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# Condition Monitoring Using Computational Intelligence Methods Applications In Mechanical And Electri

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**SWEENEY VANG**

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*Emerging Trends and Applications* IGI Global

Condition Monitoring Using Computational Intelligence Methods promotes the various approaches gathered under the umbrella of computational intelligence to show how condition monitoring can be used to avoid equipment failures and lengthen its useful life, minimize downtime and reduce maintenance costs. The text introduces various signal-processing and pre-processing techniques, wavelets and

principal component analysis, for example, together with their uses in condition monitoring and details the development of effective feature extraction techniques classified into frequency-, time-frequency- and time-domain analysis. Data generated by these techniques can then be used for condition classification employing tools such as: • fuzzy systems; rough and neuro-rough sets; neural and Bayesian networks; hidden Markov and Gaussian mixture models; and support vector machines.

*Industrial Applications and Performance Models* Springer

Artificial Intelligence Tools: Decision Support Systems in Condition Monitoring

and Diagnosis discusses various white- and black-box approaches to fault diagnosis in condition monitoring (CM). This indispensable resource: Addresses nearest-neighbor-based, clustering-based, statistical, and information theory-based techniques Considers the merits of e

### **Artificial Intelligence in Economics and Finance Theories** Springer

Interaction of various components in rotating machinery like gearboxes may generate excitation forces at various frequencies. These frequencies may sometimes overlap with the frequencies of the forces generated by other components in the system. Conventional vibration spectrum analysis does not attenuate noise and spectral frequency band overlapping, which in many applications masks the changes in the structural response caused by the deterioration of certain components in the machine. This problem is overcome by the use of time domain averaging (dsynchronous averaging). In time domain averaging, the vibration signal is sampled at a frequency that is synchronized with the rotation of the gear of interest and the samples obtained for each singular position of the gear are ensemble-averaged. When sufficient averages are taken, all the vibration from the gearbox, which is asynchronous with the vibration of the gear, is attenuated. The resulting time synchronously averaged signal obtained through this process indicates the vibration produced during one rotation of the monitored gear. This direct time domain averaging process essentially acts as a broadband noise synchronous filter, which filters out the frequency content that is asynchronous with the vibration of the gear of interest provided that enough averages are taken. The

time domain averaging procedure requires an enormous amount of vibration data to execute, making it very difficult to develop online gearbox condition monitoring systems that make use of time domain averaging to enhance their diagnostic capabilities since data acquisition and analysis cannot be done simultaneously. The objective of this research was to develop a more efficient way for calculating the time domain average of a gear vibration signal. A study of Artificial Neural Networks (ANNs) and Support Vector Machines (SVMs) was conducted to assess their suitability for use in time domain averaging. Two time domain averaging models that use ANNs and SVMs were developed. Model 1 uses a single feedforward network configuration to map the input which are rotation synchronized gear vibration signals to the output which is the time domain average of the gear vibration signal, using only a section of the input space. Model 2 operates in two stages. In the first stage, it uses a feedforward network to predict the instantaneous time domain average of the gear vibration after 10 inputs (10 rotation synchronized gear vibration signals) to predict the instantaneous average of the gear rotation. The outputs from the first state are used as inputs to the second stage, where a second feedforward network is used to predict the time domain average of the entire vibration signal. When ANNs and SVMs were implemented, the results indicated that the amount of gear vibration data that is required to calculate the time domain average using Model 1 can be reduced by 75 percent and the amount of gear vibration data that needs to be stored in the data acquisition system when Model 2 is used can be reduced by 83 percent.

**Applications in Mechanical and Electrical Systems** IGI Global

Despite the large volume of publications devoted to neural networks, fuzzy logic, and evolutionary programming, few address the applications of computational intelligence in design and manufacturing. Computational Intelligence in Manufacturing Handbook fills this void as it covers the most recent advances in this area and state-of-the-art applications. This comprehensive handbook contains an excellent balance of tutorials and new results, that allows you to: obtain current information understand technical details assess research potentials, and define future directions of the field Manufacturing applications play a leading role in progress, and this handbook gives you a ready reference to guide you easily through these developments.

**Smart Maintenance for Human-Robot Interaction** Academic Press

In recent years, rapid changes and improvements have been witnessed in the field of transformer condition monitoring and assessment, especially with the advances in computational intelligence techniques. Condition Monitoring and Assessment of Power Transformers Using Computational Intelligence applies a broad range of computational intelligence techniques to deal with practical transformer operation problems. The approaches introduced are presented in a concise and flowing manner, tackling complex transformer modelling problems and uncertainties occurring in transformer fault diagnosis. Condition Monitoring and Assessment of Power Transformers Using Computational Intelligence covers both the fundamental theories and the most up-to-date research in this rapidly changing field. Many examples have

been included that use real-world measurements and realistic operating scenarios of power transformers to fully illustrate the use of computational intelligence techniques for a variety of transformer modelling and fault diagnosis problems. Condition Monitoring and Assessment of Power Transformers Using Computational Intelligence is a useful book for professional engineers and postgraduate students. It also provides a firm foundation for advanced undergraduate students in power engineering.

**Artificial Intelligence and Economic Theory: Skynet in the Market** Condition

Monitoring : Using Computational Intelligence Methods Condition Monitoring Using Computational Intelligence Methods Applications in Mechanical and Electrical Systems During the last two decades, computer and information technologies have forced great changes in the ways businesses manage operations in meeting the desired quality of products and services, customer demands, competition, and other challenges. The Handbook of Computational Intelligence in Manufacturing and Production Management focuses on new developments in computational intelligence in areas such as forecasting, scheduling, production planning, inventory control, and aggregate planning, among others. This comprehensive collection of research provides cutting-edge knowledge on information technology developments for both researchers and professionals in fields such as operations and production management, Web engineering, artificial intelligence, and information resources management.

**Theoretical Foundations and Applications** Academic Press

As Artificial Intelligence (AI) seizes all aspects of human life, there is a fundamental shift in the way in which humans are thinking of and doing things. Ordinarily, humans have relied on economics and finance theories to make sense of, and predict concepts such as comparative advantage, long run economic growth, lack or distortion of information and failures, role of labour as a factor of production and the decision making process for the purpose of allocating resources among other theories. Of interest though is that literature has not attempted to utilize these advances in technology in order to modernize economic and finance theories that are fundamental in the decision making process for the purpose of allocating scarce resources among other things. With the simulated intelligence in machines, which allows machines to act like humans and to some extent even anticipate events better than humans, thanks to their ability to handle massive data sets, this book will use artificial intelligence to explain what these economic and finance theories mean in the context of the agent wanting to make a decision. The main feature of finance and economic theories is that they try to eliminate the effects of uncertainties by attempting to bring the future to the present. The fundamentals of this statement is deeply rooted in risk and risk management. In behavioural sciences, economics as a discipline has always provided a well-established foundation for understanding uncertainties and what this means for decision making. Finance and economics have done this through different models which attempt to predict the future. On its part, risk management attempts to hedge or mitigate these uncertainties in

order for “the planner” to reach the favourable outcome. This book focuses on how AI is to redefine certain important economic and financial theories that are specifically used for the purpose of eliminating uncertainties so as to allow agents to make informed decisions. In effect, certain aspects of finance and economic theories cannot be understood in their entirety without the incorporation of AI.

*Condition Monitoring and Assessment of Power Transformers Using Computational Intelligence* IGI Global  
 "This book is for those who use data analysis to build decision support systems, particularly engineers, scientists and statisticians"--Provided by publisher.

Higher Education in the Era of the Fourth Industrial Revolution World Scientific  
 Artificial intelligent systems, which offer great improvement in healthcare sector assisted by machine learning, wireless communications, data analytics, cognitive computing, and mobile computing provide more intelligent and convenient solutions and services. With the help of the advanced techniques, now a days it is possible to understand human body and to handle & process the health data anytime and anywhere. It is a smart healthcare system which includes patient, hospital management, doctors, monitoring, diagnosis, decision making modules, disease prevention to meet the challenges and problems arises in healthcare industry. Furthermore, the advanced healthcare systems need to upgrade with new capabilities to provide human with more intelligent and professional healthcare services to further improve the quality of service and user experience. To explore recent advances and disseminate state-of-the-art techniques related to intelligent

healthcare services and applications. This edited book involved in designing systems that will permit the societal acceptance of ambient intelligence including signal processing, imaging, computing, instrumentation, artificial intelligence, internet of health things, data analytics, disease detection, telemedicine, and their applications. As the book includes recent trends in research issues and applications, the contents will be beneficial to Professors, researchers, and engineers. This book will provide support and aid to the researchers involved in designing latest advancements in communication and intelligent systems that will permit the societal acceptance of ambient intelligence. This book presents the latest research being conducted on diverse topics in intelligence technologies with the goal of advancing knowledge and applications healthcare sector and to present the latest snapshot of the ongoing research as well as to shed further light on future directions in this space. The aim of publishing the book is to serve for educators, researchers, and developers working in recent advances and upcoming technologies utilizing computational sciences.

### **Theory and Engineering Applications** Springer

This book is devoted to current problems of artificial and computational intelligence including decision-making systems. Collecting, analysis, and processing information are the current directions of modern computer science. Development of new modern information and computer technologies for data analysis and processing in various fields of data mining and machine learning creates the conditions for increasing effectiveness of the information

processing by both the decrease of time and the increase of accuracy of the data processing. The book contains of 54 science papers which include the results of research concerning the current directions in the fields of data mining, machine learning, and decision making. The papers are divided in terms of their topic into three sections. The first section "Analysis and Modeling of Complex Systems and Processes" contains of 26 papers, and the second section "Theoretical and Applied Aspects of Decision-Making Systems" contains of 13 papers. There are 15 papers in the third section "Computational Intelligence and Inductive Modeling". The book is focused to scientists and developers in the fields of data mining, machine learning and decision-making systems.

### **Soft Computing in Condition Monitoring and Diagnostics of Electrical and Mechanical Systems**

Springer Nature

Condition Monitoring : Using Computational Intelligence Methods  
Condition Monitoring Using Computational Intelligence Methods  
Applications in Mechanical and Electrical Systems  
Springer Science & Business Media

*Artificial Intelligence: Concepts, Methodologies, Tools, and Applications*  
John Wiley & Sons

Probabilistic Finite Element Model Updating Using Bayesian Statistics: Applications to Aeronautical and Mechanical Engineering  
Tshilidzi Marwala and Ilyes Boulkaibet, University of Johannesburg, South Africa  
Sondipon Adhikari, Swansea University, UK  
Covers the probabilistic finite element model based on Bayesian statistics with applications to aeronautical and mechanical engineering  
Finite element models are used widely to model the

dynamic behaviour of many systems including in electrical, aerospace and mechanical engineering. The book covers probabilistic finite element model updating, achieved using Bayesian statistics. The Bayesian framework is employed to estimate the probabilistic finite element models which take into account of the uncertainties in the measurements and the modelling procedure. The Bayesian formulation achieves this by formulating the finite element model as the posterior distribution of the model given the measured data within the context of computational statistics and applies these in aeronautical and mechanical engineering. Probabilistic Finite Element Model Updating Using Bayesian Statistics contains simple explanations of computational statistical techniques such as Metropolis-Hastings Algorithm, Slice sampling, Markov Chain Monte Carlo method, hybrid Monte Carlo as well as Shadow Hybrid Monte Carlo and their relevance in engineering. Key features: Contains several contributions in the area of model updating using Bayesian techniques which are useful for graduate students. Explains in detail the use of Bayesian techniques to quantify uncertainties in mechanical structures as well as the use of Markov Chain Monte Carlo techniques to evaluate the Bayesian formulations. The book is essential reading for researchers, practitioners and students in mechanical and aerospace engineering.

### **Computational Intelligence in Time Series Forecasting** IOS Press

This book provides readers with a snapshot of recent methods for non-stationary vibration analysis of machinery. It covers a broad range of advanced techniques in condition monitoring of machinery, such as

mathematical models, signal processing and pattern recognition methods and artificial intelligence methods, and their practical applications to the analysis of nonstationarities. Each chapter, accepted after a rigorous peer-review process, reports on a selected, original piece of work presented and discussed at the International Conference on Condition Monitoring of Machinery in Non-Stationary Operations, CMMNO'2016, held on September 12 - 16, 2016, in Gliwice, Poland. The contributions cover advances in both theory and practice in a variety of subfields, such as: smart materials and structures; fluid-structure interaction; structural acoustics as well as computational vibro-acoustics and numerical methods. Further topics include: engines control, noise identification, robust design, flow-induced vibration and many others. By presenting state-of-the-art in predictive maintenance solutions and discussing important industrial issues the book offers a valuable resource to both academics and professionals and is expected to facilitate communication and collaboration between the two groups.

### Condition Monitoring Using Computational Intelligence Methods BoD - Books on Demand

In attempts to reduce greenhouse gas emissions, many alternatives to manufacturing have been recommended from a number of international organizations. Although challenges will arise, remanufacturing has the ability to transform ecological and business value. Computational Intelligence in Remanufacturing introduces various computational intelligence techniques that are applied to remanufacturing-related issues, results, and lessons from

specific applications while highlighting future development and research. This book is an essential reference for students, researchers, and practitioners in mechanical, industrial, and electrical engineering.

#### Militarized Conflict Modeling Using Computational Intelligence Springer

The first notable feature of this book is its innovation: Computational intelligence (CI), a fast evolving area, is currently attracting lots of researchers' attention in dealing with many complex problems. At present, there are quite a lot competing books existing in the market. Nevertheless, the present book is markedly different from the existing books in that it presents new paradigms of CI that have rarely mentioned before, as opposed to the traditional CI techniques or methodologies employed in other books. During the past decade, a number of new CI algorithms are proposed. Unfortunately, they spread in a number of unrelated publishing directions which may hamper the use of such published resources. These provide us with motivation to analyze the existing research for categorizing and synthesizing it in a meaningful manner. The mission of this book is really important since those algorithms are going to be a new revolution in computer science. We hope it will stimulate the readers to make novel contributions or even start a new paradigm based on nature phenomena. Although structured as a textbook, the book's straightforward, self-contained style will also appeal to a wide audience of professionals, researchers and independent learners. We believe that the book will be instrumental in initiating an integrated approach to complex problems by allowing cross-fertilization of design principles from different design

philosophies. The second feature of this book is its comprehensiveness: Through an extensive literature research, there are 134 innovative CI algorithms covered in this book.

#### Intelligent Data Mining and Fusion Systems in Agriculture IGI Global

This book theoretically and practically updates major economic ideas such as demand and supply, rational choice and expectations, bounded rationality, behavioral economics, information asymmetry, pricing, efficient market hypothesis, game theory, mechanism design, portfolio theory, causality and financial engineering in the age of significant advances in man-machine systems. The advent of artificial intelligence has changed many disciplines such as engineering, social science and economics. Artificial intelligence is a computational technique which is inspired by natural intelligence concepts such as the swarming of birds, the working of the brain and the pathfinding of the ants. Artificial Intelligence and Economic Theory: Skynet in the Market analyses the impact of artificial intelligence on economic theories, a subject that has not been studied. It also introduces new economic theories and these are rational counterfactuals and rational opportunity costs. These ideas are applied to diverse areas such as modelling of the stock market, credit scoring, HIV and interstate conflict. Artificial intelligence ideas used in this book include neural networks, particle swarm optimization, simulated annealing, fuzzy logic and genetic algorithms. It, furthermore, explores ideas in causality including Granger as well as the Pearl causality models.

Focus on Attribute Reduction IGI Global  
The book focuses on smart computing

for crowdfunding usage, looking at the crowdfunding landscape, e.g., reward-, donation-, equity-, P2P-based and the crowdfunding ecosystem, e.g., regulator, asker, backer, investor, and operator. The increased complexity of fund raising scenario, driven by the broad economic environment as well as the need for using alternative funding sources, has sparked research in smart computing techniques. Covering a wide range of detailed topics, the authors of this book offer an outstanding overview of the current state of the art; providing deep insights into smart computing methods, tools, and their applications in crowdfunding; exploring the importance of smart analysis, prediction, and decision-making within the fintech industry. This book is intended to be an authoritative and valuable resource for professional practitioners and researchers alike, as well as finance engineering, and computer science students who are interested in crowdfunding and other emerging fintech topics.

Computational Intelligence in Remanufacturing CRC Press

This open access collection examines how higher education responds to the demands of the automation economy and the fourth industrial revolution. Considering significant trends in how people are learning, coupled with the ways in which different higher education institutions and education stakeholders are implementing adaptations, it looks at new programs and technological advances that are changing how and why we teach and learn. The book addresses trends in liberal arts integration of STEM innovations, the changing role of libraries in the digital age, global trends in youth mobility, and the development of lifelong learning

programs. This is coupled with case study assessments of the various ways China, Singapore, South Africa and Costa Rica are preparing their populations for significant shifts in labour market demands – shifts that are already underway. Offering examples of new frameworks in which collaboration between government, industry, and higher education institutions can prevent lagging behind in this fast changing environment, this book is a key read for anyone wanting to understand how the world should respond to the radical technological shifts underway on the frontline of higher education.

*Reliability in Power Electronics and Electrical Machines: Industrial Applications and Performance Models* Springer Nature

Ongoing advancements in modern technology have led to significant developments in artificial intelligence. With the numerous applications available, it becomes imperative to conduct research and make further progress in this field. Artificial Intelligence: Concepts, Methodologies, Tools, and Applications provides a comprehensive overview of the latest breakthroughs and recent progress in artificial intelligence. Highlighting relevant technologies, uses, and techniques across various industries and settings, this publication is a pivotal reference source for researchers, professionals, academics, upper-level students, and practitioners interested in emerging perspectives in the field of artificial intelligence.

**Computational Intelligence and Predictive Analysis for Medical Science** Academic Press

Artificial intelligence (AI) is taking an increasingly important role in our society. From cars, smartphones,



airplanes, consumer applications, and even medical equipment, the impact of AI is changing the world around us. The ability of machines to demonstrate advanced cognitive skills in taking decisions, learn and perceive the environment, predict certain behavior, and process written or spoken languages, among other skills, makes

this discipline of paramount importance in today's world. Although AI is changing the world for the better in many applications, it also comes with its challenges. This book encompasses many applications as well as new techniques, challenges, and opportunities in this fascinating area.