Preface

Technology in today's world has continued to develop into multifaceted structures. The performance of computers, specifically, has significantly increased leading to various and complex problems regarding the dependability of these systems. Recently, solutions for these issues have been based on soft computing methods; however, there lacks a considerable amount of research on the applications of these techniques within system dependability.

Soft Computing Methods for System Dependability is a collection of innovative research on the applications of these processing techniques for solving problems within the dependability of computer system performance. This book will feature comparative experiences shared by researchers regarding the development of these technological solutions. While highlighting topics including evolutionary computing, chaos theory, and artificial neural networks, this book is ideally designed for researchers, data scientists, computing engineers, industrialists, students, and academicians in the field of computer science.

The book is organized into nine chapters, written by experts and scholars from various countries. A brief description of each chapter is given as follows:

Chapter 1: This chapter presents the application of Grey Wolf Optimizer in Software Release Planning considering warranty based on the proposed mathematical model that measures reliability growth of software system. Hence optimal release and warranty time are determined while minimizing the overall software development cost. The software cost model is based on failure phenomenon modelled by incorporating Fault Removal Efficiency, Fault Reduction Factor and error generation. The model has been validated on fault dataset of ERP system. Sensitivity analysis has been carried out to study the discrete changes in the cost parameter due to changes in optimal solution. The work significantly contributes in the literature by fulfilling gaps of reliability growth models, release problems considering warranty and efficient ways for solving optimization problem. Further the Grey Wolf Optimizer result has been compared with Genetic Algorithm and Particle Swarm Optimization techniques.

Chapter 2: Noninvasive process of vital sign identification and design of low-cost decision-making system for the betterment of rural health care support is a prime facet of research now a days. The identification of bio-signals from different sensors, noise removal, signal processing and decision making requires the use of sophisticated expert system.

Method: In this chapter, we propose a modified multi grey wolf pack optimization technique (MMGWO) for better generalization and diversification. The basic model has been modified using net energy gain of the individual wolf in the process of hunting. Here multiple packs of wolves are considered with simultaneous sharing and conflict among them. The performance of the proposed technique is tested on 23 well known classical benchmark functions, CEC 2014 benchmark problem set along with classical real-life applications. The experimental results and related analysis show that the proposed MMGWO is significantly superior to other existing techniques.

Chapter 3: This chapter presents a novel Telescopic Operational Transconductance Amplifier (OTA) using the Bulk-Driven MOS technique. This circuit is optimized for ultra-low power applications such as biomedical devices. The proposed the Bulk-Driven fully differential Telescopic OTA with very low threshold voltages is designed under ± 0.9V supply voltage. Thanks to the Particle Swarm Optimization (PSO) algorithm, the circuit achieves high performances. The OTA simulation results present a DC gain of 63.6dB, a GBW of 2.8MHz, a phase margin (PM) of 55.8 degrees and an input referred noise of 265.3nV/$\sqrt{\text{Hz}}$ for a low bias current of 52nA.

Chapter 4: The unprecedented scaling of embedded devices and its undesirable consequences leading to stochastic fault occurrences make reliability a critical design and optimization metric. In this chapter, in order to improve reliability of multi-core embedded systems, a task recomputation based approach is presented. Given a task graph representation of the application, the proposed technique targets at the tasks whose failures cause more significant effect on overall system reliability. The results of the tasks with larger fault propagation scope are recomputed during the idle times of the available processors without incurring any performance or power overhead. The technique incorporates the fault propagation scope of each task and its degree of criticality into the scheduling algorithm and maximizes the usage of the processing elements. The experimental evaluation demonstrates the viability of the proposed approach and generates more efficient results under different latency constraints.

Chapter 5: Agriculture plays a vital role in the development of Indian economy, and in addition to it contributes around 15% to the nation's GDP. Manually or mechanically operated diverse devices and supplies implied for farming machines are utilized in farming process. Still sustainability is the most important

issue in farming. Modern equipment smoke, dust, chemicals and fertilizers both in manual driven farming and modern farming are major environmental issue.so in this paper sustainability issues in farming are studied and linear relationship between them can be found by interpretive structural modelling, such that the Micmac analysis and model can be developed for barriers of Agricultural sector Sustainability.

Chapter 6: The main objective of this chapter is to analyze safety in railway systems through studying and understanding the train drivers' tasks and their common errors. Different approaches to classifying and analyzing driver errors are reviewed, as well the factors that affect driver performance. A comprehensive overview of the systems theoretic process analysis (STPA) method is presented, along with how it could be applied for controllers and humans. Quantitative risk assessment, along with some methods for quantifying human errors, are overviewed, and a Bayesian network is selected to study the effects of the identified driver errors. A case study aims to present a detailed quantitative safety analysis at European Train Control System (ETCS) system Levels 1 and Level 2, including driver errors. The STPA and Bayesian methods are combined to identify the hazards and quantify the probabilities of hazards when trains fail to stop at red signals.

Chapter 7: A distributed system is a complex system. Developing complex systems is a demanding task when attempting to achieve functional and non-functional properties such as synchronization, communication, fault tolerance. These properties impose immense complexities on the design, development, and implementation of the system that incur massive effort and cost. Therefore, it is vital to ensure that the system must satisfy the functional and non-functional properties. Once a distributed system is developed, it is very difficult and demanding to conduct any modification in its architecture. As a result, the quantitative analysis of a complex distributed system at the early stage of the development process is always an essential and intricate endeavor. To meet the above challenge, this chapter introduces an extensive framework for performability evaluation of a distributed system. The goal of the performability modeling framework is to consider the behavioral change of the system components due to failures. This later reveals how such behavioral changes affect the system performance.

Chapter 8: This chapter proposes how to decide the sample size in the reliability design of mechanical system – automobile, refrigerator, etc. Due to the cost and time, it is unfeasible to carry out the reliability testing of product with many samples. More studies on testing methods therefore should be explained how to decrease the sample size in securing the product reliability. To reasonably provide the accurate analysis for product reliability in the bathtub curve, Weibull

distribution is chosen. Based on Weibayes method defined as Weibull Analysis with a given shape parameter, we can derive the sample size equation from the product BX life. As the reliability of product is targeted and the limited sample size is given, we can determine the mission cycles from new sample size equation. Thus, by applying the accelerated loading to mechanical product, we can reveal the design failures of product and confirm if the reliability target is achieved. Comparing a variety of conventional sample size equation, this derivation of sample size equation is helpful to evaluate the lifetime of new mechanical product and correct its design problems through the parametric accelerated life testing (ALT). This equation also might be applicable to develop and select the test method of all sorts of structure in the civil engineering.

Chapter 9: Occupational safety is a big issue of discussion for Agricultural workers. The methods of working in field in extreme climate totally depends on environmental factor. Due to change in Weather conditions change; prices at the time of harvest could drop; hired labour may not be available at peak times; machinery and equipment could break down when most needed; draught animals might die; and government policy can change overnight. All of these changes are examples of the risks that farmers face in managing their farm as a business. All of these risks affect their farm profitability. Heavy rains and Draught without rain could also damage or even wipe out crops. Another source of production risk is equipment. The most common sources of risk factor are weather, climate, diseases, natural disasters, and market and environmental factor shocks. Agricultural workers need sufficient precaution and safety measures at the time of field and machine work, to minimize risk factor. So, in this chapter an effort is taken to prioritize safety majors by MAUT method.