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09.00 Opening Ceremony - Welcome and introduction

Authors - Professor L Gelman, UK, D Gilbert, UK, and Dr S Baboo, Singapore Chair: Professor L Gelman, University of Huddersfield, UK - Room A: Wisteria

09.20 Plenary Keynote Lecture – [IA0] Health monitoring with vibrations at Safran Aircraft Engines: an overview of the 'doing well' and the 'I would like'...N/A

Author - J Griffaton, France Chair: Professor L Gelman, University of Huddersfield, UK - Room A: Wisteria

Session A – Data-driven and physics-based modelling for condition monitoring of industrial assets

Chair: Dr A Rahbarimanesh Room: A: Wisteria

II.00 [IAI] Application of machine learning in computational fluid dynamics-based design and optimisation of turboexpanders used in natural gas pressure reduction stations...N/A

Authors - S Rahbarimanesh¹, A Nejat², A Rahbarimanesh³ and S Mousavi²

¹University of British Columbia, Canada

²University of Tehran, Iran

³University of Manchester, UK

II.20 [IA2] Machine learning-enabled decision support system (ML-DSS) for asset condition monitoring...N/A

Authors - A Rahbarimanesh¹, M Burrows² and S Rahbarimanesh³

¹University of Manchester, UK

²RS Group plc, UK

³University of British Columbia, Canada

II.40 [IA3] Project nautilUS +: a fully autonomous robotic technology for smart floor thickness monitoring of hazardous liquid storage tanks...N/A

Authors - A Rahbarimanesh¹ and M Burrows²

¹University of Manchester, UK

²RS Group plc, UK

12.00 [1A4] Extending B-COSFIRE for automatic extraction of craquelure...1

Authors - M Fernandes^{1,2}, R Araújo¹, G Almeida¹ and S Paredes²

¹JTA – The Data Scientists, Portugal

²Polytechnic Institute of Coimbra, Portugal



Session B – Innovations in signal processing and modelling for complex industrial systems

Chairs: Professor F Pellicano and Dr A Zippo Room: B: Crimson Birch

[181] Lateral bearing stiffness effect on the spiral bevel gear non-linear vibration response...8

Authors - F Samani^{1,2}, M Molaie², S Rakhshani¹, M Asadi¹, R Ebrahimnejad², A Zippo², G Iarriccio² and F Pellicano²

¹ Shahid Bahonar University of Kerman, Iran

² University of Modena and Reggio Emilia, Italy

II.20 [IB2] Dynamical response of electrical transmission system...N/A

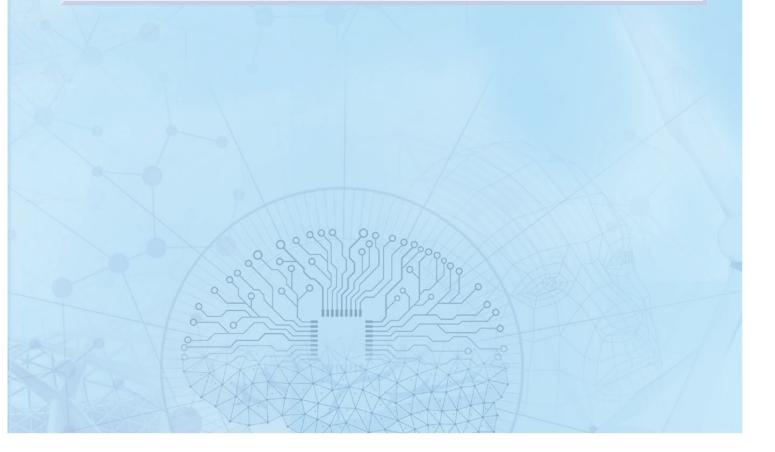
Authors - R Ebrahimnejad, M Molaei, G Iarriccio, A Zippo and F Pellicano University of Modena and Reggio Emilia, Italy

II.40 [IB3] Fault diagnosis for rotating machine based on Mel spectrogram and residual neural network...20

Authors - FTu, S Yang and J Yang Sichuan University, China

$\begin{tabular}{ll} \textbf{12.00} & \textbf{[IB4] Distinguished Overview Lecture: Difference mode decomposition:} \\ & \textbf{the uniqueness of classical Fourier transform for machine condition monitoring...} N/A \\ \end{tabular}$

Author - D Wang Shanghai Jiao Tong University, China



13.30 Plenary Keynote Lecture – [2A0] Enhancing asset integrity in the oil & gas industry through condition monitoring of storage infrastructures: a sensor-based approach... N/A

Author - Dr S Babu, Singapore Chair: Professor L Gelman, University of Huddersfield, UK - Room A: Wisteria

14.00 CM Book Update

Author - Professor A Hope, UK Chair: Professor L Gelman, University of Huddersfield, UK - Room A: Wisteria

Session A – Advances in interpretable condition monitoring and diagnostic methods

Chairs: Professor D Wang Room: A: Wisteria

[2A1] Interpretable fusion methodology of health indices and multi-dimensional analogue on complex industrial turbine cavitation condition monitoring... N/A

Authors -Y Fu¹, D Wang¹ and Z Peng^{1,2}
¹Shanghai Jiao Tong University, China
²Ningxia University, China

$\begin{tabular}{ll} \textbf{[2A2] Composite health index construction for online monitoring based}\\ \textbf{on control chart performance optimisation}...N/A \end{tabular}$

Authors - Y Wang, D Wang and B Hou Shanghai Jiao Tong University, China

[2A3] Aero engine remaining life prediction based on grey similarity multi-scale matching...32

Authors - S Sun^{1,2}, H Huang¹, J Ding¹, W Lu^{1,2} and D Wang³

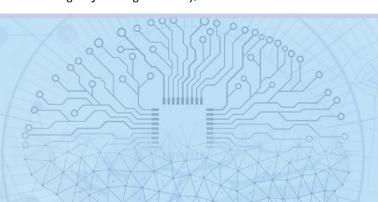
¹Harbin Institute of Technology, China

²Guangdong Provincial Key Laboratory of Intelligent Morphing Mechanisms and Adaptive Robotics, China

³Shanghai Jiao Tong University, China

$\begin{tabular}{ll} \textbf{[2A4] Gaussian assumptions free interpretable linear discriminant analysis for machine condition monitoring...} N/A \end{tabular}$

Authors -Y Chen and D Wang Shanghai Jiao Tong University, China



Session B – Innovations in signal processing and modelling for complex industrial systems continued

Chairs: Professor F Pellicano and Dr A Zippo Room: B: Crimson Birch

 $\begin{tabular}{ll} \textbf{[2BI] Application of minimum entropy decomposition rolling element} \\ \textbf{bearing fault analysis in a permanent magnet motor...} \\ \textbf{N/A} \\ \end{tabular}$

Author - S Ganeriwala SpectraQuest Inc, USA

[2B2] Matsuoka non-linear oscillator integration for investigating Parkinsonian tremor dynamics through multibody simulation...44

Authors - A Zippo and F Pellicano
University of Modena and Reggio Emilia, Italy

[2B3] Developing a digital twin model for a centrifugal pump: opportunity and challenges...N/A

Author - S Ganeriwala SpectraQuest Inc, USA

15.10 [2B4] Failure mode and slip frequency analysis in induction motor...N/A

Author - S Ganeriwala SpectraQuest Inc, USA



Session A – Computer vision and deep learning for structural health monitoring of renewable energy

Chairs: Professor M Shafiee Room: A: Wisteria

I5.50 [3A1] Computer vision and deep learning for structural health monitoring of wind turbines...N/A

Author - M Shafiee University of Surrey, UK

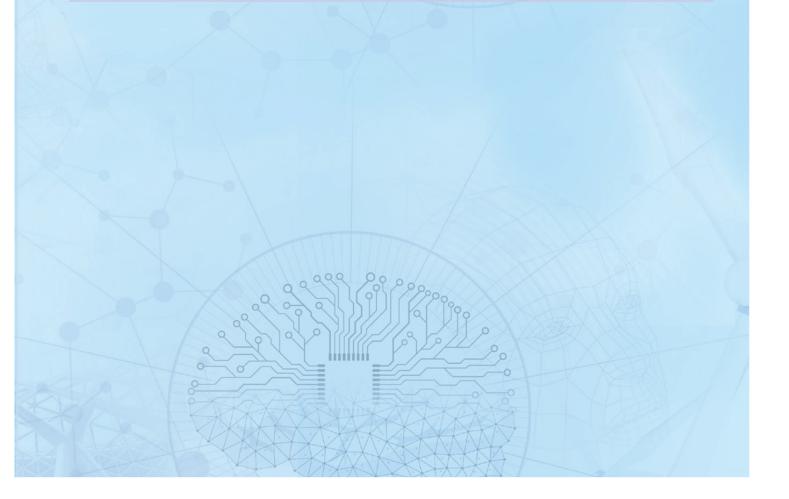
16.10 [3A2] Monitoring mooring lines of floating offshore wind turbines: autoregressive coefficients and stacked auto-associative deep neural networks...51

Authors - S Sharma¹ and V Nava¹.²
¹Basque Center for Applied Mathematics, Spain
²Tecnalia, Spain

[3A3] The application of the process capability index (PCI) in a fatigue test of a tidal turbine blade using historic and real-time load data...63

Authors - M Munko, K Connolly, F Cuthill, M Valdivia Camacho, E McCarthy and S Lopez Dubon University of Edinburgh, UK

16.50 [3A4] THIS SLOT IS AVAILABLE FOR A LATE SUBMISSION



Session B - Condition monitoring methods and technologies

Chair: D Whittle Room: B: Crimson Birch

[3B1] A concise review of transfer learning and generative learning for autonomous and robotic systems fault detection and diagnosis...75

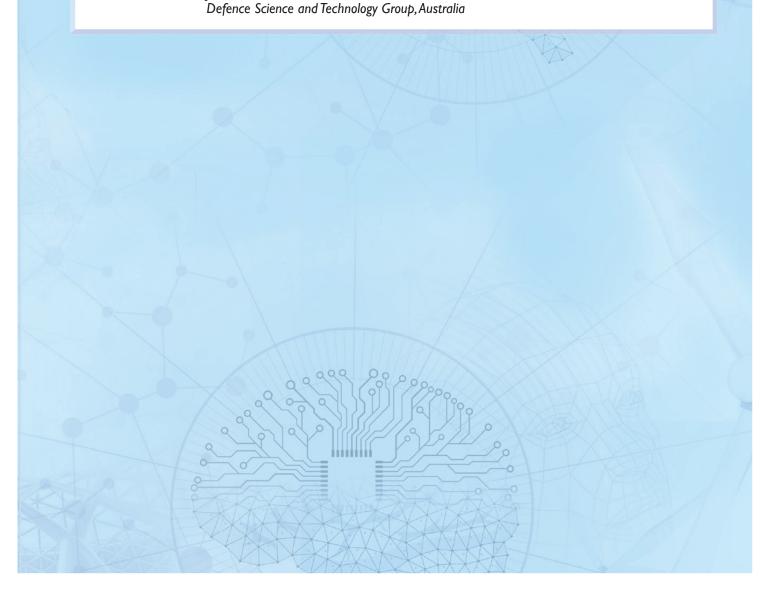
Authors - C Li and L Zhang University of Manchester, UK

16.10 [3B2] Gearbox fault detection method under unseen working conditions and damage...93

Authors - S Wang, Y Vidal and F Pozo Universitat Politècnica de Catalunya, Spain

- 16.30 [3B3] THIS SLOT IS AVAILABLE FOR A LATE SUBMISSION
- **16.50** [3B4] The monitoring of exhaust particulate from a marine diesel engine...101

Author - J Harris



09.00 Plenary Keynote Lecture – [4A0] Artificial intelligence (Al) and its applications: a future perspective...N/A

Author - W Mansoor, UAE Chair: Professor L Gelman, University of Huddersfield, UK - Room A: Wisteria

Session A - Condition monitoring management, training and certification

Chair: S Mills Room: A: Wisteria

09.30 [4AI] Condition monitoring and failure analysis of a liquefied natural gas plant cryogenic heavies removal column reflux pump ...111

Author - E Pereira Glasgow Caledonian University, UK

09.50 [4A2] Title to be confirmed...N/A

Author - G Walker Faraday Predictive Ltd, UK

10.10 [4A3] Effective conference presenting...123

Author - S Mills SpectrumCBM Ltd, UK



Session B - AI in condition monitoring

Chair: D Manning-Ohren Room: B: Crimson Birch

09.30 [4BI] Alleviating limited dataset in inter-shaft bearing fault diagnosis based on multi-source information with information discriminator...127

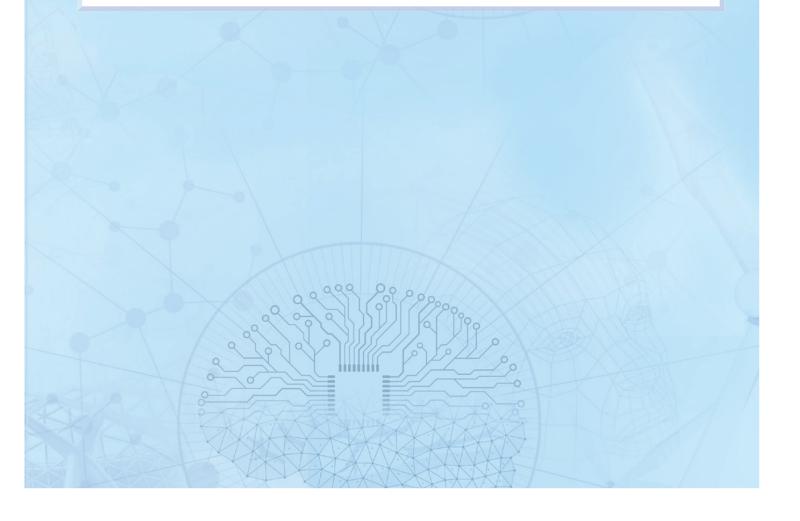
Authors - YYu and H R Karimi Politecnio di Milano, Italy

109.50 [4B2] A post-hoc analysis of deep learning approach for cracks identification in concrete structures...N/A

Authors - M Sohaib¹, M Junayed Hasan² and Z Zheng¹
¹Zhejiang Normal University, China
²Robert Gordon University, UK

10.10 [4B3] Enhancing gas pipeline monitoring with graph neural networks: a new approach for acoustic emission analysis under variable pressure conditions...134

Authors - M Junayed Hasan¹, M Arifeen¹, M Sohaib², A Rohan¹ and S Kannan¹ Robert Gordon University, UK
²Zhejiang Normal University, China



Session A - General condition monitoring

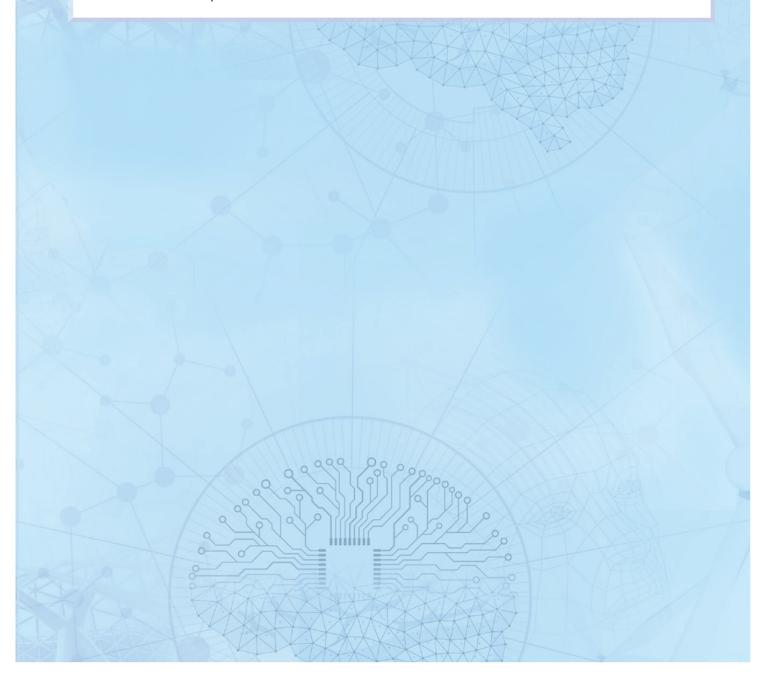
Chair: Professor A Hope Room: A: Wisteria

 $\begin{tabular}{ll} \textbf{II.10} & \textbf{[5A1] Visualising vibration: a 'gamechanger' for troubleshooting,} \\ & \textbf{diagnostics and root cause analysis...} N/A \end{tabular}$

Author - D Whittle RMS Ltd, UK

II.30 [5A2] Update on ISO standards in condition monitoring...144

Author - S Mills SpectrumCBM Ltd, UK



Session A - Vibration monitoring and analysis Chair: Professor A Hope Room: A: Wisteria

[5A3] Mind the gap...N/A11.50

Author - D Manning-Ohren Eriks, UK

[5A4] Instrumentation condition monitoring vibration and failure 12.10 analysis of screw air compressor package in liquefied natural gas plant...155

Author - E Pereira Glasgow Caledonian University, UK

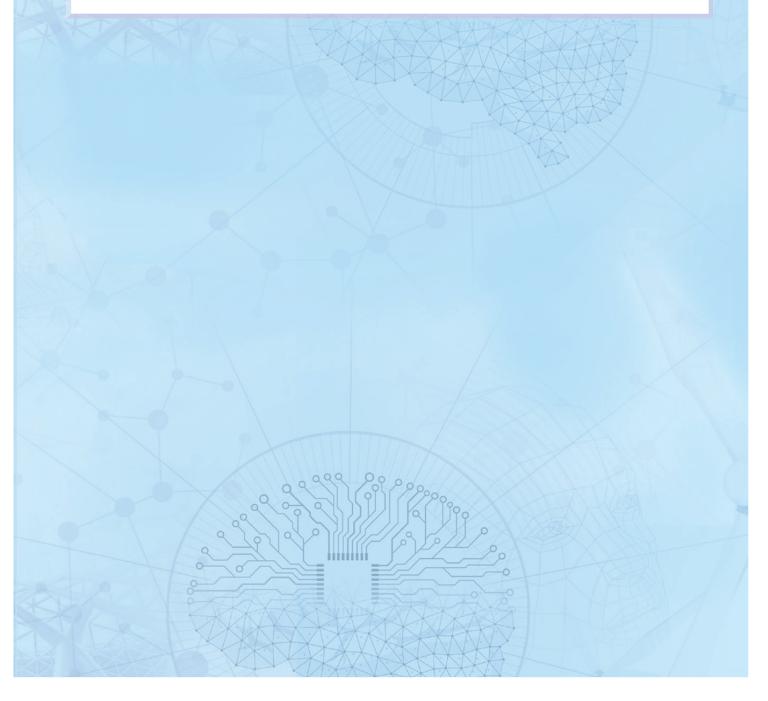


Session B – Al in condition monitoring
Chair: Dr J Griffaton Room: B: Crimson Birch

- **II.10** [5B1] Modelling of the vibratory response of an aircraft engine using Al...167

 Authors J Gomez and J Griffaton

 Safran Aircraft Engines, France
- 11.30 [5B2] Anomaly detection for complex equipment monitoring...179
 Authors J Becu, C Thirard, B Wascat and T Mazoyer
 Acoem, France



Session B - Human dynamics and health-related condition monitoring

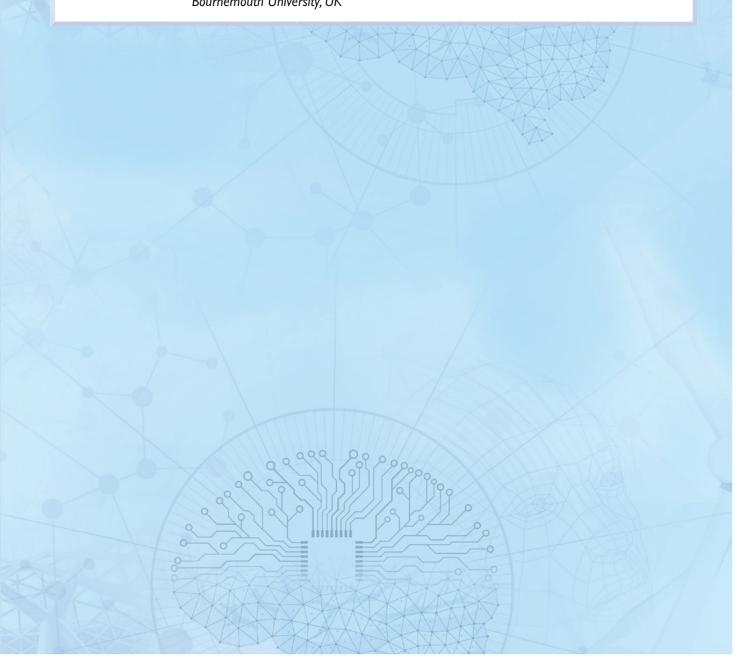
Chair: Professor S Noroozi Room: B: Crimson Birch

[5B3] Cadaveric testing of a novel sensor for non-destructive load balancing in total knee replacements (TKRs)...191

Authors - S Al-Nasser, S Noroozi and A Harvey Bournemouth University, UK

12.10 [5B4] The need for monitoring deltoid tension and shoulder kinematics during a total reverse shoulder arthroplasty (RSA)...196

Authors - S Noroozi, N Aslani, S Al-Nasser and R Hartley Bournemouth University, UK



> Author - Professor Z Su, China Chair: Professor L Gelman, University of Huddersfield, UK - Room A: Wisteria

Session A - General condition monitoring

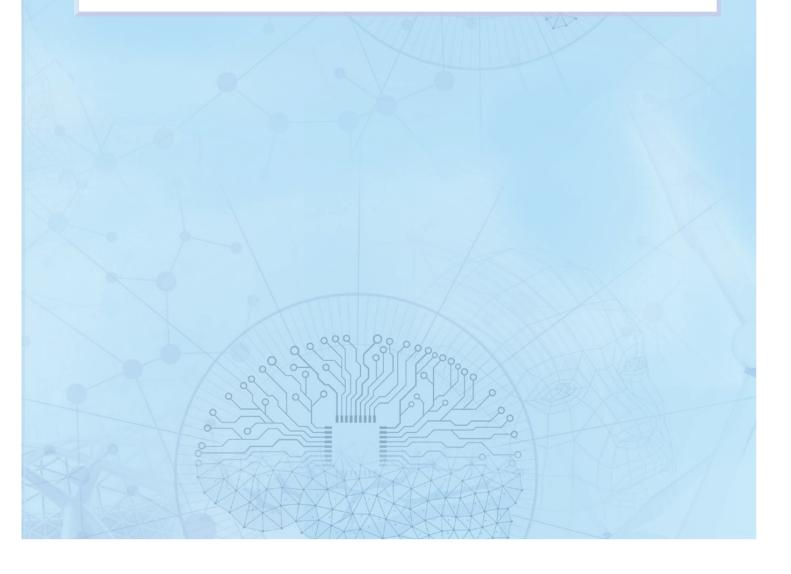
Chair: S Greenfield Room: A: Wisteria

14.00 [6A1] Criticality, risk assessment and cost-effective condition monitoring examples...203

Author - S Greenfield
Anokhi Consulting Engineers, UK

14.20 [6A2] Varnish in oil: the true amount...N/A

Author - R Cutler Oil Analysis Laboratories, UK



Session A - General condition monitoring continued

Chair: S Greenfield Room: A: Wisteria

14.40 [6A3] Monitoring energy recovery in a full-scale fatigue test...217

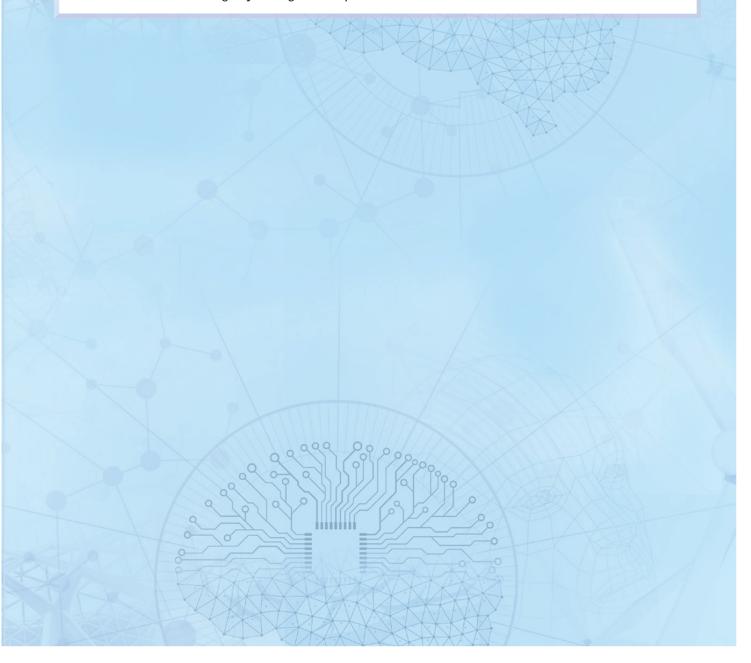
Authors - M Munko¹, S Lopez Dubon¹, F Cuthill¹, W Rampen¹ and C Ó Brádaigh²

¹University of Edinburgh, UK

²University of Sheffield, UK

15.00 [6A4] Impulsive mode decomposition and its four application cases to impulsive signal extraction...229

Authors - B Hou and D Wang Shanghai Jiao Tong University, China



Session B – Advanced signal processing and diagnostics in condition monitoring Chair: Dr E Juuso Room: B: Crimson Birch

[6BI] Natural language-based information in intelligent condition monitoring and control...236

Author - E Juuso University of Oulu, Finland

[6B2] Estimation of remaining useful life (RUL) of rolling element bearings based on the adaptive kernel Kalman filter...247

Authors - Z Li, R Zhu, T Verwimp, H Wen and K Gryllias KU Leuven, Belgium



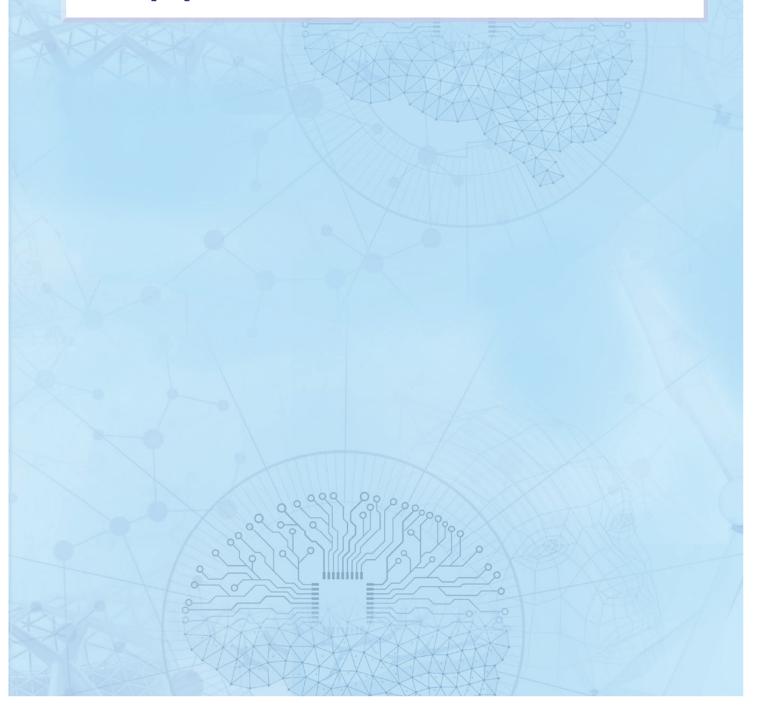
Session B - Title to be confirmed

Chair: to be confirmed Room: B: Crimson Birch

14.40 [6B3] Condition monitoring of aero engines: big data challenges and a comparison to NDT...N/A

Author - I Baillie Rolls-Royce plc, UK

15.00 [6B4] THIS SLOT IS AVAILABLE FOR A LATE SUBMISSION



Session A - Title to be confirmed

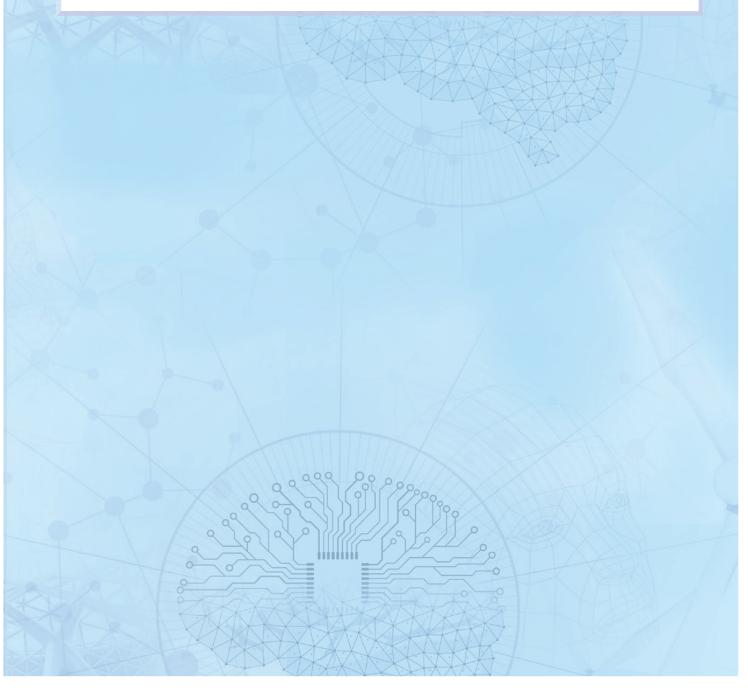
Chair: to be confirmed Room: A: Wisteria

15.40 Workshop - An introduction to oil debris monitoring technologies...N/A

Author - S Greenfield
Anokhi Consulting Engineers, UK

16.20 Workshop - Vibration analysis diagnostics and case study challenge...N/A

Author - D Whittle RMS Ltd, UK



09.00 Plenary Keynote Lecture – [7A0] Non-contact-based sensing: fundamentals, impact and challenges...N/A

Author - Dr M Khan, UK Chair: Professor A Hope, UK - Room A: Wisteria

Session A - General condition monitoring

Chair: to be confirmed Room: A: Wisteria

09.30 [7A1] Distinguished Overview Lecture: Deep information fusion for mechanical fault diagnosis... N/A

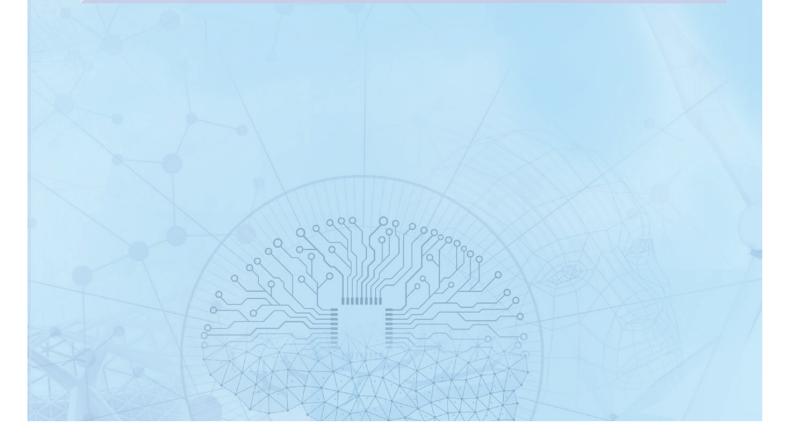
Author - H R Karimi Politecnico di Milano, Italy

09.50 [7A2] Artificial intelligence on wind turbines...N/A

Author - T Lau Sensonics Ltd, UK

10.10 [7A3] Distinguished Overview Lecture: Challenges in condition monitoring for industry, academics and standardisation organisations...N/A

Authors - M Behzad¹ and L Gelman²
¹Sharif University of Technology, Iran
²University of Huddersfield, UK



Session B - NDT and SHM

Chair: Dr J Griffaton Room: B: Crimson Birch

09.30 [7B1] Non-destructive evaluation of debonding in composites using air-coupled coda wave analysis and local defect resonance techniques...N/A

Authors - Z Li and J Jiao Beijing University of Technology, China

09.50 [7B2] Construction of tensile curves via conformal prediction...259

Authors - D Razafindrakoto^{1,2}, A Celisse¹, J Lacaille², L Sadeg Martelet² and F Corpace²

¹Université Paris I Panthéon-Sorbonne, France

²Safran Aircraft Engines, France

10.10 [7B3] Distinguished Overview Lecture: Automated defect detection in aeronautic materials using machine learning and neural networks...N/A

Author - J Lacaille Safran Aircraft Engines, France



Session A - General condition monitoring Chair: Professor L Gelman Room: A: Wisteria

I 1.00 [8A1] Distinguished Overview Lecture: Quantum physics and artificial intelligence: current challenges and opportunities in technical diagnostics and condition monitoring...269

Author - R Burdzik Silesian University of Technology, Poland

 $\begin{tabular}{ll} \textbf{I 1.20} & \textbf{[8A2] Novel condition monitoring technologies via motor current signature analysis...} N/A \end{tabular}$

Author - L Gelman University of Huddersfield, UK

 $\begin{tabular}{ll} \textbf{I 1.40} & \textbf{[8A3] Distinguished Overview Lecture: Assessing the success or failure of a reliability engineering programme in the wind industry...N/A \\ \end{tabular}$

Authors - D Hickey and B Simmonds Natural Power, UK



Session B - Maintenance

Chair: to be confirmed Room: B: Crimson Birch

[8B1] An individual report reviewing the current maintenance effectiveness of a safety-critical site (ABC Chemical Manufacturers) ...281

Authors - J Watkinson, A Ompusunggu and J Orson Cranfield University, UK

- 11.20 [8B2] THIS SLOT IS AVAILABLE FOR A LATE SUBMISSION
- 11.40 [8B3] THIS SLOT IS AVAILABLE FOR A LATE SUBMISSION
- 12.00 Plenary Keynote Lecture [9A0] Condition monitoring of aero engines: big data challenges and a comparison to NDT...N/A

Author - Professor I Baillie, UK Chair: Professor L Gelman, University of Huddersfield, UK - Room A: Wisteria

12.30 Panel Session - Future directions in condition monitoring...N/A

Author - Speaker(s) to be confirmed Chair: Professor L Gelman, University of Huddersfield, UK - Room A:Wisteria