



## Hung-An Kao (Ann Kao)

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- EDUCATION**
- Ph.D.** • Mechanical Engineering 2012 - Now  
University of Cincinnati, Cincinnati, OH, USA  
Research Area: Prognostics and Health Management (PHM)
- M.S.** • Computer Science and Information Engineering 2006 - 2008  
National Taiwan University, Taipei, Taiwan  
Research direction: Information Retrieval and Natural Language Processing
- B.S.** • Information and Computer Education 2002 - 2006  
National Taiwan Normal University, Taipei, Taiwan  
Senior Design Project: Performance Evaluation of TCP Congestion Control
- WORK EXPERIENCE**
- Graduate Researcher** • Center for IMS, Cincinnati, OH 2012 – Now  
Provided research & development, technical training & leadership in:
- > Prognostics of Sensory Systems with Self-aware Intelligence
    - Investigate suitable sensing applications and targeted failure modes for BIST (Built-in Self-Test) circuits based sensor health assessment technology
    - Design suitable BIST testing pattern to obtain critical parameters for prognostic calculation
    - Explore data-driven techniques for sensor signature analysis, health assessment and prognostics
    - Evaluate developed system in real applications in terms of algorithm computation complexity and accuracy, circuit stability and data reliability
  - > Gearbox Prognostics & Health Management using Vibration Signals
    - Co-develop an automatic data quality check algorithm for vibration signals since the dataset is often too large to check manually
    - Utilize Fourier transform, wavelet transform and Cepstrum methods to extract features from the given data set
    - Utilize different machine learning methods to assess the health condition and diagnose the faults of different gearbox systems
  - > Band Sawing Machine Prognostics & Health Management Service Platform
    - Design a PHM service platform for band sawing machine through several



interviews with machine end users

- Investigate suitable sensors for band sawing machine condition based monitoring, including vibration, acoustic, flow rate, pressure, etc.
- Implement blade health assessment, risk analysis and RUL prediction based on the analysis of signals from PLC controller and add-on sensors

> Dynamic Feature Extraction for Machine Health Monitoring Applications

- Conduct expertise interviewing and literature survey for developing a knowledge base for critical machine components, their failure modes, and related data resources/features based on quality function deployment (QFD)
- Design a Bayesian probability based decision tree learning method for prioritizing features for machine health diagnosis
- Evaluate on real data set and show that the proposed strategy can optimize the computational time by about 1.46 seconds (85.9%) in common DAQ process and about 0.78 seconds (45.9%) once faults have been detected

> Intelligent Maintenance System Design for Water Pump Stations

- Use existing Scada data to perform a system wide and component wide analysis to monitor and assess the performance of station and/or its components
- Investigate different failure modes and root causes for centrifugal pump systems
- Review and organize the state-of-the-art prognostic works in order to improve current reliability centered maintenance strategy

**Industry Partners:** Tekniker, OMRON, TechSolve, COSEN, III, Woodward, GCWW

**Teaching Assistant** • University of Cincinnati, OH 2014 – Now  
Taught E-Manufacturing course and managed group projects

**Project Manager** • Institute for Information Industry, Taiwan 2008 – Unleave

> Networked intelligent machinery monitoring agent with capabilities for machinery prognostics and cloud-based service applications

> Developed a project with TechSolve (Cincinnati, OH) and the NSF IMS Center to design a pilot instrumentation system using ServBox system for Smart Machine Health Monitoring (Demonstrated in WCEAM exhibition in Oct. 2011)

> Service Design for Manufacturing Industries, capable of Service Experience Engineering Methodology (S.E.E.) and Dominant Innovation

**Lecturer** • Training Institute, National Taiwan University, Taiwan 2002 – 2006

Courses: Data Structure, C/C++ programming, web application and database programming



**SKILLS** Signal Processing, Machine Learning, Data Mining, Project Management  
Data Acquisition System, Sensor and Instrumentation  
MATLAB, LabVIEW, C++/C, Java, PHP

**SELECTED PUBLICATIONS**

Lee, J., Holgado, M., **Kao, H.A.**, Macchi, M. (2014, August). New Thinking Paradigm for Maintenance Innovation Design. In the 19th World Congress of the International Federation of Automatic Control, Cape Town, South Africa.

**Kao, H. A.**, Jin C., Liu, Z. C., Yang S. H., Shi, Z. (2014, May). Dynamic Condition based Feature Extraction Strategy for Machine Health Monitoring Applications. In Machinery Failure Prevention Technology (MFPT) 2014, Virginia Beach, USA.

Lee, J., Lapira, E., Bagheri, B., & **Kao, H. A.** (2013). Recent advances and trends in predictive manufacturing systems in big data environment. *Manufacturing Letters*, 1(1), 38-41.

**Kao, H. A.**, Yang, R., Yen, C. T., Hung, Y. S., & Lai, C. W. (2013, May). Manufacturing Servitization Progress Identification and Evaluation for Capability and Maturity. *FRAMEWORKS AND ANALYSIS*, 29, In Spring Servitization Conference 2013, Birmingham, UK.

**Kao, H. A.**, Lee, J., Lapira, E. R., Yang, S., Huang, Y., & Yen, N. (2011, October). iFactory cloud service platform based on IMS tools and servo-lution. In *Engineering Asset Management 2011* (pp. 699-709). Springer London.

**Kao, H. A.**, & Chen, H. H. (2010, May). Comment Extraction from Blog Posts and Its Applications to Opinion Mining. In the seventh international conference on Language Resources and Evaluation (LREC), Valletta, Malta.

**AWARDS**

First Prize in Best New Employee Awards • Institute for Information Industry (2011)  
One employee selected out of all new employees within three years (about six hundreds) to receive this award.

Outstanding S.E.E. Lecturer Awards • Innovation DigiTech-Enabled Applications & Service Institute, Institute for Information Industry (2009)  
One lecturer selected out of all lecturers (about thirty) to receive this award.