

Dear SHRM Newsletter Subscribers

Greetings and Welcome to our SHRM newsletter!

In this edition we are pleased to deliver highlights of SHRM member activities from Second half of 2016 and First half of 2018.

This newsletter features the wide-ranging scholarly and professional activities of current and former SHRM members, including notable achievements in both research and education activities.

Index

- 1 New Journal Papers / Awards / Patents
- 2 Project Updates
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1 New Journal Papers / Awards / Patents

Journal Papers (18 Published, 1 Accepted, 10 submitted)

18 papers were published and 1 papers were accepted for publication in highly ranked journals. In addition, 10 papers are in preparation for submission. Progress on these papers will be reported in a future newsletter.

Published

1) Taejin Kim, Hyunseok Oh, Hyunjae Kim and Byeng D. Youn, "An Online Applicable Model for Predicting Health Degradation of PEM Fuel Cells with Root Cause Analysis," IEEE Transactions on Industrial Electronics, v63, n.11, p7094-7103, 2016-11

- 2) Guilian Yi and Byeng D. Youn, "A Comprehensive Survey on Topology Optimization of Phononic Crystals," *Structural and Multidisciplinary Optimization*, v54, n.5, p1315-1344, 2016-11
- 3) Jungho Park, Jong M. Ha, Hyunseok Oh, Byeng D. Youn, Joo-Ho Choi and Nam Ho Kim, "Model-Based Fault Diagnosis of a Planetary Gear: A Novel Approach Using Transmission Error," *IEEE Transactions on Reliability*, v65, n.4, p1830-1841, 2016-12
- 4) Hyunseok Oh, Jisun Kim, Hyejeong Son, Byeng D. Youn and Byung C. Jung, "A Systematic Approach for Model Refinement Considering Blind and Recognized Uncertainties in Engineered Product Development," *Structural and Multidisciplinary Optimization*, v54, n.6, p1527-1541, 2016-12
- 5) Dae Whan Kim, Hyunseok Oh, Byeng D. Youn and Dongil Kwon, "Bivariate Lifetime Model for Organic Light-Emitting Diodes," *IEEE Transactions on Industrial Electronics*, v64, n.3, p2325-2334, 2017-03
- 6) Jong M. Ha, Hyunseok Oh, Jungho Park and Byeng D. Youn, "Classification of Operating Conditions of Wind Turbines for a Class-wise Condition Monitoring Strategy," *Renewable Energy*, v103, p.594-605, 2017-04
- 7) Joon Ha Jung, Byung Chul Jeon and Byeng D. Youn, Myungyon Kim, Donghwan Kim, and Yeonwhan Kim, "Omnidirectional Regeneration (ODR) of Proximity Sensor Signals for Robust Diagnosis of Journal Bearing Systems," *Mechanical Systems and Signal Processing*, v90, p.189-207, 2017-06
- 8) Asif Khan, Heung Soo Kim and Byeng D. Youn, "Modeling and Assessment of Partially Debonded Piezoelectric Sensor in Smart Composite Laminates," *International Journal of Mechanical Sciences*, v131-132, p.26-36, 2017-10
- 9) Hsiu-Ping Wei, Bongtae Han, Byeng D. Youn, Hyuk Shin, Ilho Kim and Hojeong Moon, "Assembly Yield Prediction of Plastically Encapsulated Packages with a Large Number of Manufacturing Variables by Advanced Approximate Integration Method," *Microelectronics Reliability*, v78, p.319-330, 2017-11
- 10) Joung Taek Yoon, Byeng D. Youn, Minji Yoo and Yunhan Kim, "A Newly Formulated Resilience Measure that Considers False Alarms," *Reliability Engineering & System Safety*, v167, p.417-427, 2017-11
- 11) Heonjun Yoon, Miso Kim, Choon-Su Park and Byeng D. Youn, "Time-Varying Output Performances of Piezoelectric Vibration Energy Harvesting under Nonstationary Random Vibrations," *Smart Materials and Structures*, v27, n.1, 2018-01
- 12) Gang Niu, Junjie Jiang, Byeng D. Youn and Michael Pecht, "Autonomous Health Management for PMSM Rail Vehicles through Demagnetization Monitoring and Prognosis Control," *ISA TRANSACTIONS*, v72, p.245-255, 2018-01
- 13) Hyunseok Oh, Joon Ha Jung, Byung Chul Jeon and Byeng D. Youn, "Scalable and Unsupervised Feature Engineering Using Vibration-Imaging and Deep Learning for Rotor System Diagnosis," *IEEE Transactions on Industrial Electronics*, v65, n.4, p3539-3549, 2018-04
- 14) Jong M. Ha, Jungho Park, Kyumin Na, Yunhan Kim and Byeng D. Youn, "Tooth-wise Fault Identification for a Planetary Gearbox Based on a Health Data Map," *IEEE Transactions on Industrial Electronics*, v65, i.7, 2018-07

- 15) Guesuk Lee, Guilian Yi and Byeng D. Youn, "A Comprehensive Study on Optimization-Based Model Calibration Using Gradient Information," *Structural and Multidisciplinary Optimization*, v57, n5, p.2005-2025, 2018-05
- 16) Taejin Kim, Byeng D. Youn and Hyunseok Oh, "Development of a Stochastic Effective Independence (SEFI) Method for Optimal Sensor Placement under Uncertainty," *Mechanical Systems and Signal Processing*, v111, p.615-627, 2018-10
- 17) Woosung Choi, Byeng D. Youn, Hyunseok Oh and Nam H. Kim, "A Bayesian Approach to Damage Growth Model with Sporadically Measured and Heterogeneous On-site Data of Steam Turbine," *Reliability Engineering & System Safety*, Online Published, 2017
- 18) Boseong Seo, Guesuk Lee, Soo-Ho Jo, Hyunseok Oh and Byeng D. Youn, "A Fault Detection Method for Solenoid Valves in Urban Railway Braking Systems Using Temperature-Effect-Compensated Electric Signals," *Transactions of the Korean Society of Mechanical Engineering A*, v40, n.9, p.835-842, 2016-09

Accepted (or Submitted)

- 1) Jungho Park, Byungjoo Jeon, Jongmin Park, Jinshi Cui, Myungyon Kim and Byeng D. Youn, "Failure Prediction of a Motor-driven Gearbox in a Pulverizer Under External Noise and Disturbance," *Smart Structures and Systems*, Accepted, 2017
- 2) Sihyeong Woo, Taejin Kim, Hyunseok Oh, Daeil Kwon and Byeng D. Youn, "TDR based Multiple Leaks Detection System using S-parameters Transmission Line Model and Bayesian Inference for Long Distance Pipeline," *Smart Structures and Systems*, Submitted, 2017
- 3) Joung Taek Yoon, Byeng D. Youn, Minji Yoo, Yunhan Kim and Sooho Kim, "Life-Cycle Maintenance Cost Analysis Framework Considering Time-Dependent False Alarms for Prognostics and Health Management(PHM) Design," *Reliability Engineering & System Safety Special Issue: PHM*, Submitted, 2017
- 4) Minji Yoo, Joung Taek Yoon, Yunhan Kim, Sooho Kim and Byeng D. Youn, "A Resilience Measure Formulation that Considers Sensor Faults," *Reliability Engineering & System Safety Special Issue: PHM*, Submitted, 2017
- 5) Junpeng Zhao, Byeng D. Youn, Heonjun Yoon, Zhifang Fu and Chunjie Wang, "On the orthogonal similarity transformation (OST)-based sensitivity analysis method for robust topology optimization under loading uncertainty: A mathematical proof and its extension," *Structural and Multidisciplinary Optimization*, Submitted, 2017
- 6) Jungho Park, Moussa Hamadache, Jong M. Ha, Yunhan Kim, Kyumin Na and Byeng D. Youn, "Positive Energy Residual (PER) Based Planetary Gears Fault Detection Method Under Variable Speed Conditions," *Mechanical Systems and Signal Processing*, Submitted, 2017
- 7) Junpeng Zhao, Heonjun Yoon and Byeng D. Youn, "An efficient decoupled sensitivity analysis method for multiscale concurrent topology optimization problems," *Structural and Multidisciplinary Optimization*, Submitted, 2017

8) Junmin Lee, Hyunseok Oh, Chan Hee Park, Byeng Dong Youn and Bongtae Han, "Test Scheme and Degradation Model of Accumulated ESD Damage for IGBT Prognostics," IEEE Transactions on Power Electronics, Submitted, 2017

9) Jinshi Cui, Heonjun Yoon and Byeng D. Youn, "An Omnidirectional Biomechanical Energy Harvesting (OBEH) Sidewalk Block for a Self-Generative Power Grid in a Smart City," International Journal of Precision Engineering and Manufacturing - Green Technology, Submitted, 2017

10) Insun Shin, Junmin Lee, Jun Young Lee, Kyusung Jung, Daeil Kwon, Byeng D. Youn, Hyun Soo Jang and Joo-Ho CHoi, "A Framework for Prognostics and Health Management Applications to Smart Manufacturing Systems," International Journal of Precision Engineering and Manufacturing - Green Technology, Submitted, 2017

11) Taejin Kim, Hyunseok Oh, Sihyeong Woo and Byeng D. Youn, "A Stepwise Bayesian Approach with a Domain Reduction Technique for Multiple-Leak Detection," IEEE Transactions on Reliability, Submitted, 2017



Awards

20 awards were rewarded, including 3 winners of Data Challenge Competitions, 1 Young Scientist Award and 5 Best Paper Awards from conferences.

Congratulation to all prize winners!



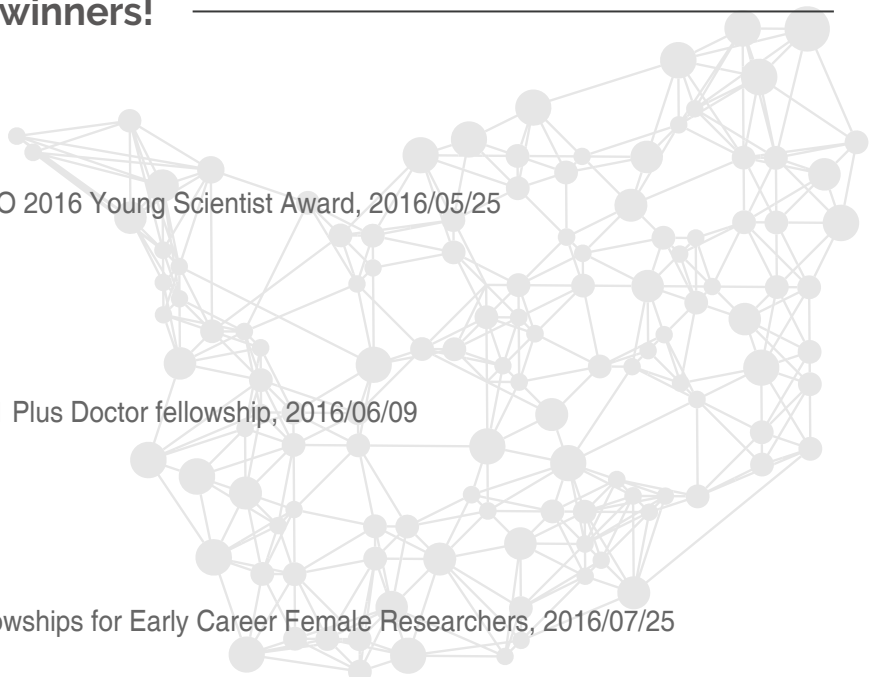
1) Hyunseok Oh, ACSMO 2016 Young Scientist Award, 2016/05/25



2) Chan Hee Park, BK21 Plus Doctor fellowship, 2016/06/09



3) Guilian Yi, IACM Fellowships for Early Career Female Researchers, 2016/07/25





4) Byeng D. Youn, Byung Chul Jeon, Jong M. Ha, Jungho Park, Joon Ha Jung and Hwanoh Choi, QR2MSE 2015 - Best Paper Award, 2016/07/27



5) Heonjun Yoon and Byeng D. Youn, ENGE 2016 - General Poster Award, 2016/11/09



6) Heonjun Yoon, Yong Chang Shin and Soo-Ho Jo, KSME-SEMES Open Innovation Challenge, 2016/12/15



7) Jungho Park, Jong M. Ha, Yunhan Kim and Byeng D. Youn, KSME-Best Paper Award, 2017/02/23



8) Taejin Kim, KSME-Best Thesis Award (Ph.D.), 2017/05/26



9) Jungho Park, Byungjoo Jeon, Jongmin Park, Jinshi Cui, Myungyon Kim and Byeng D. Youn, PHMAP 2017 Data Challenge Competition - Winner (1st Place), 2017/07/13



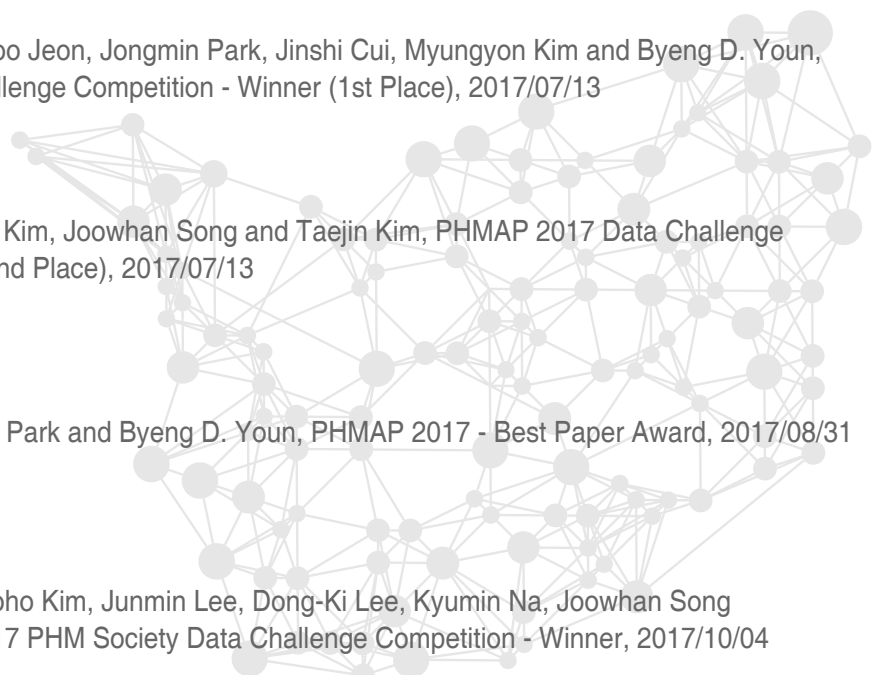
10) Guesuk Lee, Sooho Kim, Joowhan Song and Taejin Kim, PHMAP 2017 Data Challenge Competition - Winner (2nd Place), 2017/07/13



11) Jong M. Ha, Jungho Park and Byeng D. Youn, PHMAP 2017 - Best Paper Award, 2017/08/31



12) Chan Hee Park, Sooho Kim, Junmin Lee, Dong-Ki Lee, Kyumin Na, Joowhan Song and Byeng D. Youn, 2017 PHM Society Data Challenge Competition - Winner, 2017/10/04





13) Byeng D. Youn, KSME-Award of Appreciation, 2017/11/02



14) Chan Hee Park, Joowhan Song, Jong M. Ha and Jungho Park, KSME-SEMES Open Innovation Challenge, 2017/11/02



15) Byeng D. Youn, Sinyang Outstanding Award, 2017/11/15



16) Joon Ha Jung, Myungyon Kim, Jin Uk Ko and Byeng D. Youn, KSME-Best Paper Award, 2018/02/22



17) Heonjun Yoon, Outstanding Doctoral Dissertation Award, 2018/02/26



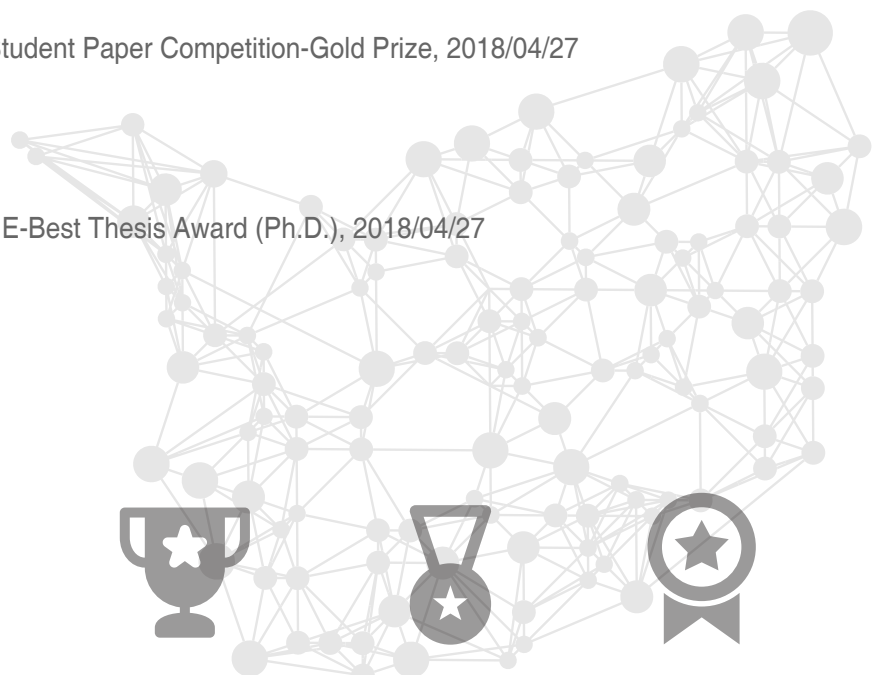
18) Soo-Ho Jo, Heonjun Yoon, Yong Chang Shin, Guilian Yi, Byeng D. Youn, Miso Kim, Choon-Su Park and Wonjae Choi, KSME-Best Paper Award, 2018/04/27



19) Soo-Ho Jo, KSME Student Paper Competition-Gold Prize, 2018/04/27



20) Heonjun Yoon, KSME-Best Thesis Award (Ph.D.), 2018/04/27



Patent

To date, 10 patents have been applied and 3 patents have been registered, consisting of 4 international patents and 9 domestic patents.

International Patent

- 1) Youn B.D, Jeon B.C, Jung J.H, Apparatus and method for diagnising rotor shaft, Patent Application 15/239,987, 2016/08/24
- 2) Youn B.D, Kim D.H, Jo Y.W, Im Y.C, Oh H.S, Lee J.M, Apparatus and Method for Failure Prognosis in Inverter, Patent Application 15/384,266, 2016/12/19
- 3) Youn B.D, Kim D.H, Jo Y.W, Im Y.C, Oh H.S, Lee J.M, Apparatus and Method for Failure Prognosis in Inverter, Patent Application 201710130059.6, 2017/03/07
- 4) Youn B.D, Kim D.H, Jo Y.W, Im Y.C, Oh H.S, Lee J.M, Apparatus and Method for Failure Prognosis in Inverter, Patent Application 102017207806.5, 2017/05/09

Domestic Patent

- 1) Youn B.D, Kim D.H, Jo Y.W, Im Y.C, Oh H.S, Lee J.M, Apparatus and Method for Failure Prognosis in Inverter, Patent Application 10-2016-0102214, 2016/08/11
 - 2) Youn B.D, Park J.G, Park J.H, Ha J.M, Fault Diagnosis System of Industrial Robot, Patent Application 10-2016-0123309, 2016/09/26
 - 3) Youn B.D, Shin Y.C, Yoon H.J, Jo S.H, Energy Harvester Based on Metamaterial, Patent Application 10-2017-0005163, 2017/01/12
 - 4) Kim K.I, Kim K, Lim D.P, Youn B.D, Ha J.M, Park J.H, Method and System for Detecting Fault of Swing Device, Patent Application 10-2017-0042907, 2017/04/03
 - 5) Choi W.S, Jang S.H, Lee S.M, Youn B.D, Oh H.S, System and Method for Predicting Life of Turbine, Patent Application 10-2017-0060986, 2017/05/17
 - 6) Kim K., Youn B.D, Ha J.M, Na G.M, Method and System for Detecting Fault of Swing Device, Patent Application 10-2017-0144699, 2017/11/01
 - 7) Youn B.D., Ha J.M., Park J.H., Method for Diagnosing and Classifying Gear Fault, Patent Registration 10-1697954, 2017/01/19
 - 8) Youn B.D., Jeon B.C., Jung J.H., Apparatus and Method for Diagnosing Rotor Shaft, Patent Registration, 10-1748559, 2017/06/13
 - 9) Youn B.D, Jo S.H, Oh H.S, Seo B.S, Failure Determination Method of Valve for Braking Vehicle, Patent Registration, 10-1851943, 2018/04/19
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2 Project Updates

9 projects are in progress now, with 18 projects completed.

In Progress

- 1) Launching Plug-in Digital Analysis Framework for Modular System Design, Korea Evaluation Institute of Industrial Technology (2014.06.01-2018.05.31)
 - 2) System Reliability Improvement and Validation for New Growth Power Industry Equipment, Korea Evaluation Institute Of Industrial Technology (2014.11.01-2019.10.31)
 - 3) Center for Soft meta-Human, Ministry of Science, ICT and Future Planning (2016.11.01-2022.12.31)
 - 4) Development of 6-DOF Cooperative Robot Technology with Repetition Accuracy of 0.1mm and Payload of 15kg in Compliance with International Safety Certification Standard, Korea Evaluation Institute of Industrial Technology (2017.04.01-2019.12.31)
 - 5) Development of Health State Diagnostics and Prognostics based on Integration of Artificial Intelligence and Expert Knowledge, Korea Electric Power Coporation (2017.05.01-2020.04.30)
 - 6) Analysis and Design of Elastic Metamaterials for Energy Focusing, National Research Council of Science & Technology (2017.05.22-2020.05.21)
 - 7) Development of Health Feature Model in an Industrial Robot Considering Operating Conditions, Hyundai Heavy Industries (2017.09.01-2018.08.31)
 - 8) Advances in Fault Detection Techniques for OHT (Overhead Hoist Transport) Driving and Non-driving Parts, Samsung Electronics (2018.01.01-2018.12.31)
 - 9) Development of Scale-Free Fault Diagnosis Techniques for Similar Mechanical Systems, Korean Institute of Machinery and Materials (2018.01.01-2020.12.31)
- 

Completed

- 1) Health Monitoring and Prognostics for Smart Plants (Turbine Rotor), Korea Evaluation Institute of Industrial Technology
 - 2) Development of Online Prediction Apparatus for Thermal Behavior of Li-Ion Battery System Under Transient Driving Conditions, National Research Foundation
 - 3) Fault Diagnostic for Railway Brake Systems for Condition-Based Maintenance, Korea Railroad Research Institute
 - 4) Development of NVH Performance Variation Prediction Model in Accordance with Part Variation, Hyundai NGV
 - 5) PLC Health data extraction of Tool Failure for CNC Equipment Downtime Minimization, LG Electronics
 - 6) Breakthrough Technology of Highly Dense Energy Harvesting Utilizing Mechanical Wave Characteristics of Acoustic Metamaterials, National Research Foundation
 - 7) Development of Diagnostic and Prognostic Module for LNG Carrier Propulsion Shafting System, Hyundai Heavy Industries
 - 8) Validation of Business Model for Prognostic and Health Management, Ministry of Science, ICT and Future Planning
 - 9) Experimental Assessment of Fault Detection Methods for an Industrial Robot under Actual Operating Conditions, Hyundai Heavy Industries
 - 10) Quantification of Health Index and Relevance Evaluation of International Vibration Criteria for Shunt Reactors, Korea Electric Power Research Institute
 - 11) Development of Rolling Bearing Diagnosis for Air Handling Unit in Smart Ship, Samsung Heavy Industry, Smartegy
 - 12) Development of Core Technologies for Fault Prognostics and Management of Smart Manufacturing Systems, SNU R&DB Foundation
 - 13) Study of Intelligent Diagnosis for Power Transformers and Prognostics for Electric Power Facilities, Korea Electric Power Research Institute
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- 14) I-Shield Bearing Validation Research with Schaeffler Bearing Fault Data, Schaeffler
- 15) Methodology Development of Statistical Failure Criteria for Diagnosing the Evacuator Speed Reducer, Doosan Infracore
- 16) Development of Fault Detection Techniques for OHT (Overhead Hoist Transport) Driving Parts under Various Operating Conditions, Samsung Electronics
- 17) F404 Engine Trend Analysis and Diagnostics Program Development, Aero Technology Research Institute, ROKAF
- 18) Development of RUL Prediction Technique for Rolling Element Bearing Based on Sensor Data, Samsung SDS

3 Alumni News

SHRM alumni got several appointments and awards from SHRM and other organizations recently, including assistant professor, researchers and engineers.

Alumni



1) Prof. Hyeonseok Oh has been appointed as an Assistant Professor at Gwangju Institute of Science and Technology (GIST) in October, 2016



2) Dr. Taejin Kim has been appointed as a Postdoctoral Researcher at SHRM in March, 2017



3) Dr. Moussa Hamadache has been appointed as a Postdoctoral Researcher at Ferrara University in June, 2017





4) Dr. Kyungho Sun was promoted to a Head Researcher at Korea Institute of Machinery and Materials (KIMM) in April, 2017



5) Dr. Jong Moon Ha has been appointed a Specialist at LG Electronics in August, 2017



6) Prof. Soobum Lee elected as a Co-Chair of ASME SMASIS Energy Harvesting Symposium in September, 2017. He also awarded from TCF, KIAT, UMB-UMBC, KAEIM and TEDCO and accepted 5 Papers in journals (3 SCI, 2 SCIE) at Energy Harvesting & Design Optimization Lab. in University of Maryland Baltimore County, Dept. of Mechanical Engineering from 2016 to 2017.



7) Mr. Sihyeong Woo was dispatched as a Liaison Officer to Atlanta, US in October, 2017



8) Mr. Hwanoh Choi was promoted to a Senior Researcher at LG Electronics in February, 2018



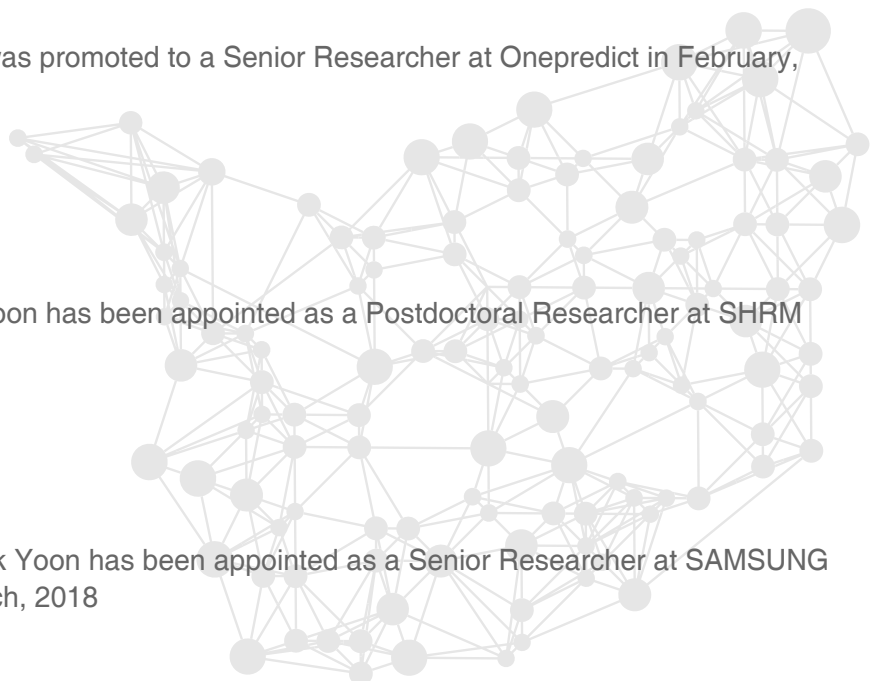
9) Ms. Jinshi Cui was promoted to a Senior Researcher at Onepredict in February, 2018



10) Dr. Heonjun Yoon has been appointed as a Postdoctoral Researcher at SHRM in March, 2018



11) Dr. Joung Taek Yoon has been appointed as a Senior Researcher at SAMSUNG Electronics in March, 2018



4 Students News

The graduates after 2016 shared their stories about research in SHRM. 5 students have received on Ph.D. degree and 3 students have received on M.S. degree. Also, 11 new members have enrolled into SHRM in these two years.

Ph. D



Taejin Kim

The research described herein describes the investigation of two original ideas of optimal sensor placement (OSP) for the PHM sensing function. The first idea is a stochastic effective independence (EFI) method, referred to as an energy-based stochastic EFI method; the proposed method overcomes the drawbacks of existing OSP methods in the sensing function. In Research Thrust 1, the stochastic sensor network design is proposed. In Research Thrust 2, a robust sensor network design that considers the latent failure of the sensor is introduced. The proposed method is validated to have accuracy that is comparable to the optimal sensor network design in normal conditions, and higher accuracy for situations in which there is a partial failure of the given sensor network.



Jong Moon Ha

To cope with the uncertainty-related challenges of vibration-based fault diagnosis of planetary gearboxes, this thesis presents three research thrusts: 1) quantitative definition of the stationary operating condition of a gearbox, 2) data-efficient fault diagnosis using autocorrelation-based time synchronous averaging (ATSA), and 3) tooth-wise fault identification using a health data map (HDmap), without the use of an encoder system.

The first research thrust presents a class-wise fault diagnosis methodology to solve the challenges that arise from the uncertain operating conditions of a gearbox. The second research thrust presents a data-efficient time synchronous averaging (TSA) method for a planetary gearbox. The third research thrust proposes an original idea for tooth-wise fault identification of a planetary gearbox.

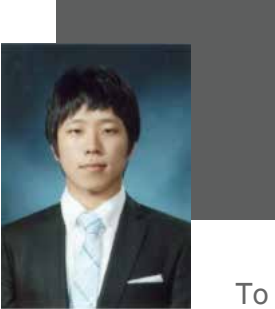
**Heonjun Yoon**

This doctoral dissertation aims at advancing three essential and co-related research areas in electroelastic modeling for PVEH analysis: 1) Research Thrust 1 - electroelastically-coupled analytical model of a PVEH device (deterministic approach); 2) Research Thrust 2 - stochastic dynamics of a PVEH device under nonstationary random vibrations (stochastic approach); and 3) Research Thrust 3 - system reliability analysis on multiple safety events of a PVEH device (probabilistic approach).

As a deterministic approach for PVEH analysis, Research Thrust 1 proposes an electroelastically-coupled analytical model of a PVEH device considering the inertia and stiffness effects of a surface-bonded piezoelectric layer. As a stochastic approach for PVEH analysis, Research Thrust 2 aims to investigate the time-varying output performances of a PVEH device under nonstationary random vibrations. As a probabilistic approach for PVEH analysis, Research Thrust 3 presents system reliability analysis on multiple safety events of a PVEH device in the presence of physical uncertainty (i.e., variability in the material properties and the geometry).

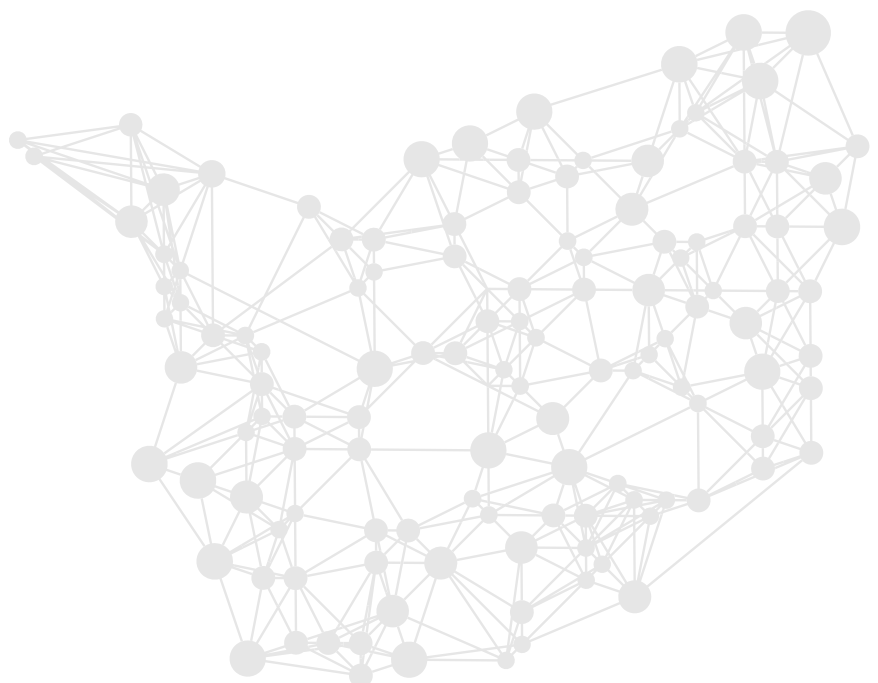
**Dae Whan Kim**

This study proposes a statistical approach to develop a lifetime model for OLED panels. The proposed approach incorporates manufacturing and operational uncertainties, and accurately estimates the lifetime of the OLED panels under normal usage conditions. The proposed statistical analysis approach consists of: (1) design of accelerated degradation tests (ADTs) for OLED panels, (2) establishment of a systematic scheme to build bivariate lifetime models for OLED panels, (3) development of two bivariate lifetime models for OLED panels, and (4) statistical model validation for the heat dissipation analysis model for OLED TV design. This four-step statistical approach will help enable accurate lifetime prediction for large OLED panels subjected to various uncertainties. Thereby, this approach will foster efficient and effective OLED TV design to meet desired lifespan requirements. Furthermore, two bivariate acceleration models are proposed in this research to estimate the lifetime of OLED panels under real-world usage conditions, subject to manufacturing and operational uncertainties. These bivariate acceleration models take into account two main factors—temperature and initial luminance intensity. The first bivariate acceleration model estimates the luminance degradation of the OLED panel; the second estimates the panel's color shift. The lifespan predicted by the proposed lifetime model shows a good agreement with experimental results.



Joung Taek Yoon

To cope with false alarm problems in resilience-driven system design (RDSD), this research is elaborated to advance the resilience engineering considering false alarms. Specifically, this consists of three research thrusts: 1) resilience analysis considering false alarms, 2) resilience-driven system design considering false alarms (RDSD-FA), and 3) resilience-driven system design considering time-dependent false alarms (RDSD-TFA). In the first research thrust, a resilience measure is newly formulated considering false alarms. Based upon the new resilience measure, RDSD-FA is proposed in the second research thrust. The third research thrust presents RDSD-TFA that considers time-dependent variability of an engineered system. Through theoretical analysis and case studies, the significance of false alarms in engineering resilience and the effectiveness of the proposed ideas are demonstrated.



M.S.

**Hwanoh Choi**

This study proposes a new calibration metric, probability residual (PR). The PR metric is defined as the sum of the product of scale factor and square of residuals. To evaluate the performance of the PR metric, this study uses mathematical models and employs statistical models of the journal bearing rotor system appropriate to normal and ii rubbing state. As a result, the PR metric performed better than other metrics including log-likelihood and KLD in terms of the calibration accuracy and efficiency, and the calibrated journal bearing rotor model with PR was proved in valid by the hypothesis testing. In summary, the proposed PR metric is promising to be applied in building an accurate computational model.

**Keon Kim**

This study examines a planetary gearbox with a knock sensor and evaluates the ability of the knock sensor. This study develops a novel quantitative sensor evaluation process for fault diagnosis. Two ideas are proposed in this study. First, quantitative metrics are used to evaluate the performance of the sensor. Second, a new application of the base-signal (i.e., difference signal used in Time Synchronous Averaging) is proposed to be used for fault diagnosis. Two case studies are presented to demonstrate the effectiveness of the proposed sensor evaluation process and metric: 1) a one-stage planetary gearbox in a wind turbine rig tester and 2) a swing reduction gear (two-stage planetary gearbox) in an excavator.

**Byungjoo Jeon**

A data-driven and real-time algorithm for bearing health monitoring is suggested in this thesis. The research objectives pursued to improve the bearing PHM framework include 1) full-time health monitoring, 2) definition of a failure threshold for rolling elements in general bearings, and 3) life prediction in real-time and in unsupervised situations. To classify the health state of bearings for detection of incipient faults and fault points, the Mahalanobis Distance is applied. the research outlined in this paper suggests a new model and a threshold decision method that enables prediction of the Remaining Useful Life in real time (i.e.,in unsupervised situations).

Newly Enrolled

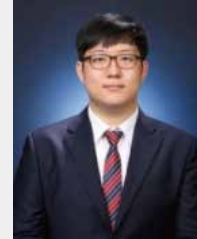
2018 /



Dr. Vikas Sharma



HyeonBae Kong



Hwa Yong Jeong



Hyunhee Choi



Gil Jun Ahn



Myeongbaek Youn
(Intern)

2017 /



Joowhan Song



Soho Kim



Jongmin Park



Jin Uk Ko



Dr. Juepng Zhao



Hao Yuan

5 Other News and Events

News from SHRM alumni,
SHRM lab and Prof. Youn are presented with heartfelt greeting and thanks.

Family event



Jisun's son was born in 14th November, 2017



Seunghyuk's daughter was born in 22nd February, 2018



Sihyeong's son was born in July, 2016



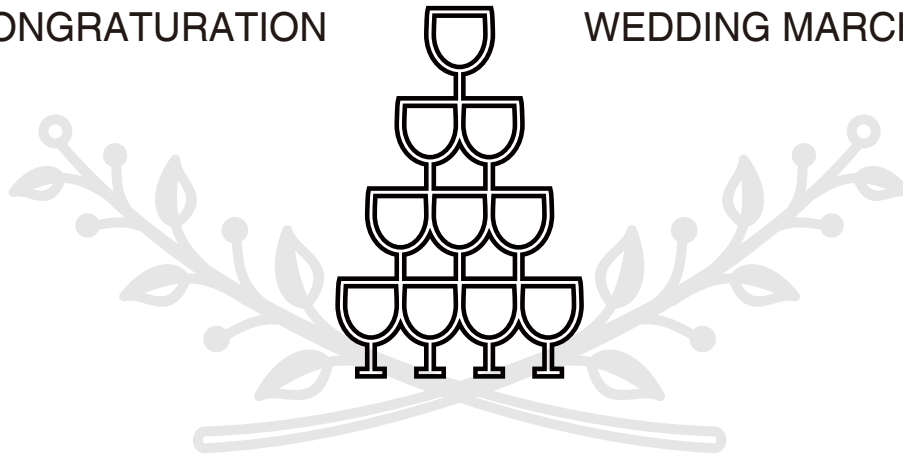
Woosung's daughter was born in 1st October, 2016

Yongchang's daughter was born in May, 2018



CONGRATURATION

WEDDING MARCH!



Yongchang married on 5th February, 2017



Minji married on 5th August, 2017



Laboratory News

foundation / OnePredict



2016

Award, excellence business model in Tech-BM

OnePredict Inc, founded

Government fund, "Industry-University-Research institute collaboration", COMPA, Ministry of Science and ICT (2016.12 - 2021.03)

Government fund, "Pumped Storage Power Generation", Korea Institute of Energy Technology Evaluation and Planning (KETEP), Ministry of Trade, Industry and Energy (2016.12 - 2017.11)

2017

Project - AI+PHM Solution (POSCO)

Project - Rule-based PHM for centrifugal compressor(SKT)

Winner of Data Challenge (PHMAP17, Jeju, Korea)

Project - Deep learning PHM solution for turbine (POSCO)

Project - AI+Physics PHM solution for turbine (POSCO)

Winner of Data Challenge (PHMAP17, Tampa, USA)

Project - Low-speed Bearing PHM solution (LG Electronics)

2018

Project - Conditioner health monitoring module development (KCTECH)

Sales - GuardiOne.Cell License (KCTECH)

Project - Establishment of gearbox and bearing diagnosis system (KOWEPO)

Launching show - GuardiOne.Bearing, GuardiOne.Turbine (at Eltower in July)

Project - GuardiOne.Bearing Performance Verification (Schaeffler)



Professor related news



Byeng D. Youn

Served

Editorial Board / International Journal of Prognostics and Health Management

Editorial Board / International Journal of Precision Engineering and Manufacturing

Editorial Board / International Journal of Precision Engineering and Manufacturing
- Green Technology

Review Editor / Structural and Multidisciplinary Optimization

Associated Editor / Journal of Mechanical Science and Technology

Scientific Committee / Asian Congress of Structural and Multidisciplinary Optimization 2016

Senior Vice President / KSPHM (Korean Society for Prognostics and Health Management)

Awards

Best Paper Award / QR2MSE 2015 (2015 International Conference on Quality, Reliability, Risk, Maintenance, and Safety Engineering), 2016

Sinyang Outstanding Award / Seoul National University, November, 2017