Center for Intelligent Maintenance Systems

IMS Researcher Profiles

IMS Researcher Profile

Institution: UC

Name:	Mohamed AbuAli
Contact Info:	abualima@email.uc.edu
	513-884-4300
Expertise:	Optimization, Quality Systems, Project Management
Current Research Activities:	Energy Systems (Omron)
	Robot Component Prognostics (Toyota, Nissan)
	Computer Network Performance Management (CISCO)
Dissertation/Thesis Topics:	Modeling and Analysis of the Relationship between Machine Health Degradation and its Energy Consumption
Project 1:	Application of Prognostics in Energy Systems (Omron)

- Goal: To research the applicability of prognostic tools and algorithms that can correlate maintenance activities and energy management in order to formulate technical strategies for energy savings and conservation.

Project 2: Prognostics for Robot Component Maintenance (Toyota, Nissan)

- Goal: To find practical solutions for online and offline health monitoring, diagnosis, and prognosis, of critical robot components including bearings, gearboxes, and cables. The systems should alarm when components degrade, or quickly identify problems when robots fail.

Skills:	MATLAB, LabView, Arena, Minitab, SPSS, MS Project, Unigraphics
Previous Background:	M.Sc. Industrial Engineering – American University in Cairo (2006)
	B.Sc. Systems Engineering – University of Arizona (2003)

IMS Researcher Profile

Institution: UC

Name:	Hassan Al-Atat
Contact Info:	(513) 602-6973
	atathf@email.uc.edu
Expertise:	FPGA and VLSI design, Sensors
Current Research Activities:	Embedded Prognostics, VHM
Dissertation/Thesis Topics:	Embedded Prognostics, VHM
Project 1:	On-board Prognostics for Vehicles

- Finishing Phase I of project which focused on Wheel Speed Sensor
- Starting Phase II

Project 2:   Vehicle Sensor Protection Algorithm

- Algorithm for differentiating system faults from sensor faults
- Finished Phase I which was a feasibility study
- Started Phase II Prototyping

Skills:	C, C++, LabVIEW, Matlab, Java
Previous Background:	Bachelors in Computer Engineering Lebanese American University

Publication:

- Wang, Al-Atat, Ghaffari, Lee and Xi." Prognostics of Automotive Sensors: Tools and Case Study". To appear in proceedings of MFPT 62, May 2008.
- Al-Atat, Genaidy, Shell, Karwowski, Ghanem, Le."The Manufacturing Enterprises Diagnostic Tool: A quick and efficient self-diagnostic tool for small and medium size manufacturers". Human Factors and Ergonomics in Manufacturing, Nov. 2007, In press.
- Hassan Al-Atat, Iyad Ouaiss. "Register Binding for FPGAs with Embedded Memory". FCCM 2004: 167-175.

IMS Researcher Profile

Institution: UC

Name: Jianbo (Bob) Yu

Contact Info: 513-556-3412

Expertise: Industrial engineering, Quality control, Maintenance, Machine learning.

Current Research Activities: Quality control, Maintenance, and Machine learning.

Dissertation/Thesis Topics: Manufacturing process quality control based intelligent learning models

Project 1: P&G

- Adaptive process monitoring
- Process failure diagnosis

Project 2: CISCO

- Network anomaly detection using intelligent learning model

Skills: 6 Sigma, MIS designing and developing, and machine learning.

Previous Background: joined and completed some projects related to quality control and maintenance.

Publications :

1. Yu Jian-bo, Xi Li-feng. An Improved Particle Swarm Optimization for Evolving Feedforward Artificial Neural Networks. *Neural Processing Letters, 26(3), 2007, 217-231*.

2. Yu Jian-bo, Wang Shi-jing, Xi Li-feng. Evolving Artificial Neural Networks Using an Improved PSO/DPSO. *NeuroComputing, 2008, 71(4-6)*.

3. Yu Jian-bo, Xi Li-feng. Intelligent Monitoring and Diagnosis of Manufacturing Processes Using an Integrated Approach of KBANN and GA. *Computers in Industry, 2008, 59(5)*.

4. Yu Jian-bo, Xi Li-feng. A Neural Network Ensemble-based Model for On-line Monitoring and Diagnosis of Out-of-control Signals in Multivariate Manufacturing Processes. *Expert Systems With Applications. (Online)*.

5. Yu Jian-bo, Xi Li-feng. A Hybrid Learning-based model for On-line Monitoring and Diagnosis of Out-of-control Signals in Multivariate Processes. *International Journal of Production Research. (Online)*
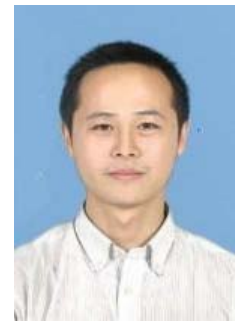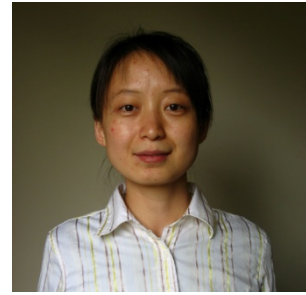
IMS Researcher Profile

University of Cincinnati

Name

Yan Chen

Contact Info

chen2yn@email.uc.edu

Dissertation/Thesis Topics

Complex machine system/production line monitoring and diagnostics (prognostics) analysis

Project 1:

- Productivity Improvement through Process Anomaly Detect and Prediction (P&G)
- Embedded prognostic agent in control system (P&G)

Project 2:

- Smart Machine Technology Development and Demonstration Test-Bed (TechSolve Inc.)

Skills:

- Scientific Programming - Matlab, SAS/JMP, C/C++, JAVA,VB,
- Simulation Analysis - ANSYS, Adam, UGS, AUTOCAD, Labview
- Others - RSLogix, RSview

Previous Background:

- Shanghai Jiao Tong University (SJTU), Shanghai, China/ M.S./Mechanical Engineering
- Tianjin University (TJU), Tianjin, China/B.S. /Mechanical & Automation Engineering

Publications:

- A new method for Feature Selection and gear defect Detection. The conference proceedings of the MSEC2007, SYMP 9 Diagnostics, Performance Prediction and Decision Making for Intelligent Maintenance of Manufacturing Systems.
- An Automated Modeling Approach of the Planar Mechanisms Analysis. The conference proceedings of the 2005 CIRP Design Seminar, May 22-25, 2005, Shanghai, P.R.China. Ref. CIRP2005-034.
- New optimal method for auto-body closure panels fitting integrating welding thermal effects, Journal of Automobile Engineering, proceedings of the Institution of Mechanical Engineers Part D (2007, No: 23304,as a co-author).

IMS Researcher Profile

Institution: UC

Name: David Siegel

Contact Info: Cell Phone: 513-290-8163

Expertise: Ground vehicle prognostics (commercial and military applications), vibrations, gas turbine/jet engine prognostics

Current Research Activities: Lead researcher for project with the Army's Tank Automotive Research Engineering and Development Center (TARDEC) to develop prognostics for the alternator component on the HMMWV military vehicle. Initial development in Labview of the Watchdog selection tool, and researching how to develop it to select tools based on the changing signals.

Dissertation/Thesis Topics: Thesis (Adaptive Prognostics and health monitoring applied to the HMMWV vehicle)

Project 1: Feasibility Study of Failure Prediction of Critical Components for Military Vehicles

- Development a methodology to monitor the alternator component by monitoring its bearing and electrical health.
- Constructed a testbed to validate prognostic method and optimize which tools work best

Project 2: General Motors Wheel Speed Sensor Prognostics

- Supported data analysis by writing code to do a modified Short Time Fourier Transform to capture one square wave at a time and extract frequency domain features and also track the speed of the wheel

Project 3: Improved fault detection for GE's Commercial Fleet of Jet Engines

In the early stages of this project but interning this summer at GE to learn their diagnostic techniques they currently use and also see what tools can improve their existing methods.

Skills: MATLAB, Labview, ANSYS, Fluent, Visual Basic

Previous Background: Bachelors of Science in Mechanical Engineering. Current Masters student at the University of Cincinnati and a research assistant at the IMS center. Relevant course work in vibrations, modal testing, signal processing, acoustics, image processing, robotics control and design. Leading one project now, and involved in quite a few others, with a focus on the vehicle and automotive side

Publications: Conference Paper (MFPT 62, "Failure Prediction of Critical Components in Military Vehicles")

Name: Sherin ElMeligy

Contact Info: elmelism@email.uc.edu

       513-293-6192

Expertise: Operations Research and Decision Support Systems

Current Research Activities: Health assessments techniques for communication networks

Dissertation/Thesis Topics: --

Project: Smart services and maintenance for communication networks

Skills: Matlab, SPSS, R, C++, Java, Arena, Vensim, RePast, Crystal Ball

Previous Background:

      M.S. (2006)   Faculty of Computers and Information, Cairo University, *M.S. degree with specialization in operations research and decision support. Thesis topic: Management Simulation Games for Training and Education.*

      B.S. (2002)   Faculty of Computers and Information, Cairo University, *B.S degree with specialization in operations research and decision support*

Publications:

    'Simulation Games as An Advanced Computer-Based Learning Technology In Management Sciences", INFOS2006, the Fourth International Conference, Faculty of Computers and Information, Cairo University, March 2006.

IMS Researcher Profile

Institution: UC

Name:	Edzel R. Lapira
Contact Info:	(513) 556-3412
	Lapiraer@email.uc.edu
Expertise:	Statistical signal processing and modeling
Current Research Activities:	Component degradation modeling using physics-based and data-driven approaches
Dissertation/Thesis Topics:	Modeling of equipment component degradation and its effect on product quality
Project 1:	Prognostics of Industrial Robots

- Method for estimating bearing faults using energy bands
- Method for determining gearbox fault using fixed cycle feature test

Project 2:   Machine Tool Health and Maintenance

- Conducted a state-of-the-art survey
- Method for estimating the state of unbalance of a tool assembly
- Used data-driven approach to determine surface roughness as affected by tool unbalance

Skills:	LabVIEW, Matlab, statistical software packages (SAS, SPSS)
Previous Background:	UNIVERSITY LECTURER – Department of Electronics & Communications Engineering, De La Salle University – Manila, Philippines
	CADET TEST ENGINEER – Analog Device, Analog Devices – Gen. Trias (ADGT), Cavite, Philippines

Publication:

Lapira E, Deshpande A, Snyder J, Lee J "Smart Machine Health and Maintenance: Tool Assembly Prognostics"(Submitted to 2008 International Manufacturing Science and Engineering Conference MSEC2008)

Institution: UC

Name: Haixia Wang

Contact Info: haixia.wang@uc.edu,
                 513-556-4651

Expertise: machine learning algorithms, manufacturing process modeling, product dimension control

Current Research Focus:

Data Streamlining – Determine additional monitoring parameters and sampling strategy for the existing processes, based on the first principle analyses and data reduction analyses.

System Modeling – Extract features that characterize performance of machines, processes, and parts;

- Establish relationships between product quality attributes and the extracted features of the machines, processes, and parts;
- Product dimensional control .

Dissertation/Thesis Topics: Dimensional Variation Modeling and Analysis for Multi-station Compliant Assemblies at a Preliminary Design Stage

Education:

Ph.D.   (2006) Industrial and Systems Engineering**,** University of Wisconsin - Madison, Madison, WI
M.S.   (2003) Industrial and Systems Engineering**,** University of Wisconsin - Madison, Madison, WI

Publications:

1.   Wang, H., Lee, J., Ueda T., Adjallah, K.H., and Ghaffari, M., "Engine health assessment and prediction using the group method of data handling and the method of match matrix – autoregressive moving average," *Proceeding of 2007 ASME Turbo Expo*, May 14-17, 2007, Palais des Congres, Montreal, Canada.

2.   Wang, H. and Ceglarek, D., "Generation of assembly sequences with k-ary operations," *2007 IEEE-ASME International Symposium on Assembly and Manufacturing*, July 22-25, pp.50-55, 2007, University of Michigan, Ann Arbor, USA.

3.   Lee, J., Ni, J., Wang, H., Djurdjanovic, D., "Intelligent maintenance systems," Chapter 7.2, *Sustainable Manufacturing – Recovery of Resources in Product and Material Cycles*, Ed. by Günther Seliger, Springer-Verlag Berlin Heidelberg, pp. 354-365,2007.

4.   Chen, Y., Wang, H., Lee, J., "A new method for feature selection and gear defect detection," *ASME International Manufacturing Science and Engineering Conference 2007*, pp. 1-5, Oct. 15-18, 2007, Atlanta, Georgia, USA.

5.   Liao, L., Wang, H., and Lee, J., "Bearing health assessment and fault diagnosis using the method of self-organizing map," *MFPT Meeting 61*, April 17-19, 2007, Virginia Beach, Virginia, USA.

Institution: UC

Name:	Linxia Liao (Leo)
Contact Info:	liaol@email.uc.edu
Expertise:	Prognostics/diagnostics modeling
Current Research Activities:	Adaptive prediction modeling
Dissertation/Thesis Topics:	Adaptive reinforcement learning-based prediction modeling for machine prognostics

Project 1: Machine Health Monitoring and Prognostics Testbed, Harley-Davidson Motor Company, 2006 and 2007.

- Designed a Watchdog Agent® prognostics platform to automatically convert sensory data into health information and predict machine degradation as well as the remaining machine life.

Project 2: Chiller System Predictive Maintenance, Hong Kong International Airport, May 2007.

- The design and implementation of the Watchdog Agent® prognostics platform deployed an effective predictive maintenance system approach for the chiller system.

Project 3: Smart Machine Predictive Maintenance Testbed, UC, September 2005 – 2006.

- The design and development of a Watchdog Agent® prognostics platform was applied to track the health condition of the automatic tool changer before and after the company ship the machine tool to their customers.

Skills: Matlab, Visual C++, Web programming, database

Previous Background:

M.S., Mechanical Science & Engineering, June 2004, Huazhong University of Science and Technology (HUST), Wuhan, China
  Major: Mechanical & Electronic Engineering (Mechatronics Engineering)

B.S., Mechanical Science & Engineering, July 2001, HUST, Wuhan, China
 Major: Mechanical Manufacture and Automation
  Minor: Computer Science

Publications:

1. Liao, L., H. Wang, and J. Lee, Bearing Health Assessment and Fault Diagnosis using the Methods of Self-organizing Map, in Proceeding of the 61st Machinery Failure Prevention Technology, 2007.
2. Liao, L., Huang, B., Lee, J., Logistic Regression-based Machine Health Assessment Method on Application of Smart Machine Tool, in Proceeding of International Conference on Smart Machining Systems, 2007.
3. Liao, L., Lee, J., A Reconfigurable Embedded Prognostics Platform for Machinery Performance Management, sent to the 62nd Machinery Failure Prevention Technology, 2008.

IMS Researcher Profile

Institution: UC
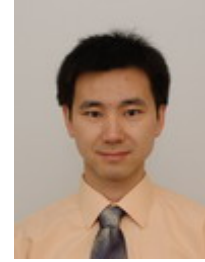
Name:	**Tianyi Wang**
Contact Info:	wangti@email.uc.edu, 513-556-3412
Expertise:	condition monitoring, health prognostics
Current Research Activities:	Multiple-regime prognosis
Dissertation/Thesis Topics:	Multiple-regime prognosis
Project 1:	Machine tool health monitoring at Caterpillar

- Data-driven machining job identification
- Spindle bearing health monitoring
- Tool wear assessment

Project 2: Bridge health assessment and prognosis

- Change detection using vibration data generated by FEA simulation
- Impact condition clustering and identification for multiple-regime bridge health prognosis

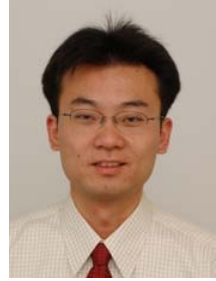|	
Skills:	Matlab, C/C++, LabView
Previous Background:	M.S. in Mechatronics, University of Siegen, Germany, 2005
	B.E. in Mechanical Engineering, Tsinghua University, China, 2002

Publications:

T. Wang, J. Lee, "The operating regime approach for precision health prognosis", accepted for publication in the 62th meeting of the Society of Machinery Failure and Prevention Technology, May 5-8, 2008

IMS Researcher Profile

Institution: UC

Name:	Lei Yang
Contact Info:	yangl6@email.uc.edu
	513-556-3412
Expertise:	Prognostic modeling
Current Research Activities:	Semi-supervised learning, model selection
Dissertation/Thesis Topics:	Prognostic algorithm benchmarking and optimization
Project 1:	Fault prediction and diagnosis in semiconductor manufacturing

- Analyze equipment failure mode
- Benchmark different algorithms for fault detection and prediction
- Define application procedure for semiconductor tools

Project 2:	Technology development for hose monitoring

- Define project roadmap, and testing plan
- Build test-bed, Install sensor, conduct testing and evaluate results
- Correlate signal feature with failure modes

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Skills:	Matlab, LabVIEW
	Hyper-mesh, Nastran
Previous Background:	Student

Publications:

Yang, L. and Lee, J. A Toolbox Approach For Prognostic Development and Deployment – Part I Watchdog Agent® and Tool Selection, Proceedings of 52nd Machine Failure Prevention Technique (MFPT) meeting, Virginia Beach, VA, May 7th – 9th, 2008.

Yang, L. and Lee, J. A Toolbox Approach For Prognostic Development and Deployment – Part II Case Studies, Proceedings of 52nd Machine Failure Prevention Technique (MFPT) meeting, Virginia Beach, VA, May 7th – 9th, 2008.

IMS Researcher Profile

Institution: UC
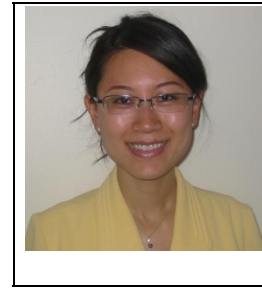
Name: Xiangdong Zhu

Contact Info: (513) 460-2825 zhuxo@email.uc.edu

Expertise: Noise and Vibration, Signal processing

Current Research Activities: Not specified

Dissertation/Thesis Topics: Development and Applications of Analytic Wavelet Transform Technique with Special Attention to Noise Risk Assessment of Impulsive Noises

Project 1: Parker Smart Hose

- Literature review and patent survey on hose degradation prediction
- Project leader

Project 2: Microsoft Healthvault

- Coordinate with AbuAli on drafting proposal

Skills: MATLAB, Visual Basic, Microsoft Access, LABVIEW, Mathematica.

Previous Background:

- BS: North China Electric Power University, 2001

- MS in ME: University of Cincinnati, 2004

    - Thesis title "*Wavelet-based Signal Analysis for Occupational Health Research*"

- Ph.D. in ME, University of Cincinnati, May 2008

    - Dissertation title "*Development and Applications of Analytic Wavelet Transform Technique with Special Attention to Noise Risk Assessment of Impulsive Noises* "

Publications:

- Zhu, X. and Kim, J. (2006), "Application of Analytic Wavelet Transform to Analysis of Highly Impulsive Noises," Journal of Sound and Vibration 294, 841-855.
- Zhu, X., Kim, J., Bhattacharaya, A. and Bornschein, R. (2007), "Study of the Effect of Early Lead Exposure on Postural Balance by advanced signal processing methods", Int. J. Biomedical Engineering and Technology, Vol. 1, No. 1, pp. 86-100