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Electric power transmission relies on AC and DC grids. The extensive integration of conventional and nonconventional energy sources and power converters into power grids has resulted in a demand for high voltage (HV), extra-high voltage (EHV), and ultra-high voltage (UHV) AC/DC transmission grids in modern power systems. To ensure the security, adequacy, and reliable operation of power systems, the practical aspects of interconnecting HV, EHV, and UHV AC/DC grids into the electric power systems, along with their economic and environmental impacts, should be considered. The stability analysis for the planning and operation of HV, EHV, and UHV AC/DC grids in power systems is regarded as another key issue in modern power systems. Moreover, interactions between power converters and other power electronics devices (e.g., FACTS devices) installed on the network are other aspects of power systems that must be addressed. This Special Issue aims to investigate the integration of HV, EHV, and UHV AC/DC grids into modern power systems by analyzing their control, operation, protection, dynamics, planning, reliability, and security, along with considering power quality improvement, market operations, power conversion, cybersecurity, supervisory and monitoring, diagnostics, and prognostics systems.

The two-volume set LNCS 8297 and LNCS 8298 constitutes the proceedings of the 4th International Conference on Swarm, Evolutionary and Memetic Computing, SEMCCO 2013, held in Chennai, India, in December 2013. The total of 123 papers presented in this volume set was carefully reviewed and selected for inclusion in the proceedings. They cover cutting-edge research on swarm, evolutionary and memetic computing, neural and fuzzy computing and its application.

A guide to the role of static state estimation in the mitigation of potential system failures With contributions from a noted panel of experts on the topic, Advances in Electric Power and Energy: Static State Estimation addresses the wide-range of issues concerning static state estimation as a main energy control function and major tool for evaluating prevailing operating conditions in electric power systems worldwide. This book is an essential guide for system operators who must be fully aware of potential threats to the integrity of their own and neighboring systems. The contributors provide an overview of the topic and review common threats such as cascading black-outs to model-based anomaly detection to the operation of micro-grids and much more. The book also includes a discussion of an effective mathematical programming approach to state estimation in power systems. Advances in Electric Power and Energy reviews the most recent

developments in the field and: Offers an introduction to the topic to help non-experts (and professionals) get up-to-date on static state estimation Covers the essential information needed to understand power system state estimation written by experts on the subject Discusses a mathematical programming approach Written for electric power system planners, operators, consultants, power system software developers, and academics, Advances in Electric Power and Energy is the authoritative guide to the topic with contributions from experts who review the most recent developments.

Many approaches have sprouted from artificial intelligence (AI) and produced major breakthroughs in the computer science and engineering industries. Deep learning is a method that is transforming the world of data and analytics. Optimization of this new approach is still unclear, however, and there's a need for research on the various applications and techniques of deep learning in the field of computing. Deep Learning Techniques and Optimization Strategies in Big Data Analytics is a collection of innovative research on the methods and applications of deep learning strategies in the fields of computer science and information systems. While highlighting topics including data integration, computational modeling, and scheduling systems, this book is ideally designed for engineers, IT specialists, data analysts, data scientists, engineers,

researchers, academicians, and students seeking current research on deep learning methods and its application in the digital industry.

This book presents an interesting sample of the latest advances in optimization techniques applied to electrical power engineering. It covers a variety of topics from various fields, ranging from classical optimization such as Linear and Nonlinear Programming and Integer and Mixed-Integer Programming to the most modern methods based on bio-inspired metaheuristics. The featured papers invite readers to delve further into emerging optimization techniques and their real application to case studies such as conventional and renewable energy generation, distributed generation, transport and distribution of electrical energy, electrical machines and power electronics, network optimization, intelligent systems, advances in electric mobility, etc.

Special edition of the Federal Register, containing a codification of documents of general applicability and future effect ... with ancillaries.

The electric power industry is currently undergoing an unprecedented reform. The deregulation of electricity supply industry has introduced new opportunity for competition to reduce the cost and cut the price. It is a tremendous challenge for utilities to maintain an economical and reliable supply of electricity in such an environment. Faced by an increasingly complicated existence, power utilities

need efficient tools and aids to ensure that electrical energy of the desired quality can be provided at the lowest cost. The overall objective, both for short-term and long-term operations, is then to find the best compromise between the requirements of security and economy. That is, effective tools are urgently required to solve highly constrained optimisation problems. In recent years, several major modem optimisation techniques have been applied to power systems. A large number of papers and reports have been published. In this respect, it is timely to edit a book on this topic with an aim to report the state of the art development internationally in this area.

In today's society, modern power grids are driven closer to transfer capacities due to increased consumption and power transfers, endangering the security of the systems. Providing methods in controlling variables to minimize costs, transmission loss, and voltage deviation of power system operation yields valuable economic information and insight into power flow. Optimal Power Flow Using Evolutionary Algorithms provides emerging research exploring the theoretical and practical aspects of optimizing power system operation through advanced electronic power devices. Featuring coverage on a broad range of topics such as hybridization algorithm, power system modeling, and transmission systems, this book is ideally designed for engineers, power system developers, academicians, and researchers seeking current research on emerging techniques in achieving quality power under normal operating conditions.

Electricity Pricing: Regulated, Deregulated and Smart Grid Systems presents proven methods for supplying uninterrupted, high-quality electrical power at a reasonable price to the consumer. Illustrating the evolution of the power market from a monopoly to an open access system, this essential text: Covers voltage stability analysis of longitudinal power supply systems using an artificial neural network (ANN) Explains how to improve performance using flexible alternating current transmission systems (FACTS) and high-voltage direct current (HVDC) Takes into account operating constraints as well as generation cost, line overload, and congestion for expected and inadvertent loading stress Goes beyond FACTS and HVDC to provide multi-objective optimization algorithms for the deregulated power market Proposes the use of stochastic optimization techniques in the smart grid, preparing the reader for future development Electricity Pricing: Regulated, Deregulated and Smart Grid Systems offers practical solutions for improving stability, reliability, and efficiency in real-time systems while optimizing electricity cost.

Internationally, the electric power industry is currently undergoing unprecedented reform. The deregulation of the electricity supply industry has introduced new opportunities for competition and has made the maintenance of economic and reliable supplies of electricity a tremendous challenge. Faced by an increasingly complicated existence, power utilities need efficient tools to ensure that electrical energy of the quality desired can be provided at the lowest possible cost. Operation of Market-oriented Power Systems provides effective computational tools for the efficient operation of restructured power systems covering all the major operational issues such as: • congestion management; • available transfer capability calculations; • price forecasting and optimal bidding strategies; • a review of international research and world-wide

industrial practice covered in each chapter gives the reader a broader understanding of the state of the art in this exciting field. Operation of Market-oriented Power Systems will be a useful reference for professional engineers and researchers in the operation and control of modern power systems as all within the power industry face up to the changes required to provide safe, reliable and profitable electricity in an increasingly competitive market.
In today's world, with an increase in the breadth and scope of real-world engineering optimization problems as well as with the advent of big data, improving the performance and efficiency of algorithms for solving such problems has become an indispensable need for specialists and researchers. In contrast to conventional books in the field that employ traditional single-stage computational, single-dimensional, and single-homogeneous optimization algorithms, this book addresses multiple newfound architectures for meta-heuristic music-inspired optimization algorithms. These proposed algorithms, with multi-stage computational, multi-dimensional, and multi-inhomogeneous structures, bring about a new direction in the architecture of meta-heuristic algorithms for solving complicated, real-world, large-scale, non-convex, non-smooth engineering optimization problems having a non-linear, mixed-integer nature with big data. The architectures of these new algorithms may also be appropriate for finding an optimal solution or a Pareto-optimal solution set with higher accuracy and speed in comparison to other optimization algorithms, when feasible regions of the solution space and/or dimensions of the optimization problem increase. This book, unlike conventional books on power systems problems that only consider simple and impractical models, deals with complicated, techno-economic, real-world, large-scale models of power systems operation and planning. Innovative applicable ideas in these models make this book a

precious resource for specialists and researchers with a background in power systems operation and planning. Provides an understanding of the optimization problems and algorithms, particularly meta-heuristic optimization algorithms, found in fields such as engineering, economics, management, and operations research; Enhances existing architectures and develops innovative architectures for meta-heuristic music-inspired optimization algorithms in order to deal with complicated, real-world, large-scale, non-convex, non-smooth engineering optimization problems having a non-linear, mixed-integer nature with big data; Addresses innovative multi-level, techno-economic, real-world, large-scale, computational-logical frameworks for power systems operation and planning, and illustrates practical training on implementation of the frameworks using the meta-heuristic music-inspired optimization algorithms.

"This reference is a broad, multi-volume collection of the best recent works published under the umbrella of computer engineering, including perspectives on the fundamental aspects, tools and technologies, methods and design, applications, managerial impact, social/behavioral perspectives, critical issues, and emerging trends in the field"--Provided by publisher.

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.

The extended and revised second edition of this successful monograph presents advanced modeling, analysis and control techniques of Flexible AC Transmission Systems (FACTS). The book covers comprehensively a range of power-system control problems: from steady-state voltage and power flow control, to voltage and reactive power control, to voltage stability control, to small signal stability control using FACTS controllers. In the six years since the first edition of the book has been published research on the FACTS has continued to flourish while renewable energy has developed into a mature and booming global green business. The second edition reflects the new developments in converter configuration, smart grid technologies, super power grid developments worldwide, new approaches for FACTS control design, new controllers for distribution system control, and power electronic controllers in wind generation operation and control. The latest trends of VSC-HVDC with multilevel architecture have been included and four completely new chapters have been added devoted to Multi-Agent Systems for Coordinated Control of FACTS-devices, Power System Stability Control using FACTS with Multiple Operating Points, Control of a Looping Device in a Distribution System, and Power Electronic Control for Wind Generation.

Because society depends greatly on electric energy, power system control and protection focuses on ensuring a secure and reliable supply of power. To operate the electric systems in safe mode, the power system component should be equipped with intelligent controllers. The Handbook of Research on Smart Power System Operation and Control is a collection of innovative research on the theoretical and practical developments in smart power system operation and control that takes into account both smart grid and micro-grid systems. While highlighting topics including cybersecurity, smart grid, and wide area monitoring, this book is ideally designed for researchers, students, and industry professionals.

This volume deals with different computational intelligence (CI) techniques for solving real world power industry problems. It will be extremely helpful for the researchers as well as the practicing engineers in the power industry.

The restructuring and deregulation of the power utility industry is resulting in significant competitive, technological and regulatory changes. Independent power producers, power marketers and brokers have added a new and significant dimension to the task of maintaining a reliable electric system. Power System Restructuring and Deregulation provides comprehensive coverage of the technological advances, which have helped redesign the ways in which utility

companies manage their business. With the aid of practical case studies, an international panel of contributors address the most up to date problems and their solutions in a cohesive manner, making this book indispensable to graduates and engineers in the power industry field. Presents state of the art techniques in power industry restructuring Includes applications of new technology in power industry deregulation Includes practical examples of changes in load forecasting techniques and methods International contributors offer a global perspective detailing power utility restructuring and deregulation from various countries The Code of Federal Regulations is the codification of the general and permanent rules published in the Federal Register by the executive departments and agencies of the Federal Government.
Computer Aided State Estimation of Electric Power Networks is a fundamental introduction to the topic of state estimation at an advanced textbook level for teaching a course at either the graduate or undergraduate level, as well as for Post Graduate students and Research Scholars who want to review of the latest techniques and best mathematical approaches for estimating the state of a general system. Theory as well as practice of Distribution System State Estimation (DSSE) is covered with imperative rigidity. The authors present the theory of state estimation clearly providing the right amount of essential

information and linked reports in order to enable the researchers and graduate students to apply state estimation techniques across a variety of fields in power systems engineering. A prerequisite knowledge of basic power system operation, control, data acquisition and measurement, in addition to basic statistics is helpful in understanding the book. Key Features include: • Advanced Topics based on Cloud Computing and Standards used for Preparation of Smart Grid • Provides Entire Coding Information for Estimating the State Estimation Topology Performance • Enables both the Researchers and Graduate Students for Pursuing their Research Projects • Covers the Important Topics on Data Attacks and Solution Strategy • Provides an Introduction to Distribution System State Estimation This book includes new contents like Distribution System State Estimation, Data Attacks, Defense strategies, with an introduction to large scale systems based on cloud computing, and an MATLAB training package for graduate students

"This book analyzes the need for a holistic approach for the construction and engineering of cities and societies"--Provided by publisher.

Optimization techniques have developed into a significant area concerning industrial, economics, business, and financial systems. With the development of engineering and financial systems, modern optimization has played an important

role in service-centered operations and as such has attracted more attention to this field. Meta-heuristic hybrid optimization is a newly development mathematical framework based optimization technique. Designed by logicians, engineers, analysts, and many more, this technique aims to study the complexity of algorithms and problems. Meta-Heuristics Optimization Algorithms in Engineering, Business, Economics, and Finance explores the emerging study of meta-heuristics optimization algorithms and methods and their role in innovated real world practical applications. This book is a collection of research on the areas of meta-heuristics optimization algorithms in engineering, business, economics, and finance and aims to be a comprehensive reference for decision makers, managers, engineers, researchers, scientists, financiers, and economists as well as industrialists.

This work can very well be the basis for an integrated and seamless market design for energy and ancillary services.

Power Systems Analysis provides a thorough understanding of the principles and techniques of power system analysis and their application to real-world problems. Beginning with basic concepts, the book gives an exhaustive coverage of transmission line parameters, symmetrical and unsymmetrical fault analysis and power flow studies. The book includes seperate chapters on state estimation, stability analysis and

contingency analysis and also provides and introduction to HVDC and FACTS. Relevant topics such as power quality and power management are also dealt with. The book extensively illustrates the use of MATLAB in the analysis of power systems. With its lucid style of presentation, the book should be useful to both students and practising engineers.

From nature, we observe swarming behavior in the form of ant colonies, bird flocking, animal herding, honey bees, swarming of bacteria, and many more. It is only in recent years that researchers have taken notice of such natural swarming systems as culmination of some form of innate collective intelligence, albeit swarm intelligence (SI) - a metaphor that inspires a myriad of computational problem-solving techniques. In computational intelligence, swarm-like algorithms have been successfully applied to solve many real-world problems in engineering and sciences. This handbook volume serves as a useful foundational as well as consolidatory state-of-art collection of articles in the field from various researchers around the globe. It has a rich collection of contributions pertaining to the theoretical and empirical study of single and multi-objective variants of swarm intelligence based algorithms like particle swarm optimization (PSO), ant colony optimization (ACO), bacterial foraging optimization algorithm (BFOA), honey bee social foraging algorithms, and harmony search (HS). With chapters describing various applications of SI techniques in real-world engineering problems, this handbook can be a valuable resource for researchers and practitioners,

giving an in-depth flavor of what SI is capable of achieving.

This book is about synergy in computational intelligence (CI). It is a c- lection of chapters that covers a rich and diverse variety of computer-based techniques, all involving some aspect of computational intelligence, but each one taking a somewhat pragmatic view. Many complex problems in the real world require the application of some form of what we loosely call "intel- gence"fortheirsolution. Fewcanbesolvedbythenaiveapplicationofasingle technique, however good it is. Authors in this collection recognize the li- tations of individual paradigms, and propose some practical and novel ways in which di?erent CI techniques can be combined with each other, or with more traditional computational techniques, to produce powerful probl- solving environments which exhibit synergy, i. e. , systems in which the whole 1 is greater than the sum of the parts . Computational intelligence is a relatively new term, and there is some d- agreement as to its precise de?nition. Some practitioners limit its scope to schemes involving evolutionary algorithms, neural networks, fuzzy logic, or hybrids of these. For others, the de?nition is a little more ?exible, and will include paradigms such as Bayesian belief networks, multi-agent systems, case-based reasoning and so on. Generally, the term has a similar meaning to the well-known phrase "Arti?cial Intelligence" (AI), although CI is p- ceived moreas a "bottom up" approachfrom which intelligent behaviour can emerge,whereasAItendstobestudiedfromthe"topdown",andderivefrom pondering upon

the "meaning of intelligence". (These and other key issues will be discussed in more detail in Chapter 1.

Provides practical guidance on the coordination issue of power protective relays and fuses Protecting electrical power systems requires devices that isolate the components that are under fault while keeping the rest of the system stable. Optimal Coordination of Power Protective Devices provides a thorough introduction to the optimal coordination of power systems protection using fuses and protective relays. Integrating fundamental theory and real-world practice, the text begins with an overview of power system protection and optimization, followed by a systematic description of the essential steps in designing directional overcurrent relays and other optimal coordinators. Subsequent chapters present mathematical formulations for solving many standard test systems, and cover a variety of popular hybrid optimization schemes and their mechanisms. The author also discusses a selection of advanced topics and extended applications including adaptive optimal coordination, optimal coordination with multiple time-current curves, and optimally coordinating multiple types of protective devices. Optimal Coordination of Power Protective Devices: Covers fuses and overcurrent, directional overcurrent, and distance relays Explains the relation between fault current and operating time of protective relays Discusses performance and design criteria such as sensitivity, speed, and simplicity Includes an up-to-date literature review and a detailed overview of the fundamentals of power system protection Features numerous

illustrative examples, practical case studies, and programs coded in MATLAB and Python programming languages Optimal Coordination of Power Protective Devices is the perfect textbook for instructors in electric power system protection courses, and a must-have reference for protection engineers in power electric companies, and for researchers and industry professionals specializing in power system protection. This book comprises ten articles covering different aspects of power quality issues in microgrids and distributed generation (DG) systems, including 1) Detection and estimation of power quality; 2) Modeling; 3) Harmonic control for DG systems and microgrids; 4) Stability improvements for microgrids. Different power quality phenomena and solution were studied in the included papers, such as harmonics, resonance, frequency deviation, voltage sag, and fluctuation. From a network point of view, some papers studied the harmonic and stability issues in standalone microgrids which are more likely to cause power quality problems. Other papers discussed the power quality problems in microgrids which are weakly interconnected with the main distribution grid. In view of the published papers, there is a trend that increasingly advanced modeling, analysis, and control schemes were applied in the studies. Moreover, the latest works focus not only on single-unit problems but also multiple units or network issues. Although some of the hot topics are not included, this book covers multiple aspects of the current power quality research frontier, and represents a particularly useful reference book for frontier researchers in this field.

This book is an introduction to some new fields in soft computing with its principal components of fuzzy logic, ANN and EA. The approach in this book is to provide an understanding of the soft computing field and to work through soft computing using examples. It also aims to integrate pseudo-code operational summaries and Matlab codes, to present computer simulation, to include real world applications and to highlight the distinctive work of human consciousness in machine.

Modern optimization approaches have attracted many research scientists, decision makers and practicing researchers in recent years as powerful intelligent computational techniques for solving several complex real-world problems. The Handbook of Research on Modern Optimization Algorithms and Applications in Engineering and Economics highlights the latest research innovations and applications of algorithms designed for optimization applications within the fields of engineering, IT, and economics. Focusing on a variety of methods and systems as well as practical examples, this book is a significant resource for graduate-level students, decision makers, and researchers in both public and private sectors who are seeking research-based methods for modeling uncertain real-world problems. .

This book presents the application of some AI related optimization techniques in the operation and control of electric power systems. With practical applications and examples the use of functional analysis, simulated annealing, Tabu-search, Genetic algorithms and fuzzy systems for the optimization of power systems is discussed in detail. Preliminary mathematical concepts are presented before moving to more advanced material. Researchers and graduate students will benefit from this book. Engineers working in utility companies, operations and control, and

resource management will also find this book useful. ?

With the considerable increase of AI applications, AI is being increasingly used to solve optimization problems in engineering. In the past two decades, the applications of artificial intelligence in power systems have attracted much research. This book covers the current level of applications of artificial intelligence to the optimization problems in power systems. This book serves as a textbook for graduate students in electric power system management and is also useful for those who are interested in using artificial intelligence in power system optimization.

An essential overview of post-deregulation market operations inelectrical power systems Until recently the U.S. electricity industry was dominated byvertically integrated utilities. It is now evolving into adistributive and competitive market driven by market forces andincreased competition. With electricity amounting to a $200 billionper year market in the United States, the implications of thisrestructuring will naturally affect the rest of the world. Why is restructuring necessary? What are the components ofrestructuring? How is the new structure different from the oldmonopoly? How are the participants strategizing their options tomaximize their revenues? What are the market risks and how are theyevaluated? How are interchange transactions analyzed and approved?Starting with a background sketch of the industry, this hands-onreference provides insights into the new trends in power systemsoperation and control, and highlights advanced issues in thefield. Written for both technical and nontechnical professionals involvedin power engineering, finance, and marketing, this must-haveresource discusses: * Market structure and operation of electric power systems * Load and price forecasting and arbitrage * Price-based unit commitment and security constrained

unitcommitment * Market power analysis and game theory applications * Ancillary services auction market design * Transmission pricing and congestion Using real-world case studies, this timely survey offers engineers,consultants, researchers, financial managers, university professorsand students, and other professionals in the industry acomprehensive review of electricity restructuring and how itsradical effects will shape the market.

The natural social behavior of large groups of animals, such as flocks of birds, schools of fish, or colonies of ants has fascinated scientists for hundreds of years, if not longer, due to the intricate nature of their interactions and their ability to move and work together seemingly effortlessly. Innovations and Developments of Swarm Intelligence Applications explores the emerging realm of swarm intelligence, which finds its basis in the natural social behavior of animals. The study and application of this swarm behavior has led scientists to a new world of research as ways are found to apply this behavior to independent intelligent agents, creating complex solutions for real world applications. Worldwide contributions have been seamlessly combined in this comprehensive reference, providing a wealth of new information for researchers, academicians, students, and engineers.

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