain the contributions to the Second European Conference on Unsaturated Soils, E-UNSAT 2012, held in Napoli, Italy, in June 2012. The event is the second of a series of European conferences, and follows the first successful one, organised in Durham, UK, in 2008. The conference series is supported by Technical Committee 106 of the International Society of Soil Mechanics and Geotechnical Engineering on Unsaturated Soils. The published contributions were selected after a careful peer-review process. A collection of more than one hundred papers is included, addressing the three thematic areas experimental, including advances in testing techniques and soil behaviour, modelling, covering theoretical and constitutive issues together with numerical and physical modelling, and engineering, focusing on approaches, case histories and geo-environmental themes. The areas of application of the papers embrace most of the geotechnical problems related to unsaturated soils. Increasing interest in geo-environmental problems, including chemical coupling, marks new perspectives in unsaturated soil mechanics. This book will provide a valuable up-to-date reference across the subject for both researchers and practitioners.

Application of Soft Computing and Intelligent Methods in Geophysics

This book provides a practical guide to applying soft-computing methods to interpret geophysical data. It discusses the design of neural networks with Matlab for geophysical data, as well as fuzzy logic and neuro-fuzzy concepts and their applications. In addition, it describes genetic algorithms for the automatic and/or intelligent processing and interpretation of geophysical data.

International Conference on Multi disciplinary Technologies and challenges in Industry 4.0

The term “soft computing” applies to variants of and combinations under the four broad categories of evolutionary computing, neural networks, fuzzy logic, and Bayesian statistics. Although each one has its separate strengths, the complementary nature of these techniques when used in combination (hybrid) makes them a powerful alternative for solving complex problems where conventional mathematical methods fail. The use of intelligent and soft computing techniques in the field of geotechnical and pavement engineering

has steadily increased over the past decade owing to their ability to admit approximate reasoning, imprecision, uncertainty and partial truth. Since real-life infrastructure engineering decisions are made in ambiguous environments that require human expertise, the application of soft computing techniques has been an attractive option in pavement and geomechanical modeling. The objective of this carefully edited book is to highlight key recent advances made in the application of soft computing techniques in pavement and geomechanical systems. Soft computing techniques discussed in this book include, but are not limited to: neural networks, evolutionary computing, swarm intelligence, probabilistic modeling, kernel machines, knowledge discovery and data mining, neuro-fuzzy systems and hybrid approaches. Highlighted application areas include infrastructure materials modeling, pavement analysis and design, rapid interpretation of nondestructive testing results, porous asphalt concrete distress modeling, model parameter identification, pavement engineering inversion problems, s-grade soils characterization, and backcalculation of pavement layer thickness and moduli.

Intelligent and Soft Computing in Infrastructure Systems Engineering

This book is a follow-up to the IChemE symposium on “Neural Networks and Other Learning Technologies”, held at Imperial College, UK, in May 1999. The interest shown by the participants, especially those from the industry, has been instrumental in producing the book. The papers have been written by contributors of the symposium and experts in this field from around the world. They present all the important aspects of neural network utilisation as well as show the versatility of neural networks in various aspects of process engineering problems — modelling, estimation, control, optimisation and industrial applications. Contents: Modelling and Identification Hybrid Schemes Estimations and Control New Learning Technologies Experimental and Industrial Applications Readership: Academic and industrial researchers, chemical engineers and control engineers. Keywords: Modelling; Hybrid Schemes; Technologies; Industrial Applications

Application of Neural Networks and Other Learning Technologies in Process Engineering

This book focuses on the application of machine learning in slope stability assessment. The contents include: overview of machine learning approaches, the mainstream smart in-situ monitoring techniques, the applications of the main machine learning algorithms, including the supervised learning, unsupervised learning, semi-supervised learning, reinforcement learning, deep learning, ensemble learning, etc., in slope engineering and landslide prevention, introduction of the smart in-situ monitoring and slope stability assessment based on two well-documented case histories, the prediction of slope stability using ensemble learning techniques, the application of Long Short-Term Memory Neural Network and Prophet Algorithm in Slope Displacement Prediction, displacement prediction of Jiuxianping landslide using gated recurrent unit (GRU) networks, seismic stability analysis of slopes subjected to water level changes using gradient boosting algorithms, efficient reliability analysis of slopes in spatially variable soils using XGBoost, efficient time-variant reliability analysis of Bazimen landslide in the Three Gorges Reservoir Area using XGBoost and LightGBM algorithms, as well as the future work recommendation. The authors also provided their own thoughts learnt from these applications as well as work ongoing and future recommendations.

Application of Machine Learning in Slope Stability Assessment

This book covers 27 articles in the applications of artificial neural networks (ANN) in various disciplines which includes business, chemical technology, computing, engineering, environmental science, science and nanotechnology. They modeled the ANN with verification in different areas. They demonstrated that the ANN is very useful model and the ANN could be applied in problem solving and machine learning. This book is suitable for all professionals and scientists in understanding how ANN is applied in various areas.

Artificial Neural Networks

This volume highlights the latest advances and innovations in the field of soil mechanics and geotechnical engineering, as presented by leading international researchers and engineers at the 5th International Conference on New Developments in Soil Mechanics and Geotechnical Engineering (ZM), held in Nicosia, Northern Cyprus on June 30-July 2, 2022. It covers a diverse range of topics such as soil properties and characterization; shallow and deep foundations; soil improvement; excavations, support systems, earth-retaining structures and underground systems; earthquake geotechnical engineering; stability of slopes and landslides; fills and embankments; environmental preservation, water and energy; modelling and analyses in geotechnical engineering. The contributions, which were selected by means of a rigorous international peer-review process, present a wealth of exciting ideas that will open novel research directions and foster multidisciplinary collaboration among different specialists.

5th International Conference on New Developments in Soil Mechanics and Geotechnical Engineering

This book adopts numerical method to model soil constitutive relationship while it abandons the traditional idea of looking for plastic potential as the only way to model. Firstly, the triaxial compression tests of expansive soil, sand and clay under different stress paths are introduced; then the elastoplastic constitutive equations of expansive soil, sand and clay under various stress paths are established by numerical modeling method; finally, the constitutive equations are embedded in the finite element program and verified by comparing the finite element calculation results of the triaxial test soil samples with the corresponding test results. The modeling obtains high accuracy.

Numerical Modeling of Soil Constitutive Relationship

This book contains selected articles from the Second International Conference on Geotechnical Engineering-Iraq (ICGE-Iraq) held in Akre/Duhok/Iraq from June 22 to 23, 2021, to discuss the challenges, opportunities, and problems of geotechnical engineering in projects. Also, the conference includes modern applications in structural engineering, materials of construction, construction management, planning and design of structures, and remote sensing and surveying engineering. The ICGE-Iraq organized by the Iraqi Scientific Society of Soil Mechanics and Foundation Engineering (ISSSMFE) in cooperation with Akre Technical Institute / Duhok Polytechnic University, College of Engineering /University of Baghdad, and Civil Engineering Department/University of Technology. The book covers a wide spectrum of themes in civil engineering, including but not limited to sustainability and environmental-friendly applications. The contributing authors are academic and researchers in their respective fields from several countries. This book will provide a valuable resource for practicing engineers and researchers in the field of geotechnical engineering, structural engineering, and construction and management of projects.

Geotechnical Engineering and Sustainable Construction

This book covers different aspects of real-world applications of optimization algorithms. It provides insights from the Sixth International Conference on Harmony Search, Soft Computing and Applications held at Istanbul University, Turkey, in July 2020. Harmony Search (HS) is one of the most popular metaheuristic algorithms, developed in 2001 by Prof. Joong Hoon Kim and Prof. Zong Woo Geem, that mimics the improvisation process of jazz musicians to seek the best harmony. The book consists of research articles on novel and newly proposed optimization algorithms; the theoretical study of nature-inspired optimization algorithms; numerically established results of nature-inspired optimization algorithms; and real-world applications of optimization algorithms and synthetic benchmarking of optimization algorithms.

Proceedings of 6th International Conference on Harmony Search, Soft Computing and Applications

"This book contains contributions that cover a wide spectrum of very important real-world engineering problems, and explores the implementation of neural networks for the representation of structural responses in earthquake engineering. It assesses the efficiency of seismic design procedures and describes the latest findings in intelligent optimal control systems and their applications in structural engineering"--Provided by publisher.

Intelligent Computational Paradigms in Earthquake Engineering

This tutorial text provides the reader with an understanding of artificial neural networks (ANNs), and their application, beginning with the biological systems which inspired them, through the learning methods that have been developed, and the data collection processes, to the many ways ANNs are being used today. The material is presented with a minimum of math (although the mathematical details are included in the appendices for interested readers), and with a maximum of hands-on experience. All specialized terms are included in a glossary. The result is a highly readable text that will teach the engineer the guiding principles necessary to use and apply artificial neural networks.

Artificial Neural Networks

Due to an ever-decreasing supply in raw materials and stringent constraints on conventional energy sources, demand for lightweight, efficient and low-cost structures has become crucially important in modern engineering design. This requires engineers to search for optimal and robust design options to address design problems that are commonly large in scale and highly nonlinear, making finding solutions challenging. In the past two decades, metaheuristic algorithms have shown promising power, efficiency and versatility in solving these difficult optimization problems. This book examines the latest developments of metaheuristics and their applications in structural engineering, construction engineering and earthquake engineering, offering practical case studies as examples to demonstrate real-world applications. Topics cover a range of areas within engineering, including big bang-big crunch approach, genetic algorithms, genetic programming, harmony search, swarm intelligence and some other metaheuristic methods. Case studies include structural identification, vibration analysis and control, topology optimization, transport infrastructure design, design of reinforced concrete, performance-based design of structures and smart pavement management. With its wide range of everyday problems and solutions, Metaheuristic Applications in Structures and Infrastructures can serve as a supplementary text for design courses and computation in engineering as well as a reference for researchers and engineers in metaheuristics, optimization in civil engineering and computational intelligence. Review of the latest development of metaheuristics in engineering. Detailed algorithm descriptions with focus on practical implementation. Uses practical case studies as examples and applications.

Elements of Artificial Neural Networks with Selected Applications in Chemical Engineering, and Chemical and Biological Sciences

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