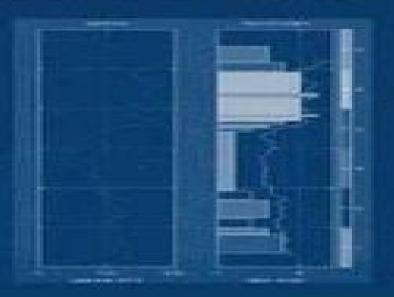MODERN APPROACHES IN GEOPHYSICS

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Geophysical Applications of Artificial Neural Networks and Fuzzy Logic

WITH A SPECIAL PREFACE BY FRED AMINZADEH,
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Geophysical Applications Of Artificial Neural Networks And Fuzzy Logic

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Geophysical Applications Of Artificial Neural Networks And Fuzzy Logic:

   Geophysical Applications of Artificial Neural Networks and Fuzzy Logic W. Sandham,M. Leggett,2003-12-31 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   **Geophysical Applications of Artificial Neural Networks and Fuzzy Logic** W. Sandham,M. Leggett,2013-06-29 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   **Advances in Modeling and Interpretation in Near**

Surface Geophysics Arkoprovo Biswas,Shashi Prakash Sharma,2020-01-01 This book deals primarily with the aspects of advances in near surface geophysical data modeling different interpretation techniques new ideas and an integrated study to delineate the subsurface structures It also involves the practical application of different geophysical methods to delineate the subsurface structures associated with mineral groundwater exploration subsurface contamination hot springs coal fire etc This book is specifically aimed with the state of art information regarding research advances and new developments in these areas of study coupled to extensive modeling and field investigations obtained from around the world It is extremely enlightening for the research workers scientists faculty members and students in Applied Geophysics Near Surface Geophysics Potential Field Electrical and Electromagnetic Methods Mathematical Modeling Techniques in Earth Sciences as well as Environmental Geophysics *Artificial Intelligence and Dynamic Systems for Geophysical Applications* Alexej Gvishiani,Jacques O. Dubois,2013-04-17 The book presents new clustering schemes dynamical systems and pattern recognition algorithms in geophysical geodynamical and natural hazard applications The original mathematical technique is based on both classical and fuzzy sets models Geophysical and natural hazard applications are mostly original However the artificial intelligence technique described in the book can be applied far beyond the limits of Earth science applications The book is intended for research scientists tutors graduate students scientists in geophysics and engineers **Image Analysis and Recognition** Fakhri Karray,Aurélio Campilho,Farida Cheriet,2017-06-19 This book constitutes the thoroughly refereed proceedings of the 14th International Conference on Image Analysis and Recognition ICIAR 2017 held in Montreal QC Canada in July 2017 The 73 revised full papers presented were carefully reviewed and selected from 133 submissions The papers are organized in the following topical sections machine learning in image recognition machine learning for medical image computing image enhancement and reconstruction image segmentation motion and tracking 3D computer vision feature extraction detection and classification biomedical image analysis image analysis in ophthalmology remote sensing applications Application of Soft Computing and Intelligent Methods in Geophysics Alireza Hajian,Peter Styles,2018-06-21 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 **Artificial Intelligence and Data Analytics for Energy Exploration and Production** Fred Aminzadeh,Cenk Temizel,Yasin Hajizadeh,2022-08-26 ARTIFICAL INTELLIGENCE AND DATA ANALYTICS FOR ENERGY EXPLORATION AND PRODUCTION This groundbreaking new book is written by some of the foremost authorities on the application of data science and artificial intelligence techniques in exploration and production in the energy industry covering the most comprehensive and updated new processes concepts and practical applications in the field The book provides an in depth treatment of the foundations of Artificial Intelligence AI Machine Learning and Data Analytics DA It also includes many of AI

DA applications in oil and gas reservoirs exploration development and production The book covers the basic technical details on many tools used in smart oil fields This includes topics such as pattern recognition neural networks fuzzy logic evolutionary computing expert systems artificial intelligence machine learning human computer interface natural language processing data analytics and next generation visualization While theoretical details will be kept to the minimum these topics are introduced from oil and gas applications viewpoints In this volume many case histories from the recent applications of intelligent data to a number of different oil and gas problems are highlighted The applications cover a wide spectrum of practical problems from exploration to drilling and field development to production optimization artificial lift and secondary recovery Also the authors demonstrate the effectiveness of intelligent data analysis methods in dealing with many oil and gas problems requiring combining machine and human intelligence as well as dealing with linguistic and imprecise data and rules **Applications of Artificial Intelligence Techniques in the Petroleum Industry** Abdolhossein Hemmati-Sarapardeh,Aydin Larestani,Nait Amar Menad,Sassan Hajirezaie,2020-08-26 Applications of Artificial Intelligence Techniques in the Petroleum Industry gives engineers a critical resource to help them understand the machine learning that will solve specific engineering challenges The reference begins with fundamentals covering preprocessing of data types of intelligent models and training and optimization algorithms The book moves on to methodically address artificial intelligence technology and applications by the upstream sector covering exploration drilling reservoir and production engineering Final sections cover current gaps and future challenges Teaches how to apply machine learning algorithms that work best in exploration drilling reservoir or production engineering Helps readers increase their existing knowledge on intelligent data modeling machine learning and artificial intelligence with foundational chapters covering the preprocessing of data and training on algorithms Provides tactics on how to cover complex projects such as shale gas tight oils and other types of unconventional reservoirs with more advanced model input **Petro-physics and Rock Physics of Carbonate Reservoirs** Kumar Hemant Singh,Ritesh Mohan Joshi,2019-10-16 This book presents selected articles from the workshop on Challenges in Petrophysical Evaluation and Rock Physics Modeling of Carbonate Reservoirs held at IIT Bombay in November 2017 The articles included explore the challenges associated with using well log data core data analysis and their integration in the qualitative and quantitative assessment of petrophysical and elastic properties in carbonate reservoirs The book also discusses the recent trends and advances in the area of research and development of carbonate reservoir characterization both in industry and academia Further it addresses the challenging concept of porosity portioning which has huge implications for exploration and development success in these complex reservoirs enabling readers to understand the varying orders of deposition and diagenesis and also to model the flow and elastic properties *Meta-attributes and Artificial Networking* Kalachand Sain,Priyadarshi Chinmoy Kumar,2022-08-16 Applying machine learning to the interpretation of seismic data Seismic data gathered on the surface can be used to generate numerous seismic attributes that enable better

understanding of subsurface geological structures and stratigraphic features With an ever increasing volume of seismic data available machine learning augments faster data processing and interpretation of complex subsurface geology Meta Attributes and Artificial Networking A New Tool for Seismic Interpretation explores how artificial neural networks can be used for the automatic interpretation of 2D and 3D seismic data Volume highlights include Historic evolution of seismic attributes Overview of meta attributes and how to design them Workflows for the computation of meta attributes from seismic data Case studies demonstrating the application of meta attributes Sets of exercises with solutions provided Sample data sets available for hands on exercises The American Geophysical Union promotes discovery in Earth and space science for the benefit of humanity Its publications disseminate scientific knowledge and provide resources for researchers students and professionals **Computational Neural Networks for Geophysical Data Processing** M.M. Poulton,2001-06-13 This book was primarily written for an audience that has heard about neural networks or has had some experience with the algorithms but would like to gain a deeper understanding of the fundamental material For those that already have a solid grasp of how to create a neural network application this work can provide a wide range of examples of nuances in network design data set design testing strategy and error analysis Computational rather than artificial modifiers are used for neural networks in this book to make a distinction between networks that are implemented in hardware and those that are implemented in software The term artificial neural network covers any implementation that is inorganic and is the most general term Computational neural networks are only implemented in software but represent the vast majority of applications While this book cannot provide a blue print for every conceivable geophysics application it does outline a basic approach that has been used successfully Advances in Geophysics, Tectonics and Petroleum Geosciences Mustapha Meghraoui,Narasimman Sundararajan,Santanu Banerjee,Klaus-G. Hinzen,Mehdi Eshagh,François Roure,Helder I. Chaminé,Said Maouche,André Michard,2022-04-21 This edited book is based on the best papers accepted for presentation during the 2nd Springer Conference of the Arabian Journal of Geosciences CAJG 2 Tunisia in 2019 It is of interest to all researchers practicing geophysics seismology structural and petroleum geology With four sections spanning a large spectrum of geological and geophysical topics with particular reference to Middle East Mediterranean region and Africa this book presents a series of research methods that are nowadays in use for measuring quantifying and analyzing several geological domains It starts with a subsection dedicated to the latest research studies on seismic hazard and risk assessment in Africa presented during the 2019 IGCP 659 meeting organized alongside the CAJG 2 And it includes new research studies on earthquake geodesy seismotectonics archeoseismology and active faulting well logging methods geodesy and exploration theoretical geophysics petroleum geochemistry petroleum engineering structural geology basement architecture and potential data tectonics and geodynamics and thermicity petroleum and other georesources The edited book gives insights into the fundamental questions that address the genesis and evolution of our planet and this is based on data collection and

experimental investigations under physical constitutive laws These multidisciplinary approaches combined with the geodynamics of tectonic provinces and investigations of potential zones of natural resources petroleum reservoirs provide the basis for a more sustainability in the economic development   *Encyclopedia of Solid Earth Geophysics* Harsh Gupta,2011-06-29 The past few decades have witnessed the growth of the Earth Sciences in the pursuit of knowledge and understanding of the planet that we live on This development addresses the challenging endeavor to enrich human lives with the bounties of Nature as well as to preserve the planet for the generations to come Solid Earth Geophysics aspires to define and quantify the internal structure and processes of the Earth in terms of the principles of physics and forms the intrinsic framework which other allied disciplines utilize for more specific investigations The first edition of the Encyclopedia of Solid Earth Geophysics was published in 1989 by Van Nostrand Reinhold publishing company More than two decades later this new volume edited by Prof Harsh K Gupta represents a thoroughly revised and expanded reference work It brings together more than 200 articles covering established and new concepts of Geophysics across the various sub disciplines such as Gravity Geodesy Geomagnetism Seismology Seismics Deep Earth Processes Plate Tectonics Thermal Domains Computational Methods etc in a systematic and consistent format and standard It is an authoritative and current reference source with extraordinary width of scope It draws its unique strength from the expert contributions of editors and authors across the globe It is designed to serve as a valuable and cherished source of information for current and future generations of professionals   *Engineering Applications of Neural Networks* Lazaros S. Iliadis,Harris Papadopoulos,Chrisina Jayne,2013-09-25 The two volumes set CCIS 383 and 384 constitutes the refereed proceedings of the 14th International Conference on Engineering Applications of Neural Networks EANN 2013 held on Halkidiki Greece in September 2013 The 91 revised full papers presented were carefully reviewed and selected from numerous submissions The papers describe the applications of artificial neural networks and other soft computing approaches to various fields such as pattern recognition predictors soft computing applications medical applications of AI fuzzy inference evolutionary algorithms classification learning and data mining control techniques aspects of AI evolution image and video analysis classification pattern recognition social media and community based governance medical applications of AI bioinformatics and learning

Journal of Environmental & Engineering Geophysics ,2003   <u>Fuzzy Logic</u> Paul P. Wang,Da Ruan,Etienne E. Kerre,2007-06-15 In order to properly characterize the content of this book it is important to clarify rst the intended meaning of its title Fuzzy Logic This clari cation is needed since the term fuzzy logic as currently used in the literature is viewed either in a narrow sense or in a broad sense In the narrow sense fuzzy logic is viewed as an area devoted to the formal development in a u ed way of the various logical systems of many valued logic It is concerned withformalizingsyntactic aspects basedonthenotionofproof andsemantic aspects based on the notion oftruth of the variouslogical calculi In order to be acceptable each of these logical calculi must be sound provability implies truth and complete truth implies provability The

most representativep lication of fuzzy logic in this sense is in my opinion the classic book by Peter Hajek 1 When the term fuzzy logic is viewed in the broad sense it refers to an extensive agenda whose primary aim is to utilize the apparatus of fuzzy set theoryfordevelopingsoundconcepts principles andmethodsforrepresenting and dealing with knowledge expressed by statements in natural language Although workin fuzzy logicin the broadsense is not directly concernedwith the issues that are investigated under fuzzy logic in the narrow sense the importance of the latter is that it provides the former with solid theoretical foundations After examining the content of this book it is easy to conclude that its title FuzzyLogic referstofuzzylogicinthebroadsense Thisisconsistent by and large with the usual meaning of the term fuzzy logic in the literature **Enhance Oil and Gas Exploration with Data-Driven Geophysical and Petrophysical Models** Keith R. Holdaway,Duncan H. B. Irving,2017-10-04 Leverage Big Data analytics methodologies to add value to geophysical and petrophysical exploration data Enhance Oil Gas Exploration with Data Driven Geophysical and Petrophysical Models demonstrates a new approach to geophysics and petrophysics data analysis using the latest methods drawn from Big Data Written by two geophysicists with a combined 30 years in the industry this book shows you how to leverage continually maturing computational intelligence to gain deeper insight from specific exploration data Case studies illustrate the value propositions of this alternative analytical workflow and in depth discussion addresses the many Big Data issues in geophysics and petrophysics From data collection and context through real world everyday applications this book provides an essential resource for anyone involved in oil and gas exploration Recent and continual advances in machine learning are driving a rapid increase in empirical modeling capabilities This book shows you how these new tools and methodologies can enhance geophysical and petrophysical data analysis increasing the value of your exploration data Apply data driven modeling concepts in a geophysical and petrophysical context Learn how to get more information out of models and simulations Add value to everyday tasks with the appropriate Big Data application Adjust methodology to suit diverse geophysical and petrophysical contexts Data driven modeling focuses on analyzing the total data within a system with the goal of uncovering connections between input and output without definitive knowledge of the system s physical behavior This multi faceted approach pushes the boundaries of conventional modeling and brings diverse fields of study together to apply new information and technology in new and more valuable ways Enhance Oil Gas Exploration with Data Driven Geophysical and Petrophysical Models takes you beyond traditional deterministic interpretation to the future of exploration data analysis **Machine Learning and Artificial Intelligence in Geosciences** ,2020-09-22 Advances in Geophysics Volume 61 Machine Learning and Artificial Intelligence in Geosciences the latest release in this highly respected publication in the field of geophysics contains new chapters on a variety of topics including a historical review on the development of machine learning machine learning to investigate fault rupture on various scales a review on machine learning techniques to describe fractured media signal augmentation to improve the generalization of deep neural networks deep generator priors for

Bayesian seismic inversion as well as a review on homogenization for seismology and more Provides high level reviews of the latest innovations in geophysics Written by recognized experts in the field Presents an essential publication for researchers in all fields of geophysics **Reservoir Characterization** Fred Aminzadeh,2022-01-06 RESERVOIR CHARACTERIZATION The second volume in the series Sustainable Energy Engineering written by some of the foremost authorities in the world on reservoir engineering this groundbreaking new volume presents the most comprehensive and updated new processes equipment and practical applications in the field Long thought of as not being sustainable newly discovered sources of petroleum and newly developed methods for petroleum extraction have made it clear that not only can the petroleum industry march toward sustainability but it can be made greener and more environmentally friendly Sustainable energy engineering is where the technical economic and environmental aspects of energy production intersect and affect each other This collection of papers covers the strategic and economic implications of methods used to characterize petroleum reservoirs Born out of the journal by the same name formerly published by Scrivener Publishing most of the articles in this volume have been updated and there are some new additions as well to keep the engineer abreast of any updates and new methods in the industry Truly a snapshot of the state of the art this groundbreaking volume is a must have for any petroleum engineer working in the field environmental engineers petroleum engineering students and any other engineer or scientist working with reservoirs This outstanding new volume Is a collection of papers on reservoir characterization written by world renowned engineers and scientists and presents them here in one volume Contains in depth coverage of not just the fundamentals of reservoir characterization but the anomalies and challenges set in application based real world situations Covers reservoir characterization for the engineer to be able to solve daily problems on the job whether in the field or in the office Deconstructs myths that are prevalent and deeply rooted in the industry and reconstructs logical solutions Is a valuable resource for the veteran engineer new hire or petroleum engineering student **Soft Computing and Intelligent Data Analysis in Oil Exploration** M. Nikravesh,L.A. Zadeh,Fred Aminzadeh,2003-04-22 This comprehensive book highlights soft computing and geostatistics applications in hydrocarbon exploration and production combining practical and theoretical aspects It spans a wide spectrum of applications in the oil industry crossing many discipline boundaries such as geophysics geology petrophysics and reservoir engineering It is complemented by several tutorial chapters on fuzzy logic neural networks and genetic algorithms and geostatistics to introduce these concepts to the uninitiated The application areas include prediction of reservoir properties porosity sand thickness lithology fluid seismic processing seismic and bio stratigraphy time lapse seismic and core analysis There is a good balance between introducing soft computing and geostatistics methodologies that are not routinely used in the petroleum industry and various applications areas The book can be used by many practitioners such as processing geophysicists seismic interpreters geologists reservoir engineers petrophysicist geostatistians asset mangers and technology application professionals It will also be of interest to academics

to assess the importance of and contribute to R D efforts in relevant areas

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