



Prognostics and Health Management Conference

PHM 2023 Paris, France

May 31 – June 2, 2023

THE MESSAGE FROM THE GENERAL CHAIR



It is my great pleasure to welcome all of you to the 2023 Prognostics and Health Management Conference in Paris (PHM 2023 Paris). After PHM 2019 in Paris, PHM 2020 in Besancon and PHM 2022 in London, the conference comes back to Paris. This is a real opportunity to keep this PHM conference in Europe and have the researchers and industry professionals in the field gather together to discuss the key issues, the challenges and advancements in PHM. I hope many of you could join in this effort to help organize the PHM Euro Conferences in the next coming years.

This conference is held together by Le Cnam, IEEE France section, London South Bank University, Université Paris Saclay, L2S, GeePS, HBM Prenscia, CTBU, and CJA. PHM 2023 Conference will be an on-site in-person event; meanwhile, virtual presentation options will be provided to those who cannot come to the conference in person for some reasons. Conference program features keynote talks, panel talk, technical paper presentation, posters, and technical discussion.

Paris is the capital and most populous city of France. Paris has a rich history with numerous world-renowned attractions for visiting, such as Eiffel Tower, Seine River, Louvre Museum, Triumphal Arch, and Notre Dame de Paris. Paris is also the center of a vibrant academic and industrial research community in PHM and related areas such as data science.

After two years where the world has been completely disrupted by the pandemic, we are pleased this year to offer you the opportunity to present your work on-site in a historical institution in the center of Paris. Many thanks to all the committee members for their dedicated, efficient and professional work. The conference is also indebted to dozens of volunteers who contributed to the various processes of the conference. It has been a great privilege for me to serve as the General Chair of PHM 2023 and it is my hope that you find the conference fulfilling and enjoyable. I thank you for your support and wish you a pleasant experience at PHM 2023.

Dr. Ryad Zemoui

General Chair, PHM 2023 Paris International Conférence
Associate Professor, Researcher, Research Center of Hydro-Québec,
Varenes, Québec, Canada

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KEYNOTE SPEAKERS

KEYNOTE I

Title: How to Take Care of Turbo Generators

Keynote Speaker:

Dr. Jean-Pierre Ducreux, Senior Research Engineer, Électricité de France (EDF), France



Abstract:

In France, nearly 87% of electricity is generated by nuclear and fossil fuel power plants with the remainder being produced by renewable energy sources (hydro, wind, etc.) Large-scale power plants are therefore essential to ensure optimal electricity production. To ensure the best possible availability, EDF has set up an important monitoring and maintenance plan for its generation facilities.

Turbine generators used in the production of electrical energy and driven by steam or gas turbines steam or combustion turbines (TAV and TAC) are subject, due to their operation, to significant stresses that can be the cause of some failures. These failures are mostly minor and have very little impact on the availability. Nevertheless, it can happen that they get worse and turn into a real fault that it is essential to monitor and diagnose.

It is in this context that a methodology of identification of faults of a turboalternator is set up. This detection methodology will be based mainly on the signal from a radial flux probe located in the air gap of the machine. There are many diagnostic methods for electrical machines. Some authors have shown that it is possible to establish a diagnosis via thresholds on local or global measurements. However, these methods are limited for the identification of the severity of faults. This has led EDF to develop rules for identifying defects of synchronous machines based on pattern recognition methods.

Therefore, rules were established that allow to determine the type of fault that characterizes the test data. It consists in performing a hierarchical classification to identify the kind of defects. This technique has been submitted to the data and gives excellent results since all the test data were assigned to the right type of defect.

To formalize the relationships between the faults and the number of candidate classes, a finite state automaton and a study on many possible scenarios was conducted. This approach improved all the results of the classification of the test data by removing some confusion areas together with some prototypes.

Speaker's Biography:

Jean-Pierre Ducreux received his degree in Electrical Engineering from Institut Industriel du Nord (nowadays Ecole Centrale de Lille) in 1990. He received his PhD degree from Université de Lille in 1994. Since 1993 he is a research-engineer at EDF. He started working on computational modeling of electromagnetic fields in electrical equipment. This point is still relevant because it covers both the qualification of the equipment and the diagnosis. As far as the diagnosis is concerned, the problem was to find out how to represent a defect and how to create an adequate model delivering an exploitable signal for the analysis. Now his work focuses on diagnostic of defects in power electric devices with the help of computational electromagnetics.

KEYNOTE II

Title: Health Condition Monitoring Techniques - Oil Immersed Transformers

Keynote Speaker:

Dr. Seyed-Saeid MOOSAVI-ANCHEHPOLI, Research Engineer and Technical Lead, Technological Research Institute Railenium, Valenciennes, France



Abstract:

The transformer is an indispensable asset in railway network infrastructure and distribution network. They are also expensive and account for massive capital expenditure in the contemporary electrical network. Not only do they require huge fiscal investments, but the reliability and dependability of the electrical railway and distribution network depends primarily on their operational stability. It is, therefore, imperative that railway companies give priority to failure prevention and the sustenance of optimal operational status of their electrical network. Condition monitoring and asset management is therefore a key concern in all electrical utility providers, especially for rail and electrical infrastructure managers.

Over the recent years, transformer health indexing (HI) has become a popular tool for performing transformer health assessments on a larger fleet of transformers. HI is a tool that allows asset engineers/managers to make informed decisions by processing available data of the transformer and convert those into an overall “condition” score. This condition is usually based on “scores” and “weighting”, which are calculated from a set of algorithms designed to evaluate both field conditions, inspection results, on-site test results, etc. which permitted to estimate the remaining useful lifetime (RUL).

In this work, results of an industrial project in collaboration with SNCF Réseau related to the determination of traction transformer faults, fault diagnosis, HI condition monitoring and RUL estimation methods for the oil immersed transformers will be presented and several case studies will be discussed.

Speaker’s Biography:

Dr. Seyed-Saeid MOOSAVI-ANCHEHPOLI, obtained his PhD from Université de Technologie de Belfort-Montbéliard (UTBM), France in 2013. He was an Assistant Professor at UTBM in 2013-2014, and Université de Caen Normandie-France in 2019-2020. In 2015, he was Head of Signaling and Electrification System, Line 2 of Mashhad City Metro - Metro-system Co, Iran. From 2015 to 2019, he was Associate Professor at Amol University of Special Modern Technologies (AUSMT) in Iran. Since 2021, he is a Research Engineer at the Technological Research Institute Railenium, Valenciennes, France.

KEYNOTE III

Title: Predictive Maintenance Using a Digital Twin

Keynote Speaker:

Dr. Lama Itani, Education and Research Engineer, MathWorks, France



Abstract:

Industrial equipment failure can lead to costly downtime, outweighing the cost of replacing the equipment. Predictive maintenance aims to reduce this unplanned downtime by utilizing sensor data to anticipate necessary maintenance. However, acquiring data from physical equipment under typical fault conditions can be challenging, potentially leading to catastrophic failure or being too costly.

In this presentation we will navigate the solution of creating a digital twin for a triplex pump enabling the generation of sensor data under various fault conditions through simulation. We will then use Machine Learning to craft the predictive maintenance algorithm to help in recognizing which components in the pump are about to fail.

Speaker's Biography:

Lama Itani holds a PhD in Mechanical Engineering from IFP Energies Nouvelles. Before joining MathWorks (makers of MATLAB and Simulink), she worked on topics related to energy optimization and signal processing for different OEMs. Today Lama is an Application Engineer in the Academia Group at MathWorks France.

2023 Prognostics and Health Management Conference (PHM2023 Paris)
Conservatoire National des Arts et Metiers (Le Cnam), 2 Rue Conté, 75003, Paris, France
May 31 - June 2, 2023

CONFERENCE PROGRAM

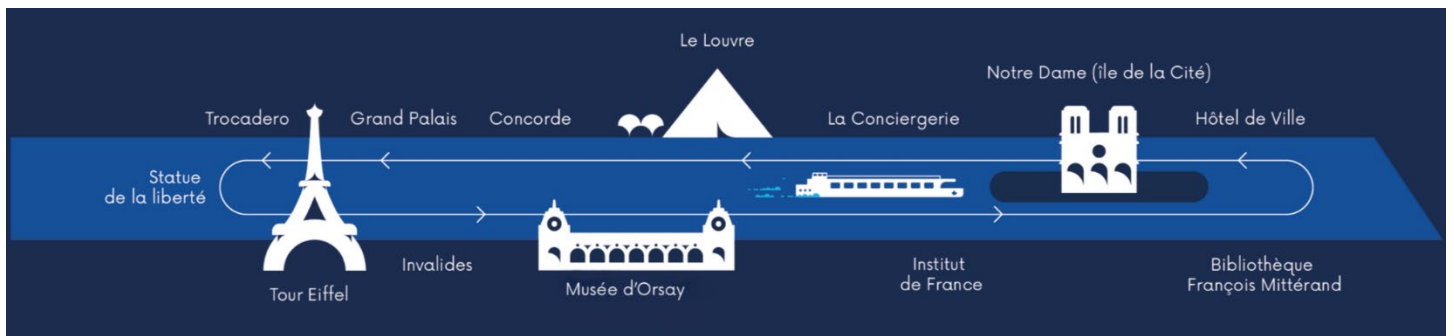
Version: 04 (Final)

Wednesday 5/31/2023		WEDNESDAY SESSIONS (Hybrid Mode)	
7:30 - 8:30	Breakfast		
8:30 - 10:30	Registration (Le Cnam Registration Desk, 2 Rue Conté, 75003, Paris)		
9:30 - 10:30	Morning Coffee Break (Amphi Georges Friedmann)		
10:30 - 11:00	Conference Opening (Amphi Georges Friedmann) Zoom Link: https://us02web.zoom.us/j/89821965347?pwd=Y1NleFMzeUlvMnRRRUQRmRTZTBdUT09 , Meeting ID: 898 2196 5347, Passcode: 618787		
	Speech of Welcome Prof. Jie (Peter) Liu, Honorary General Chair, PHM 2023; Carleton University, Canada		
	Conference Overview Dr. Ryad Zemouri, General Chair, PHM 2023; Research Center of Hydro-Quebec, Canada		
11:00 - 12:00	Keynote Talk (I) - Chair: Prof. Demba Diallo How to Take Care of Turbo Generators Dr. Jean-Pierre Ducreux, Senior Research Engineer, Électricité de France (EDF), France		
12:00 - 14:00	Lunch Break ("Café des techniques")		
14:00 - 15:00	Keynote Talk (II) - Chair: Dr. Ryad Zemouri Health Condition Monitoring Techniques - Oil Immersed Transformers Dr. Seyed-Saeid MOOSAVI-ANCHEHPOLI, Research Engineer and Technical Lead, Technological Research Institute Railenium, Valenciennes, France		
	ROOM A (Onsite)	ROOM B (Onsite)	
	Technical Session 1 (Onsite) (RUL Prediction) Session Chair: Prof. Zhonghai Lu	Technical Session 2 (Onsite) (General Technical Topics) Session Chair: Fang Duan	
15:15 - 16:15	049: Identification of Key Parameters for Remaining Useful Life Prediction of Radar T/R Module using Least-Squares Method	127: Particle Filter and Its Variants for Degradation State Estimation and Remaining Useful Life Prediction	
	020: Improved Neural Controlled Differential Equation for Remaining Useful Life Prediction of Power Transformers	119: Fault Diagnosis Based on Feature Mode Decomposition of Whale Optimization Algorithm	
	033: RUL Estimation for Power Electronic Devices Based on LESIT Equation	154: Prediction of High-speed Train Vibratory Stability Via Pseudo Excitation Method	
16:15 - 16:45	Afternoon Coffee Break (Amphi Georges Friedmann)		
	Technical Session 3 (Onsite) (PHM for Rotary Machinery) Session Chair: Dr. Dmitry Belov	Technical Session 4 (Onsite) (Fault Detection and Diagnosis) Session Chair: Dr. Sheriff Murtala	
16:45 - 18:00	098: Data-Driven Degradation Modeling Approach for Neutron Generators in Multifunction Logging-While-Drilling Service	109: Simplified Modeling of a Flapper-Nozzle Servo Valve for Electro-Hydraulic Actuators: Genetic Algorithms and Neural Networks	
	039: BHA Critical Connection PHM Model for Drilling Industry	056: Data-Driven Fault Diagnostics for Neutron Generator Systems in Multifunction Logging-While-Drilling Tools	
	091: An Investigation on The Effect of Wheel-polygonal Wear on Dynamic Vibration Characteristics of Urban Rail Vehicle Axle-box Bearings	101: A Three-stage Damage Diagnosis Method for Heavy Haul Railway Bridge by Bogie Response Measurements	
	132: An improved UNet model based on adaptive activation function and squeeze-and-excitation module for milling tool wear segmentation	121: Performance of Fault Severity Estimation in 7-Phase Electrical Machines Under Noisy Conditions	
18:15 - 21:00	Welcome Reception (Conference Cocktail, "Café des techniques")		

Thursday 6/01/2023		THURSDAY SESSIONS (Hybrid Mode)	
7:30 - 9:00	Breakfast		
9:00 - 11:00	Registration (Le Cnam Registration Desk, 2 Rue Conté, 75003, Paris)		
9:00 - 10:00	<p align="center">(Amphi Georges Friedmann) Keynote Talk (III) - Chair: Prof. Claude Delpha Predictive Maintenance Using a Digital Twin Dr. Lama Itani, Education and Research Engineer, MathWorks, France</p>		
	ROOM A (Onsite)	ROOM C (Virtual) Zoom Link: https://us02web.zoom.us/j/89821965347?pwd=Y1NleFMzeUlvMnRRRUQrQmRTZTBDU09 Meeting ID: 898 2196 5347 Passcode: 618787	
	Technical Session 5 (Onsite) (Predictive/Periodic Maintenance) Session Chair: Prof. Claude Delpha	Technical Session 6 (Virtual) (Advanced Signal Processing) Session Chair: Prof. Fangyi Wan	
10:15 - 11:30	107: Predictive Maintenance Planning for Mechanical Components of Bottomhole Assemblies	027: Problem decoupling and optimization of aeroengine life cycle maintenance decision	
	149: Federated Learning for Predictive Maintenance and Quality Inspection in Industrial Applications	143: Robust structural control of onshore wind turbines using MR dampers	
	059: Integrating Fleet Compatibility and Environmental Risk in Downhole Tool Investment Planning	102: Failure Simulation and Reliability Modelling Analysis of Aircraft Drag Parachute Lock System	
	037: A Study on the Development of Augmented Reality Contents for Air Compressor of Railway Vehicles	108: An efficient algorithm for task allocation with multi-agent collaboration constraints	
11:30 - 11:45	Morning Coffee Break (Amphi Georges Friedmann)		
	Technical Session 7 (Onsite) (Machine/Deep Learning Approaches) Session Chair: Dr. Dan Xiang	Technical Session 8 (Virtual) (General Technical Topics) Session Chair: Dr. Shuai Zhao	
11:45 - 13:00	150: Generating High-Resolution Flight Parameters in Structural Digital Twins using Deep Learning-based Upsampling	164: Multi-state system reliability analysis based on PH distribution for periodic maintenance	
	114: Unsupervised Representation Learning in Multivariate Time Series with Simulated Data	038: The Statistical Data-driven Remaining Useful life Prediction-A Review on the Wiener Process-based Method	
	115: State-of-health prediction of Li-ion NMC Batteries using Kalman Filter and Gaussian Process Regression	142: Online Tool Condition Monitoring Using Unreliable Pseudo-Labels	
	040: A Multi-Functional Sensor Network System for Health Monitoring of Inflatable Softgoods Structures	065: Automatic Fault Detection for Resistivity Systems in Logging-While-Drilling Tools	
13:00 - 15:00	Lunch Break ("Café des techniques")		
15:00 - 16:30	<p align="center">(Amphi Georges Friedmann) Plenary Panel Talk - Chair: Prof. Jie (Peter) Liu Prognostics and Health Management - Current States and Future Trends Panelists: Dr. Ryad Zemouri, Senior Researcher, Research Center of Hydro Quebec, Canada Dr. Dan Xiang, Vice President, X-Wave Innovations Inc., USA Dr. Dmitry Belov, Principal Data Scientist, Schlumberger Cambridge Research Ltd., UK Prof. Pradeep Kundu, Assistant Professor, KU Leuven, Belgium</p>		
	<p align="center">Technical Session 9 (Onsite/Digital Posters)</p> <p>Due to ongoing international travel constraints/interruptions, some authors may not be able to make it to the conference to present their papers on site; in this case, their papers will be presented either virtually via a Zoom link given above or using a digital poster. All posters will be shared with all conference participants. If you have questions on a poster, please feel free to contact the authors directly via emails with a copy to the conference email address (phm2023@phmice.org). Questions should be answered by the authors within 24 hours after receiving the questions during the conference period May 31 - June 2, 2023.</p>		
16:30 - 17:30	073: Adaptive Manifold Partial Transfer Learning for Cross-Domain Fault Diagnosis (Poster)		
	052: Fire Control System Fault Prediction Method Based on CAO-SVM (Poster)		
	058: Research on GOA-RNN based fault prediction method for fire control system (Poster)		
	128: A Transfer Learning Method for Fault Diagnosis of Analog Circuit Using Deep Subdomain Adaptation Network (Poster)		
	076: Analysis of Common Fault Diagnosis Methods for Aeroengine (Poster)		
	051: An enhanced deep joint distribution alignment mechanism for planetary gearbox fault transfer diagnosis (Poster)		
	082: Summary of Fault Prediction Algorithms for Fire Control System (Poster)		
	134: Application of Deep Transfer Learning in Fault Diagnosis of Integrated Transmission (Poster)		
	113: Summarization of Fire Control System Fault Detection and Health Prediction Methods (Poster)		
	133: Monocular vision-based 3D reconstruction of aero-engine blade damage (Poster)		
	135: A Graph Neural Network-Based Method for Predicting Remaining Useful Life of Rotating Machinery (Poster)		
	084: Fire Control System Fault Prediction and Health Management Related Technology (Poster)		
	162: Sensor Fault Detection in Wind Turbines Using Machine Learning and Statistical Monitoring Char (Poster)		
20:30 - 23:15	Conference Banquet and Best Paper Awards Ceremony (Cruise Dinner on Seine River; Boarding of the cruise is scheduled at the foot of the Musée d'Orsay at 8:30pm)		

Friday 6/02/2023	FRIDAY SESSIONS (Hybrid Mode)	
7:30 - 9:00	Breakfast	
	ROOM C (Virtual) Zoom Link: https://us02web.zoom.us/j/89821965347?pwd=Y1NleFMzeUlvMnRRRUQrQmRTZTB-DUT09 Meeting ID: 898 2196 5347 Passcode: 618787	ROOM D (Virtual) Zoom Link: https://us06web.zoom.us/j/87416734051?pwd=dE9Odi9GVmkyZ1g3bXQrRkRoY1RNU-T09 Meeting ID: 874 1673 4051 Passcode: 379276
	Technical Session 10 (Virtual) (General Technical Topics) Session Chair: Prof. Yilin Zhou	Technical Session 11 (Virtual) (General Technical Topics) Session Chair: Prof. Maotai Zhao
9:00 - 10:30	046: A MP-based method for the periodic fault impulses detection in rotating machinery	013: Short-term Traffic Flow Prediction Based on Neuron Network Model
	088: Comparison of Degradation Prediction Methods for Proton Exchange Membrane Fuel Cell	017: Robot Localization and Mapping Method in Dynamic Intelligent Manufacturing Shop Environment
	015: A Bayesian-optimized Hybrid Neural Network Based on CNN and BiLSTM for Predictive Maintenance of Diesel Generator	029: Improved Negative Pressure Wave Method for Municipal Water Pipeline Leak Location Using Real-Time Flow and Pressure Data
	148: Bearing Fault Diagnosis Based on Diffusion Model and One-Class Support Vector Machine	054: Application Research on Dynamic Obstacle Avoidance Path Planning of Unmanned Vehicle in Uncertain Environment
	063: A New Convolutional Prognostics Network with Adaptive Kernels for Estimating Remaining Useful Life of Bearings Considering Variable Speed	060: Safety Helmet Detection Based on Optimized YOLOv5
10:30 - 11:00	Morning Coffee Break (Amphi Georges Friedmann)	
	Technical Session 12 (Virtual) (General Technical Topics) Session Chair: Prof. Chuan Li	Technical Session 13 (Virtual) (General Technical Topics) Session Chair: Prof. Maotai Zhao
11:00 - 12:30	003: Research on Fault Diagnosis Method of Rocket Launch Pad Based on Fault Tree	070: Research on simulation acceleration method of FPGA design with external memory chip
	120: Remaining Useful Life Prognostics and Uncertainty Quantification for Aircraft Engines Based on Convolutional Bayesian Long Short-Term Memory Neural Network	094: MOA analysis of large hydropower station
	159: Remaining Useful Life Prediction Method Based on Convolutional Neural Network and Long Short-Term Memory Neural Network	105: Research and analysis on the relationship between the simultaneous grid-connected impulse current and AGC of large hydro-generator
	007: Fault Diagnosis of Aero-engine Lubrication System Based on KPCA-ABC-SVM	125: Research on the vector of permanent magnet synchronous motor based on MATLAB simulation
	036: Thermal fatigue failure analysis of charging module based on C-M model and Monte Carlo	152: Design and implementation of a panoramic training platform for distribution automation based on the combination of virtualness and reality
9:30 - 12:30	Academic Tour and Networking	
	Le Cnam Museum Visit ("Musée des Arts métiers") - Instructions to Follow	
12:30	Conference Adjourn	

Cruise Route:



CONFERENCE VENUE MAP



Entrance located at: 2 rue conté, 75003, paris

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