Failure Prediction And Detection In Cloud Datacenters

The application of gear fault prediction techniques to experimental data is examined. A single mesh spur gear fatigue rig was used to produce naturally occurring faults on a number of test gear sets. Gear tooth surface pitting was the primary failure mode for a majority of the test runs. The damage ranged from moderate pitting on two teeth in one test to spelling on several teeth in another test. Previously published failure prediction techniques were applied to the data as it was acquired to provide a means of monitoring the test and stopping it when a failure was suspected. A newly developed technique along with variations of published methods were also applied to the experimental data. The published methods experienced some success in detecting initial pitting before it progressed to affect the overall root-mean-square (RMS) vibration level. The new technique robustly detected the damage on all of the tests, and in most cases continued to react to the damage as it spread and increased in severity. Since no single method was able to consistently predict the damage first on all the runs, it was concluded that the best approach to reliably detect pitting damage is to use a combination of detection methods ... Gear, Fatigue, Diagnostics, Failure prediction.
The main objective of this program was to develop a means for the detection and prediction of a particular class of mechanical failure through the use of indirect measurements. The failure mechanism of interest in this program is gear wear. This was selected because it limits the problem to manageable proportions, is a reasonably important source of failure in mechanical systems, and because the effect of gear wear on indirect measurement is analytically describable. The design of a detector for mechanical failures is divided into two phases: signal generation and signal detection. In the signal generation phase an attempt is made to establish a correlation between an indirect measurement of a physical condition of interest, and the occurrence of the particular condition. In the signal detection phase, an attempt is made to design a detector which automatically detects the presence of the desired signal. (Author).
In recent years, the number of patients with liver disease is rapidly increasing while it remains difficult to detect the symptoms of this disease. A person suffering from liver dysfunction or damage often feels healthy which makes many health care providers fail to detect this condition early on, leading to poor patient outcomes. Such a scenario can be minimized by using clinical decision support systems to optimize detection and prediction of liver failure. Although there are many existing models for liver failure, each of them come with limitations and the issue of liver failure prediction has not been completely resolved to date. In this study, we have addressed this issue by leveraging two comprehensive open-access critical care patient databases to build and validate models for predicting the risk or likelihood of liver failure. Artificial Neural Network (ANN) model architectures that include Multilayer Perceptron (MLP), Generalized Feedforward (GFF), and Modular Neural Network (MNN) were applied to generate a novel 0-100 Liver Failure Risk Index. Models were developed such that an increasing value of the index is associated with an increased risk or likelihood of liver dysfunction. The performance of developed models was compared in terms of sensitivity, specificity, and median lead time for diagnosis. This study has achieved promising results with the

best model achieving 83.3% sensitivity at a specificity of 77.5% and correctly diagnosed 83.3%(N = 629 out of 755 possible patients) of liver failure patients. Among these diagnosed patients, the model predicted the onset of liver failure in 83.5% (N = 525) of patients with a median of 17.5 hours before the onset of liver failure. Hence, our developed models allow health care providers to identify patients at risk of liver failure and facilitate early interventions that may prevent or minimize the associated morbidity and mortality.

The technique of photoelasticity has been used basically as a stress analysis tool. More recently, its application to failure prediction has found extensive application, and it has become a powerful and economical approach in solving the failure analysis problem. Some areas of application are discussed in this article, including defect detection, residual stress measurement, effect of assembly stresses, service overloads, and proof testing.

ICCAD serves EDA and design professionals, highlighting new challenges and innovative solutions for integrated circuit design technology and systems

The International Symposium for Testing and Failure Analysis (ISTFA) 2018 is co-located with the International Test Conference (ITC) 2018, October 28 to November 1, in Phoenix, Arizona, USA at the Phoenix Convention Center. The theme for the November 2018 conference is "Failures Worth Analyzing." While technology advances fast and the market demands the latest and the greatest, successful companies strive to stay competitive and remain profitable.

This book provides a complete picture of several decision support tools for predictive maintenance. These include embedding early anomaly/fault detection, diagnosis and reasoning, remaining useful life prediction (fault prognostics), quality prediction and self-reaction, as well as optimization, control and self-healing techniques. It shows recent applications of these techniques within various types of industrial (production/utilities/equipment/plants/smart devices, etc.) systems addressing several challenges in Industry 4.0 and different tasks dealing with Big Data Streams, Internet of Things, specific infrastructures and tools, high system dynamics and non-stationary environments . Applications discussed include production and manufacturing systems, renewable energy production and management, maritime systems, power plants and turbines, conditioning systems, compressor valves, induction motors, flight simulators, railway infrastructures, mobile robots, cyber security and Internet of Things. The contributors go beyond state of the art by placing a specific focus on dynamic systems, where it is of utmost importance to update system and maintenance models on the fly to maintain their predictive power.

Intelligent Fault Diagnosis and Remaining Useful Life Prediction of Rotating Machinery provides a comprehensive introduction of intelligent fault diagnosis and RUL prediction based on the current achievements of the author's research group. The main contents include multi-domain signal processing and feature extraction, intelligent diagnosis models, clustering algorithms, hybrid intelligent diagnosis strategies, and RUL prediction approaches, etc. This book presents fundamental theories and advanced methods of identifying the occurrence, locations, and degrees of faults, and also includes information on how to predict the RUL of rotating machinery. Besides experimental demonstrations, many application cases are presented and illustrated to test the methods mentioned in the book. This valuable reference provides an essential

guide on machinery fault diagnosis that helps readers understand basic concepts and fundamental theories. Academic researchers with mechanical engineering or computer science backgrounds, and engineers or practitioners who are in charge of machine safety, operation, and maintenance will find this book very useful. Provides a detailed background and roadmap of intelligent diagnosis and RUL prediction of rotating machinery, involving fault mechanisms, vibration characteristics, health indicators, and diagnosis and prognostics Presents basic theories, advanced methods, and the latest contributions in the field of intelligent fault diagnosis and RUL prediction Includes numerous application cases, and the methods, algorithms, and models introduced in the book are demonstrated by industrial experiences

This book presents original research works by researchers, engineers and practitioners in the field of artificial intelligence and cognitive computing. The book is divided into two parts, the first of which focuses on artificial intelligence (AI), knowledge representation, planning, learning, scheduling, perception-reactive AI systems, evolutionary computing and other topics related to intelligent systems and computational intelligence. In turn, the second part focuses on cognitive computing, cognitive science and cognitive informatics. It also discusses applications of cognitive computing in medical informatics, structural health monitoring, computational intelligence, intelligent control systems, bio-informatics, smart manufacturing, smart grids, image/video processing, video analytics, medical image and signal processing, and knowledge engineering, as well as related applications.

Failures at runtime in complex software systems are inevitable because these systems usually contain a large number of components. Having all components working perfectly at the same time is, if at all possible, very difficult. Hardware components can fail and software components can still have hidden faults waiting to be triggered at runtime and cause the system to fail. This dissertation proposes an architecture-aware online failure prediction approach, called Hora. The Hora approach improves online failure prediction by combining the results of failure prediction with the architectural knowledge about the system. The task of failure prediction is split into predicting the failure of each individual component, in contrast to predicting the whole system failure. Suitable prediction techniques can be employed for different types of components. The architectural knowledge is used to deduce the dependencies between components which can reflect how a failure of one component can affect the others. The failure prediction and the component dependencies are combined into one model which employs Bayesian network theory to represent failure propagation. The combined model is continuously updated at runtime and makes predictions for individual components, as well as inferring their effects on other components and the whole system.

This book presents the main concepts, state of the art, advances, and case studies of fault detection, diagnosis, and prognosis. This topic is a critical variable in industry to reach and maintain competitiveness. Therefore, proper management of the corrective, predictive, and preventive politics in any industry is required. This book complements other subdisciplines such as economics, finance, marketing, decision and risk analysis, engineering, etc. The book presents real case studies in multiple disciplines. It considers the main topics using prognostic and subdiscipline techniques. It is essential to link these topics with the areas of finance, scheduling, resources, downtime, etc. to

increase productivity, profitability, maintainability, reliability, safety, and availability, and reduce costs and downtime. Advances in mathematics, modeling, computational techniques, dynamic analysis, etc. are employed analytically. Computational techniques, dynamic analysis, probabilistic methods, and mathematical optimization techniques are expertly blended to support the analysis of prognostic problems with defined constraints and requirements. The book is intended for graduate students and professionals in industrial engineering, business administration, industrial organization, operations management, applied microeconomics, and the decisions sciences, either studying maintenance or needing to solve large, specific, and complex maintenance management problems as part of their jobs. The work will also be of interest to researches from academia.

Depending on the role of software in everyday life, the cost of a software failure can sometimes be unaffordable. During system execution, errors may occur in system components and failures may be manifested due to these errors. These errors differ with respect to their effects on system behavior and consequent failure manifestation manners. Predicting failures before their manifestation is important to assure system resilience. It helps avoid the cost of failures and enables systems to perform corrective actions prior to failure occurrences. However, effective runtime error detection and failure prediction techniques encounter a prohibitive challenge with respect to the control flow representation of large software systems with intricate control flow structures. In this thesis, we provide a technique for failure prediction from runtime errors of large software systems. Aiming to avoid the possible difficulties and inaccuracies of the existing Control Flow Graph (CFG) structures, we first propose a Connection Dependence Graph (CDG) for control flow representation of large software systems. We describe the CDG structure and explain how to derive it from program source code. Second, we utilize the proposed CDG to provide a connection-based signature approach for control flow error detection. We describe the monitor structure and present the error checking algorithm. Finally, we utilize the detected errors and erroneous state parameters to predict failure occurrences and modes during system runtime. We craft runtime signatures based on these errors and state parameters. Using system error and failure history, we determine a predictive function (an estimator) for each failure mode based on these signatures. Our experimental evaluation for these techniques uses a large open-source software (PostgreSQL 8.4.4 database system). The results show highly efficient control flow representation, error detection, and failure prediction techniques. This work contributes to software reliability by providing a simple and accurate control flow representation and utilizing it to detect runtime errors and predict failure occurrences and modes with high accuracy.

A rubber cover failure theory was developed to test the rubber covered steel rolls used in the paper drying process. An online system was created to continuously monitor the rolls and send out alarm messages whenever the predefined vibration thresholds are violated.

The two-volume set LNCS 11944-11945 constitutes the proceedings of the 19th International Conference on Algorithms and Architectures for Parallel Processing, ICA3PP 2019, held in Melbourne, Australia, in December 2019. The 73 full and 29 short papers presented were carefully reviewed and selected from 251 submissions. The papers are organized in topical sections on: Parallel and Distributed Architectures, Software Systems and Programming Models, Distributed and Parallel and Network-based Computing, Big Data and its Applications, Distributed and Parallel Algorithms, Applications of Distributed and Parallel Computing, Service

Dependability and Security, IoT and CPS Computing, Performance Modelling and Evaluation.
"Tool condition monitoring (TCM) systems are essential to achieve the desired competitive advantage in manufacturing in terms of reducing cost, increasing productivity, improving quality, and preventing damage to the machined part. In this research work, a new intelligent TCM system has been developed for accurate detection of tool wear failure as well as prediction of sudden tool chipping/breakage before damaging the machined part. The system analyzes process-born features gathered from multi-sensor feedback signals using advanced signal processing and machine learning methods to detect the tool condition during cutting processes. Communication between the developed system and a CNC machine controller has been implemented. The time required for signal processing, decision making and communication with the machine controller allows stopping the operation before part damage. For tool wear detection, robust and real-time signal processing and decision-making algorithms were developed using feedback signals from the spindle drive motor. The proposed signal processing approach accentuates the tool condition effect on the extracted features while masking the effects of the cutting parameters. These features were employed in a machine learning algorithm to detect the tool condition. The results indicated the capability of the processing technique to minimize system learning effort by at least 75% and to detect tool wear with an accuracy above 95% and a confidence level above 90%. Such capability has never been achieved before.For sudden failure prediction, a novel signal processing approach for online prediction and prevention of tool chipping/breakage during intermittent machining was developed. The approach analyzes the acoustic emission waves associated with the generation of new surfaces during unstable crack propagation, which precede tool fracture. The features of the prefailure phase were identified using the Hilbert-Huang transformation method and the Teager-Kaiser Energy Operator, which can discriminate high energy/frequency events in the prefailure phase. Extensive experimental results demonstrated the accuracy of the developed system to consistently predict tool chipping. The system output has been shown to be independent of the cutting parameters and workpiece material. A correlation between the chipping size and the prefailure features was developed for decision making. No such system previously existed." --

The report is intended as the summary of approximately two years of study carried on in conjunction with the Naval Air Systems Command under the auspices of the Office of Naval Research through the George Washington University's Program in Logistics. The emphasis throughout this work has been the development of procedures for detecting: (1) when devices have been burned-in; and (2) when they first begin to show signs of ageing. The paper is divided into three specific technical sections. The first presents the main technique that is used for detection. The second section discusses the determination of an optimal replacement policy. The final technical presentation illustrates the use of the F technique on the failure and removal of 13 specific Naval air devices, and includes copies of the data and computer output for each case. (Modified author abstract).

Lists citations with abstracts for aerospace related reports obtained from world wide sources and announces documents that have recently been entered into the NASA Scientific and Technical Information Database.

DASFAA is an annual international database conference, located in the Asia-Paci?cregion,whichshowcasesstate-of-the-artR & Dactivities in databases- tems and their applications. It provides a forum for technical presentations and discussions among database researchers, developers and users from academia, business and industry. DASFAA 2009, the 14th in the series, was held during April 20-23, 2009 in Brisbane, Australia. In this year, we carefully selected six workshops, each focusing on speci?c research issues that contribute to the main themes of the DASFAA conference.

Thisvolumecontainsthe?nalversionsofpapersacceptedforthesesixworkshops that were held in

conjunction with DASFAA 2009. They are: – First International Workshop on Benchmarking of XML and Semantic Web Applications (BenchmarX 2009) – Second International Workshop on Managing Data Quality in Collaborative Information Systems (MCIS 2009) – First International Workshop on Data and Process Provenance (WDPP 2009) – First International Workshop on Privacy-Preserving Data Analysis (PPDA 2009) – FirstInternationalWorkshoponMobileBusinessCollaboration(MBC2009) – DASFAA 2009 PhD Workshop All the workshops were selected via a public call-for-proposals process. The workshop organizers put a tremendous amount of e?ort into soliciting and - lecting papers with a balance of high quality, new ideas and new applications. We asked all workshops to follow a rigid paper selection process, including the procedure to ensure that any Program Committee members are excluded from the paper review process of any paper they are involved with. A requirement about the overall paper acceptance rate of no more than 50% was also imposed on all the workshops.

The 30-volume set, comprising the LNCS books 12346 until 12375, constitutes the refereed proceedings of the 16th European Conference on Computer Vision, ECCV 2020, which was planned to be held in Glasgow, UK, during August 23-28, 2020. The conference was held virtually due to the COVID-19 pandemic. The 1360 revised papers presented in these proceedings were carefully reviewed and selected from a total of 5025 submissions. The papers deal with topics such as computer vision; machine learning; deep neural networks; reinforcement learning; object recognition; image classification; image processing; object detection; semantic segmentation; human pose estimation; 3d reconstruction; stereo vision; computational photography; neural networks; image coding; image reconstruction; object recognition; motion estimation.

"In this thesis, the detection and prediction of faults in rotating machinery is undertaken and presented in two papers. In the first paper, Principal Component Analysis (PCA), a well known data-driven dimension reduction technique, is applied to data for normal operation and four fault conditions from a one-half horsepower centrifugal water pump. Fault isolation in this scheme is done by observing the location of the data points in the Principal Component domain, and the time to failure (TTF) is calculated by applying statistical regression on the resulting PC scores. The application of the proposed scheme demonstrated that PCA was able to detect and isolate all four faults. Additionally, the TTF calculation for the impeller failure was found to yield satisfactory results. On the other hand, in the second paper, the fault detection and failure prediction are done by using a model based approach which utilizes a nonlinear observer consisting of an online approximator in discrete-time (OLAD) and a robust adaptive term. Once a fault has been detected, both the OLAD and the robust adaptive term are initiated and the OLAD then utilizes its update law to learn the unknown dynamics of the encountered fault. While in similar applications it is common to use neural networks to be used for the OLAD, in this paper an Artificial Immune System (AIS) is used for the OLAD. The proposed approach was verified through implementation on data from an axial piston pump. The scheme was able to satisfactorily detect and learn both an incipient piston wear fault and an abrupt sensor failure"--Abstract, leaf iv.

Project Report from the year 2019 in the subject Computer Science - Software, grade: A, course: Doctoral Degree, language: English, abstract: This research works seeks to explore and provide an improved fault detection approach for inspection and fault detection. It systematically investigate and characterize software faults and faults to

improve fault detection and prevention mechanisms in the quality software development process. Firstly, it contributes an Adaptive PSO-based association rule mining techniques for software fault classification using ANN. This task categorizes real defects by finding the best support and reliability to have the best policy for software fault classification using ANN. Secondly, it provides a Fault Prediction Approach (FPA) based on probabilistic models to perform software testing in Software Inspection. This describes a cost-effective way to accurately detect the defects by performing software inspection to develop quality software. The proposed FPA probes stochastic methods using the modified Naive Bayes classification to estimate the possible faults in the experimental environment to suggest novel defect control development. Software reliability engineering has become very important as the complexity of the system has increased exponentially with technological advances. The fact that all systems today depend on many other systems and interfaces is not only an application error but also a number of environmental factors that lead to failure. The impact of these failures depends on the nature of the system, but many of them cause customer dissatisfaction and business loss. System testing and fault detection have become the most important processes in the software life cycle. Various failure prediction models can be analyzed and suggested so that failures can be detected at an early stage and many test efforts can be saved. Software development has many defects in the design phase. In the past, many examples of software development

A Companion to Economic Forecasting provides an accessible and comprehensive account of recent developments in economic forecasting. Each of the chapters has been specially written by an expert in the field, bringing together in a single volume a range of contrasting approaches and views. Uniquely surveying forecasting in a single volume, the Companion provides a comprehensive account of the leading approaches and modeling strategies that are routinely employed.

Software timing behavior measurements, such as response times, often show high statistical variance. This variance can make the analysis difficult or even threaten the applicability of statistical techniques. This thesis introduces a method for improving the analysis of software response time measurements that show high variance. Our approach can find relations between timing behavior variance and both trace shape information and workload intensity information. This relation is used to provide timing behavior measurements with virtually less variance. This can make timing behavior analysis more robust (e.g., improved confidence and precision) and faster (e.g., less simulation runs and shorter monitoring period). The thesis contributes TracSTA (Trace-Context-Sensitive Timing Behavior Analysis) and WiSTA (Workload-Intensity-Sensitive Timing Behavior Analysis). TracSTA uses trace shape information (i.e., the shape of the control flow corresponding to a software operation execution) and WiSTA uses workload intensity metrics (e.g., the number of concurrent software executions) to create context-specific timing behavior profiles. Both the applicability and effectiveness are evaluated in several case studies and field studies. The evaluation shows a strong relation between timing behavior and the metrics considered by TracSTA and WiSTA. Additionally, a fault localization approach for enterprise software systems is presented as application scenario. It uses the timing behavior data provided by TracSTA and WiSTA for anomaly detection.

This three-volume proceedings contains revised selected papers from the Second

International Conference on Artificial Intelligence and Computational Intelligence, AICI 2011, held in Taiyuan, China, in September 2011. The total of 265 high-quality papers presented were carefully reviewed and selected from 1073 submissions. The topics of Part II covered are: heuristic searching methods; immune computation; information security; information theory; intelligent control; intelligent image processing; intelligent information fusion; intelligent information retrieval; intelligent signal processing; knowledge representation; and machine learning.

Proceedings of the First Symposium on Aviation Maintenance and Management collects selected papers from the conference of ISAMM 2013 in China held in Xi'an on November 25-28, 2013. The book presents state-of-the-art studies on the aviation maintenance, test, fault diagnosis, and prognosis for the aircraft electronic and electrical systems. The selected works can help promote the development of the maintenance and test technology for the aircraft complex systems. Researchers and engineers in the fields of electrical engineering and aerospace engineering can benefit from the book. Jinsong Wang is a professor at School of Mechanical and Electronic Engineering of Northwestern Polytechnical University, China.

Due to the increasing demand for security and reliability in manufacturing and mechatronic systems, early detection and diagnosis of faults are key points to reduce economic losses caused by unscheduled maintenance and downtimes, to increase safety, to prevent the endangerment of human beings involved in the process operations and to improve reliability and availability of autonomous systems. The development of algorithms for health monitoring and fault and anomaly detection, capable of the early detection, isolation, or even prediction of technical component malfunctioning, is becoming more and more crucial in this context. This Special Issue is devoted to new research efforts and results concerning recent advances and challenges in the application of "Algorithms for Fault Detection and Diagnosis", articulated over a wide range of sectors. The aim is to provide a collection of some of the current state-of-the-art algorithms within this context, together with new advanced theoretical solutions.

Next Generation HALT and HASS presents a major paradigm shift from reliability prediction-based methods to discovery of electronic systems reliability risks. This is achieved by integrating highly accelerated life test (HALT) and highly accelerated stress screen (HASS) into a physics-of-failure-based robust product and process development methodology. The new methodologies challenge misleading and sometimes costly mis-application of probabilistic failure prediction methods (FPM) and provide a new deterministic map for reliability development. The authors clearly explain the new approach with a logical progression of problem statement and solutions. The book helps engineers employ HALT and HASS by illustrating why the misleading assumptions used for FPM are invalid. Next, the application of HALT and HASS empirical discovery methods to quickly find unreliable elements in electronics systems gives readers practical insight to the techniques. The physics of HALT and HASS methodologies are highlighted, illustrating how they uncover and isolate software failures due to hardware-software interactions in digital systems. The use of empirical operational stress limits for the development of future tools and reliability discriminators is described. Key features: * Provides a clear basis for moving from statistical reliability prediction models to practical methods of insuring and improving reliability. * Challenges existing failure prediction methodologies by highlighting their limitations using real field data. * Explains a practical approach to why and how HALT and HASS are applied to electronics and electromechanical systems. * Presents opportunities to develop reliability test discriminators for prognostics using empirical stress limits. * Guides engineers and managers on the benefits of the deterministic and more efficient methods of HALT and HASS. * Integrates the empirical limit discovery methods of HALT and HASS into a physics of failure based robust product and process development process.

This book constitutes the refereed proceedings of the 8th International Conference on Advanced Data Mining and Applications, ADMA 2012, held in Nanjing, China, in December 2012. The 32 regular papers and 32 short papers presented in this volume were carefully reviewed and selected from 168 submissions. They are organized in topical sections named: social media mining; clustering; machine learning: algorithms and applications; classification; prediction, regression and recognition; optimization and approximation; mining time series and streaming data; Web mining and semantic analysis; data mining applications; search and retrieval; information recommendation and hiding; outlier detection; topic modeling; and data cube computing.