Failure Prediction And Detection In Cloud Datacenters

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Fault Prediction Approach Springer Nature
This report describes the research performed during a three year study of computer reliability as affected by system activity. Data collected over an eight year period on three generations of computers was analyzed to determine what relationships exist between failures and activity. The activity included type of utilization, as well as amount of activity (or load) on the computer at time of failure. The failures included both software and hardware (transient, intermittent, and permanent). Another aspect of the research was an evaluation of the fault tolerance provided by the computer system as indicated by software error detection and recovery rates. A third major area of research was the development of a methodology for analysis of failure prediction data. Keywords: Reliability Modeling; Failure/Load Relationship; Failure Prediction; Fault Tolerance; Computer Utilization Rates; Error Detection; Error Correction.
Predictive Maintenance in Dynamic Systems Springer Nature
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.
Algorithms for Fault Detection and Diagnosis BoD – Books on Demand
Our knowledge of human biology especially related to the heart, increases every day. This makes it nearly impossible for physicians to stay current on the latest research in their fields, let alone in all of the others that directly affect their ability to treat their patients properly. Predicting Heart Failure: Invasive, Non-Invasive, Machine Learning and Artificial Intelligence Based Methods focuses on the mechanics and symptoms of heart failure and various approaches, including conventional and modern techniques to diagnose it. Moreover, it book provides a detailed presentation of the latest research data for preventing and treating heart failure. In this book, thirteen chapters address different conditions related to the heart, with detailed descriptions of each. The first chapter discusses invasive, non-invasive, machine learning, and artificial intelligence-based methods for predicting heart failure. Additionally, this chapter discusses heart failure causes, symptoms, and treatment, as well as research related to heart failure. In the second chapter, we examine the traditional methods of predicting heart diseases and implementing artificial intelligence technology to predict heart diseases accurately. A discussion of the main characteristics of cardiovascular biosensors is presented in Chapter 3, along with their open issues for development and application. We summarize the difficulties of wireless sensor communication and power transfer in chapters four, five, and six, which outline the utility of artificial intelligence in cardiology. Chapter 7 discusses how to predict heart diseases using data mining classification techniques. Applied machine learning is all discussed in Chapters 8 and 9 and advanced methods for estimating HF severity and diagnosing and predicting heart failure. In chapter 10, the present state of artificial intelligence and biosensors based on materials is briefly discussed. The underlying technologies of various invasive and non-invasive devices, and their benefits, are discussed and analyzed in Chapter 11. A discussion of the risks and issues associated with the remote monitoring system was also included in this chapter. A panel of these HF prediction devices is presented in Chapter 12 and their invasive and noninvasive alternatives. Furthermore, it advances the potential of artificial intelligence in mobile monitoring technologies to provide clinicians with improved treatment options, ultimately easing access to healthcare by all patient populations. Chapter 13 assessed the potential applications of implantable and wearable devices in HF detection application, summarizes available data for wearables, and machine learning for improving patients' cardiac health, and discusses the future of wearables for early prediction of HF. Predicting Heart Failure: Invasive, Non-Invasive, Machine Learning and Artificial Intelligence Based Methods provides a comprehensive but concise guide to all modern cardiological practice, emphasizing practical clinical management in many different contexts. This book provides readers with trustworthy insights into all aspects of heart failure, including essential background information on clinical practice guidelines, in-depth, peer-reviewed articles, and broad coverage of this fast-moving field. Providing the latest research data for the diagnosis and treatment of heart failure, this book is an excellent resource for nurses, nurse practitioners, physician assistants, medical students, and general practitioners to gain a better understanding of bedside cardiology.
Incipient Failure Diagnosis for Assuring Safety and Availability of Nuclear Power Plants Springer Science & Business Media
"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." --
Algorithms and Architectures for Parallel Processing BoD – Books on Demand
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.
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orkshops 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.

Advanced Data Mining and Applications John Wiley & Sons

This study is based on time-series data taken from the combined cycle heavy-duty utility gas turbines. For analysis, first, a multi-stage vector autoregressive model is constructed for the nominal operation of powerplant assuming sparsity in the association among variables, and this model is used as a basis for anomaly detection and prediction. This prediction is compared with the time-series data of the powerplant test data containing anomalies. Granger causality networks, which are based on the associations between the time series streams, can be learned as an important implication from the vector autoregressive modelling. This method suffers from the disadvantage that some of the variables are not stationary even after segmenting the working mode based on the RPM. To improve the efficacy of the algorithm, the observations are further clustered into different working modes, because of the heterogeneous behavior of the gas turbine parameters under various modes. Then predicting the operational parameters is considered under each mode respectively, via algorithms including random forest, generalized additive model, and neural networks. The comparative advantage based on prediction accuracy and applicability of the algorithms is discussed for real-time use and post processing. The advantage of this segmentation method is that it achieves high predictive power and provides insight into the behavior of specific gas turbine variables. Next, the long-memory behavior of residuals is modeled, and heterogeneous variances are observed from the residuals of the generalized additive model. Autoregressive Fractionally Integrated Moving Average (ARFIMA) and Generalized Autoregressive Conditional Heteroskedasticity (GARCH) models are employed to fit the residual process, which significantly improve the prediction. Rolling one-step-ahead forecast is studied. Numerical experiments of abrupt changes and trend in the blade-path temperature are performed to evaluate the specificity and sensitivity of the prediction. The prediction is sensitive given reasonable signal-to-noise ratio and has lower false-positive rate.

Predicting Heart Failure Springer Science & Business Media

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

MECHANICAL FAILURE DETECTION. Springer Nature

This book constitutes the refereed proceedings of the 6th ECML PKDD Workshop on Advanced Analytics and Learning on Temporal Data, AALTD 2021, held during September 13-17, 2021. The workshop was planned to take place in Bilbao, Spain, but was held virtually due to the COVID-19 pandemic. The 12 full papers presented in this book were carefully reviewed and selected from 21 submissions. They focus on the following topics: Temporal Data Clustering; Classification of Univariate and Multivariate Time Series; Multivariate Time Series Co-clustering; Efficient Event Detection; Modeling Temporal Dependencies; Advanced Forecasting and Prediction Models; Cluster-based Forecasting; Explanation Methods for Time Series Classification; Multimodal Meta-Learning for Time Series Regression; and Multivariate Time Series Anomaly Detection.

Computer Vision – ECCV 2020 Springer Science & Business Media

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.

New Trends in Banking Management AuLac Technologies Inc.

The requirements for failure prediction in ceramics using ultrasonics have been examined. These show that the absolute prediction of failure at acceptable stress levels and lifetimes requires high frequencies, in the 50-400 MHz range. The ability to utilize such high frequencies for flaw detection studies is primarily dependent on the attenuation of the material in this frequency range. Attenuation studies performed on a variety of ceramic materials have shown that the coarse grained or porous ceramics are excessively attenuating, whereas the fine grained fully dense ceramics are acceptable. An analysis of attenuation using numerical scattering cross sections and microstructural parameters has demonstrated that the attenuation is entirely predictable from the large extreme of the microstructure. The analysis has also suggested that attenuation measurements may permit the implementation of statistical failure prediction at high levels of confidence, in materials that are not amenable to absolute failure prediction using high frequency ultrasonics. (Author).

Fault Detection and Prediction with Application to Rotating Machinery Springer

This book concentrates on the subject of health monitoring technology of Liquid Rocket Engine (LRE), including its failure analysis, fault diagnosis and fault prediction. Since no similar issue has been published, the failure pattern and mechanism analysis of the LRE from the system stage are of particular interest to the readers. Furthermore, application cases used to validate the efficacy of the fault diagnosis and prediction methods of the LRE are different from the others. The readers can learn the system stage modeling, analyzing and testing methods of the LRE system as well as corresponding fault diagnosis and prediction methods. This book will benefit researchers and students who are pursuing aerospace technology, fault detection, diagnostics and corresponding applications.

Second International Conference, AICI 2011, Taiyuan, China, September 24-25, 2011, Proceedings Springer

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.

Optimal Discrete Control Theory DIANE Publishing

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.

The Rational Function Structure Model Springer Nature

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.

Predicting the Failure of Electric Motors Fatigue Damage Detection and Failure Prediction by Optical CorrelationPredicting Heart FailureInvasive, Non-Invasive, Machine Learning and Artificial Intelligence Based Methods

"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.

Workload-sensitive Timing Behavior Analysis for Fault Localization in Software Systems MDPI

This book constitutes the thoroughly refereed post-competition proceedings of the AI Ops Competition on Large-Scale Disk Failure Prediction, conducted between February 7th and May 15, 2020 on the Alibaba Cloud Tianchi Platform. A dedicated workshop, featuring the best performing teams of the competition, was held at the 24th Pacific-Asia Conference on Knowledge Discovery and Data Mining, PAKDD 2020, in Singapore, in April 2019. Due to the COVID-19 pandemic, the workshop was hosted online. This book includes 13 selected contributions: an introduction to dataset, selected approaches of the competing teams and the competition summary, describing the competition task, practical challenges, evaluation metrics, etc.

An Artificial Neural Network Approach to Predict Liver Failure Likelihood Springer

The paper is divided into four specific technical sections. The first presents two classical approaches to the detection of the commencement of wearout of a device, the primary one being the F technique. These methods are essentially ones for testing for constantness in the failure rate and as such can therefore also be used to detect the end of burn-in. The use of the F procedure is then illustrated on some Navy data. The second technical section presents a Bayes-type approach to the same problem and illustrates its use via a similated problem. The next two sections get back to more classical methods, with the first outlining some direct approaches to the estimation of the hazard-rate function itself, and the second indicating a simple method for incorporating the estimating procedure into the determination of an optimal economic replacement interval. (Modified author abstract).

Generalized Sensor-based Tool Failure Detection and Prevention System for Intermittent Cutting Operations Wiley

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.

Software Architecture-based Failure Prediction Butterworth-Heinemann

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.

Conference Proceedings, Gatlinburg, Tennessee, October 30-November 1, 1967

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.