National Science Foundation (NSF)
Industry/University Collaborative Research Center for
Intelligent Maintenance Systems

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Bin Huang

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HIGHLIGHT

A **self-motivated, passionate, responsible, and innovative** researcher with interest and research experience in data-driven Prognostics and Health Management (PHM), Cyber-physical System(CPS) and Industrial AI using tools in signal processing, machine learning, computational fluid dynamics (CFD).

EDUCATION

University of Cincinnati 08/2016~present
Ph.D. candidate in Mechanical Engineering
- Research Assistant at NSF I/UCRC for Intelligent Maintenance System

State University of New York at Buffalo 08/2013~05/2016
M.S. in Mechanical Engineering

Harbin Institute of Technology, China 08/2009~07/2013
B.E. in Thermal and Power Engineering

PROJECT EXPERIENCE

Detergent Production Line Maintenance for P&G, US 11/2017~present
- Investigated 8-month production process data, targeting to precise enzyme dosing.
- Separated 2 failure modes clearly out of normal regime using PCA and T^2 statistics.
- Predicted process variability indicator using multivariate time series forecasting technique, CNN+LSTM neural network on Keras & Tensorflow.

UV Laser Marking Machine Maintenance for Compal Electrics, Taiwan 01/2018~present
- Summarized 5 possible factors which causes the failures of laser machine and determined 15 key variables which are mostly related laser degradation process.
- Observed the multi-stage degradation using SOM+MQE health assessment method.

Vibration Motor Maintenance for ACCL, Taiwan 03/2017~01/2018
- Developed an online monitoring system in Python, for tracking the performance of 68 vibration motors, to improve the quality of PCB plating process.
- Used a comparison-based strategy to dynamically assess the current risk of the pair of motors and predicted their possible failure events by ARMA.

Wind Turbine Maintenance for Shanghai Electric, Shanghai, China 06/2017~11/2018
- Optimized a power dispatching task using Genetic Algorithm, which allows the electricity merged from 37 wind turbines to meet hourly requested grid orders.
- Developed an algorithm for power loss calculation which is based on each turbine's power curve fitted with historical data and updating periodically.

INTERNSHIP EXPERIENCE

Fusion360 Data Analytics, Autodesk China Research & Development 07/2017~11/2017
- Analyzed how Fusion360, a 3D online design platform, is being used, and conducted user pattern mining based on usage of about 20,000 users for 3 months.
- Clustered 20 patterns, each of which represents a unique user behavior, by k-means and hierarchical clustering, and visualized in wind rose and radar chart.
- Extracted a great business values, which supports developer, user experience, business strategy and management, from result of random forest & cross validation.

PUBLICATIONS

- Huang, Bin, Yuan Di, Chao Jin, and Jay Lee. "REVIEW OF DATA-DRIVEN PROGNOSTICS AND HEALTH MANAGEMENT TECHNIQUES: LESSIONS LEARNED FROM PHM DATA CHALLENGE COMPETITIONS."

RESEARCH EXPERIENCE

Industrial Big Data Analytics and Applications 01/2017~present

- Assessed the health states of bearings by using Logistic Regression.
- Solved a bearing multi-failure classification problem by Support Vector Machine (SVM) and Self-Organizing Map (SOM).
- Predicted the jet engine remaining useful life (RUL) by similarity-based method.

Artificial Intelligence Study 01/2016~03/2017

- Summarized the fundamental knowledge and historical development of artificial intelligence (AI).
- Reviewed AI applications in different fields including manufacturing, transportation, finance and e-commerce, and explored the potentials of implementing AI to enhance the industry.

Review of Data-driven Prognostics and Health Management Techniques 11/2016~03/2017

- Summarized the problems and datasets of PHM Data Challenge competitions from 2008 to 2016, and categorized all problems into health assessment, fault classification and remaining useful life prediction.
- Analyzed how each problem in each category was solved by wining solutions and compared the various strategies took for different scenarios.
- Provided a generalized PHM methodology to facilitate algorithm selection and problem-solving strategy in different scenarios.

Survey on Cyber-Physical System 07/2016~08/2016

- Reviewed the milestones in the development history of Cyber-Physical System (CPS).
- Summarized and discussed the key ideas, enabling techniques, and their corresponding challenges.
- Studied CPS techniques and industrial cases in terms of different application fields.

Virtual Metrology for Chemical Mechanical Planarization 07/2016~10/2016

PHM'16 Data Challenge

- Implemented and benchmarked the performance of 1) Feature Selection Methods: PCA and k-Nearest Neighbor; 2) Regression Methods: Linear Regression, RBF Neural Network, Support Vector Regression, Self-Organizing Map for Regression; 3) Time Series Analysis: Linear Interpolation.
- Achieved a competitive result with an acceptable error of MSE=8.3.

PREVIOUS RESEARCH EXPERIENCE

Thesis of **Predicting the Fate of Downwind Bio-aerosols using Numerical Simulation** 10//2014~05/2016

- Developed a stochastic Lagrangian air dispersion model in Matlab for predicting the particle movements in wind fields created by the high-resolution hourly-updated meteorological data – Real-Time Mesoscale Analysis (RTMA).
- Offered an alternative and additional explanation to environmental trigger of asthma and pointed out the potential impact area.

Project of **Total Temporomandibular Joint Implant** 02//2014~05/2016

- Support TMJ design in 3D modeling, Finite Element Analysis (FEA) and minimizing the cost.
- Aided in financial report as purchasing manager.

Project of **Water Surface Spilling Oil Recovering Device Project** 03/2011~08/2011

- Improved the efficiency of spilling oil collection based on current existing oil collectors, by applying three innovative techniques, feasibility study and thermal analysis with ANSYS Fluent.
- Built a prototype machine based on the 3D design in Solidworks.

Research on **Physiology Property of Yellow Vein Phenotype Yv1** 11/2007~05//2008

- Isolated the gene from an Arabidopsis mutant with the yellow vein phenotype using the map-based cloning approach and polymerase chain reaction (PCR).
- Named the identified gene "MGT10" which encodes an Mg2+ transporter localized in the thylakoid.

PATENTS

CN102383409 (B) Water surface oil recovering device 05/2011

HORNOR & AWARDS

Second Prize in the Forth National College Students' Contest on Energy Conservation and Pollution Emissions Reduction 08/2011

Honorable Mention in Consortium for Mathematics and Its Applications Mathematical Contest in Modeling 02/2012

First Prize in National TRIZ Innovative Design Contest (TRIZ is the Russian acronym for "Theory of Inventive Problem Solving".) 11/2012

SKILLS

- Programming: MATLAB, Python, R, C++, LabVIEW
- Data Analytics: Machine learning, Signal processing, Data mining, Bayesian analysis
- Others: Computational fluid dynamics, Thermal & fluid dynamics

LANGUAGE

- Chinese: Native
- English: Proficient
- Japanese: Elementary