

## Curriculum Vitae

### Dr. Kaibo Liu

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### **Education**

- Ph.D.** 2013, Industrial Engineering (Minor: Machine Learning), Georgia Institute of Technology
- M.S.** 2011, Statistics, Georgia Institute of Technology
- B.S.** 2009, Industrial Engineering and Engineering Management, Hong Kong University of Science and Technology, Hong Kong

### **Employment**

- Associate Professor**, Industrial and Systems Engineering, University of Wisconsin-Madison, May 2019~present
- Associate Director**, UW-Madison IoT Systems Research Center, April 2019~present
- Assistant Professor**, Industrial and Systems Engineering, University of Wisconsin-Madison, November 2013~May 2019

### **Research Interest**

System Informatics and Big Data Analytics; Data Fusion for Process Modeling, Monitoring, Diagnosis, Prognostics, and Decision Making; Statistical Learning, Machine Learning, and Data Mining; Statistical Process Control

### **Publications** (Students advised by me are underlined)

#### **Refereed Journals and Transactions**

1. **Liu, K.** and Shi, J. (2013), “Objective-Oriented Optimal Sensor Allocation Strategy for Process Monitoring and Diagnosis by Multivariate Analysis in a Bayesian Network”, *IISE Transactions*, 45, 630-643.
2. Jin, R. and **Liu, K.** (2013), “Multistage Multimode Process Monitoring Based on a Piecewise Linear Regression Tree Considering Modeling Uncertainty”, *IISE Transactions*, 45, 617-629.
3. **Liu, K.**, Gebraeel, N., and Shi, J. (2013), “A Data-Level Fusion Model for Developing Composite Health Indices for Degradation Modeling and Prognostic Analysis”, *IEEE*

- Transactions on Automation Science and Engineering*, 10, 652-664. (This paper received Best Student Paper Award in Data Mining Section of INFORMS, 2012)
4. **Liu, K.**, Jain, S., and Shi, J. (2013), “Physician Performance Assessment Using a Composite Quality Index”, *Statistics in Medicine*, 32, 15, 2661-2680. (This paper received Best Student Paper Award Finalist in Quality, Statistics, and Reliability Section of INFORMS, 2012)
  5. **Liu, K.**, Zhang, X., and Shi, J. (2014), “Adaptive Sensor Allocation Strategy for Process Monitoring and Diagnosis in a Bayesian Network”, *IEEE Transactions on Automation Science and Engineering*, 11, 2, 452-462. (This paper received Best Student Paper Award in the Industrial and Systems Engineering Research Conference (ISERC), 2013; This paper is selected for presentation in the T-ASE invited session in the 2015 INFORMS conference)
  6. **Liu, K.**, Mei, Y., and Shi, J. (2015), “An adaptive sampling strategy for online high-dimensional process monitoring”, *Technometrics*, 57, 3, 305-319. (This paper is selected for presentation in the Technometrics-sponsored session in the 2015 JSM conference.)
  7. **Liu, K.** and Shi, J. (2015), “A Systematic Approach for Business Data Analytics with a Real Case Study”, *International Journal of Business Analytics (IJBAN)*, 2, 4, 23-44.
  8. **Liu, K.** and Shi, J. (2015), “Internet of Things (IoT)-enabled System Informatics for Service Decision Making: Achievements, Trends, Challenges, and Opportunities”, *IEEE Intelligent Systems*, 30, 6, 18-21.
  9. Zhou, C., **Liu, K.**, Zhang, X., Zhang, W., and Shi, J. (2016), “An automatic process monitoring method using recurrence plot in progressive stamping processes”, *IEEE Transactions on Automation Science and Engineering*, 13, 2, 1102-1111.
  10. Song, C., **Liu, K.**, Zhang, X., Chen, L., and Xian, X. (2016), “An Obstructive Sleep Apnea Detection Approach Using a Discriminative Hidden Markov Model from ECG Signals”, *IEEE Transactions on Biomedical Engineering*, 63, 7, 1532-1542 (This paper was selected as the Best Student Paper Finalist in the Industrial and Systems Engineering Research Conference (ISERC), 2015).
  11. **Liu, K.** and Huang, S. (2016), “Integration of Data Fusion Methodology and Degradation Modeling Process to Improve Prognostics”, *IEEE Transactions on Automation Science and Engineering*, 13, 1, 344-354. (This paper is selected for presentation in the T-ASE invited session in the 2016 INFORMS conference)
  12. Yan, H., **Liu, K.**, Zhang, X., and Shi, J. (2016), “Multiple Sensor Data Fusion for Degradation Modeling and Prognostics under Multiple Operational Conditions”, *IEEE Transactions on Reliability*, 65, 3, 1416-1426.
  13. Hao, L., **Liu, K.**, Gebrael, N., and Shi, J. (2017), “Controlling the Residual Life Distribution of Parallel Multi-component Systems Through Workload Adjustment”, *IEEE Transactions on Automation Science and Engineering*, 14, 2, 1042-1052.

14. **Liu, K., Chehade, A., and Song, C.** (2017), “Optimize the Signal Quality of the Composite Health Index via Data Fusion for Degradation Modeling and Prognostic Analysis”, *IEEE Transactions on Automation Science and Engineering*, 14, 3, 1504-1514. (This paper received the Best Student Poster award in Quality, Statistics, and Reliability Section of INFORMS, 2015; This paper is selected for presentation in the T-ASE invited session in the 2018 INFORMS conference)
15. Li, J., **Liu, K.**, and **Xian, X.** (2017), “Causation-based Process Monitoring and Diagnosis for Multivariate Categorical Processes”, *IISE Transactions*, 49, 3, 332-343. (Feature article in ISE Magazine; This paper is selected for presentation in the IISE Transactions sponsored session in the 2018 INFORMS conference).
16. **Chehade, A., Bonk, S., and Liu, K.** (2017), “Sensory-based Failure Threshold Estimation for Remaining Useful Life Prediction”, *IEEE Transactions on Reliability*, 66, 3, 939-949.
17. **Xian, X., Wang, A., and Liu, K.** (2018), “A Nonparametric Adaptive Sampling Strategy for Online Monitoring of Big Data Streams”, *Technometrics*, 60, 1, 14-25. (This paper received the Best Student Poster award in Quality, Statistics, and Reliability Section of INFORMS, 2016; This paper is selected for presentation in the Technometrics invited session in the 2018 INFORMS conference)
18. **Song, C., Liu, K.,** Zhang, X. (2018), “Integration of Data-level Fusion Model and Kernel Methods for Degradation Modeling and Prognostic Analysis”, *IEEE Transactions on Reliability*, 67, 2, 640-650.
19. **Chehade, A., Song, C., Liu, K.,** Saxena, A., and Zhang, X. (2018), “A Data-level Fusion Approach for Degradation Modeling and Prognostic Analysis under Multiple Failure Modes”, *Journal of Quality Technology*, 50, 2, 150-165. (This paper received the Best Student Paper Finalist award (2<sup>nd</sup> place) in the QCRE Section of Industrial and Systems Engineering Research Conference (ISERC), 2016).
20. Lin, Y., **Liu, K.,** Byon, E., Qian, X., and Huang, S. (2018), “A Collaborative Learning Framework for Estimating Many Individualized Regression Models in a Heterogeneous Population”, *IEEE Transactions on Reliability*, 67, 1, 328-341.
21. **Xian, X.,** Archibald, R., Mayer, B., **Liu, K.,** and Li, J. (2019), “An Effective Online Data Monitoring and Saving Strategy for Large-Scale Climate Simulations”, *Quality Technology & Quantitative Management*, 16, 3, 330-346.
22. **Wang, A., Xian, X.,** Tsung, F., and **Liu, K.** (2018), “A Spatial Adaptive Sampling Procedure for Online Monitoring of Big Data Streams”, *Journal of Quality Technology*, 50, 4, 329-343. (This paper is selected for presentation in the JQT invited session in the 2019 INFORMS conference)
23. **Song, C.,** and **Liu, K.** (2018), “Statistical Degradation Modeling and Prognostics of Multiple Sensor Signals via Data Fusion: A Composite Health Index Approach”, *IISE*

- Transactions*, 50, 10, 853-867. (This paper received the Best Paper Finalist award (theoretical track) in the Data Mining Section of INFORMS, 2017).
24. Chehade, A., and **Liu, K.** (2019), “Structural Degradation Modeling Framework for Sparse Datasets with an application on Alzheimer’s Disease”, *IEEE Transactions on Automation Science and Engineering*, 16, 1, 192-205.
  25. Wang, D., **Liu, K.**, and Zhang, X. (2019), “Modeling of a three-dimensional dynamic thermal field under grid-based sensor networks in grain storage”, *IIEE Transactions*, 51, 5, 531-546. (Feature article in ISE Magazine)
  26. Xian, X., Li, J., and **Liu, K.** (2019), “Causation-based Monitoring and Diagnosis for Multivariate Categorical Processes with Ordinal Information”, *IEEE Transactions on Automation Science and Engineering*, 16, 2, 886-897.
  27. Song, C., **Liu, K.**, and Zhang, X. (2019), “A Generic Framework for Multisensor Degradation Modeling based on Supervised Classification and Failure Surface”, *IIEE Transactions*, 51, 11, 1288-1302. (Feature article in ISE Magazine).
  28. Feng, T., Qian, X., **Liu, K.**, and Huang, S. (2019), “Dynamic Inspection of Latent Variables in State-Space Systems”, *IEEE Transactions on Automation Science and Engineering*, 16, 3, 1232-1243.
  29. Kim, M., Song, C., and **Liu, K.** (2019), “A Generic Health Index Approach for Multisensor Degradation Modeling and Sensor Selection”, *IEEE Transactions on Automation Science and Engineering*, 16, 3, 1426-1437. (This paper is selected for presentation in the T-ASE invited session in the 2019 INFORMS conference).
  30. Wang, D., **Liu, K.**, and Zhang, X. (2019), “Spatiotemporal Thermal Field Modeling Using Partial Differential Equations with Time-Varying Parameters”, *IEEE Transactions on Automation Science and Engineering*, in press.
  31. Xian, X., Zhang, C., Bonk, S., and **Liu, K.** (2019), “Online Monitoring of Big Data Streams: A Rank-based Sampling Algorithm by Data Augmentation”, *Journal of Quality Technology*, accepted.
  32. Wang, D., **Liu, K.**, Zhang, X. and Wang, H. (2019), “Spatiotemporal Multitask Learning for 3D Dynamic Field Modeling”, *IEEE Transactions on Automation Science and Engineering*, in press. (This paper received the Best Student Paper Finalist award in the DAIS Section of Industrial and Systems Engineering Research Conference (ISERC), 2019).

### **Submitted Papers**

33. Xian, X., Ye, H., Wang, X., and **Liu, K.**, “Spatiotemporal modeling and real-time prediction of origin-destination traffic demand”, submitted to *Technometrics*, tentatively accepted.
34. Ye, H., Wang, X., and **Liu, K.**, “Adaptive Preventive Maintenance for Flow Shop

Scheduling with Resumable Processing”, submitted to *IEEE Transactions on Automation Science and Engineering*, under revision.

35. Wang, D., Liu, K., and Zhang, X., “A Spatiotemporal Prediction Approach for A 3D Thermal Field with Sparse Data”, submitted to *Journal of Quality Technology*, under revision (This paper received Best Student Paper Award in Data Mining Section of INFORMS, 2019).
36. Kim, M., Song, C., and Liu, K., “Individualized Degradation Modeling and Prognostics in a Heterogeneous Group via Modeling Covariate Interrelations among Units”, submitted to *IISE Transactions*, under review.
37. Song, C., Liu, K., and Zhang, X., “Collusion Detection and Ground Truth Inference in Crowdsourcing for Labeling Tasks”, submitted to *Journal of Machine Learning Research*, under revision. (This paper received the Best Paper award in the Quality, Statistics, and Reliability Section of INFORMS, 2019).
38. Wang, D., Li, F., Song, W., Liu, K., and Zhang, X., “Real-time Attack Detection and Identification for Information Security in Internet of Things”, *submitted to IEEE Internet of Things Journal*, under review.
39. Kim, M., and Liu, K., “A Bayesian Deep Learning Framework for Interval Estimation of Remaining Useful Life in Complex Systems by Incorporating General Degradation Characteristics”, submitted to *IISE Transactions*, under review.

#### **Peer-reviewed Conference Proceedings**

1. Lin, Y., Liu, K., Byon, E., Qian, X., and Huang, S. (2015), “Domain-Knowledge Driven Cognitive Degradation Modeling of Alzheimer’s Disease”, *The SIAM International Conference on Data Mining*, 721-729.

#### **Other publications**

2. Liu, K. (2016), “Industrial data analytics courses: need, content and expectations – insights from 2015 ISERC panel discussion”, *Industrial Engineer*, 48, 4, 43-46. (Feature article in ISE Magazine).
3. Liu, K., Klabjan, D., Shmoys, D., and Sokol, J. (2016), “Present and future of analytics education”, *ORMS Today*, 43, 5, 32-35. (Feature article in INFORMS Magazine).

#### **Honors and Awards**

1. Best Paper Award in Quality, Statistics, and Reliability Section of INFORMS, for the paper “Collusion Detection and Ground Truth Inference in Crowdsourcing for Labeling Tasks,” 2019
2. Dr. Hamed K. Eldin Outstanding Early Career IE in Academia Award, Institute of Industrial and Systems Engineers (IISE), 2019

3. Outstanding Young Manufacturing Engineer Award, Society of Manufacturing Engineers (SME), 2019
4. Feigenbaum Medal Award, American Society for Quality (ASQ), 2019
5. Feature Article “A Generic Framework for Multisensor Degradation Modeling based on Supervised Classification and Failure Surface” in ISE Magazine, 2019
6. Feature Article “Modeling of a three-dimensional dynamic thermal field under grid-based sensor networks in grain storage” in ISE Magazine, 2019
7. Feature Article “Causation-based Process Monitoring and Diagnosis for Multivariate Categorical Processes” in ISE Magazine, 2017
8. Feature Article “Present and future of analytics education” in INFORMS Magazine, 2016
9. Feature Article “Industrial data analytics courses: need, content and expectations – insights from 2015 ISERC panel discussion” in ISE Magazine, 2016
10. Early Career Scholarship, Spring Research Conference, 2015
11. Pritsker Doctoral Dissertation Award (2<sup>nd</sup> place), Institute of Industrial and Systems Engineers (IISE), 2014
12. Richard A. Freund International Scholarship, American Society for Quality (ASQ), 2013
13. Best Student Paper Award in the Industrial and Systems Engineering Research Conference (ISERC), for the paper “Adaptive Sensor Allocation Strategy for Process Monitoring and Diagnosis in a Bayesian Network,” 2013
14. Best Student Paper Award in Data Mining Section of INFORMS, for the paper “Health Index Development Based on Sensory Data Fusion for Degradation Modeling and Prognostic Analysis,” 2012
15. Best Student Paper Award Finalist in Quality, Statistics, and Reliability Section of INFORMS, for the paper “Physician Performance Assessment Using a Composite Quality Index,” 2012
16. Gilbreth Memorial Fellowship, Institute of Industrial and Systems Engineers (IISE), 2012
17. CELT/BP Outstanding Teaching Assistant Award Finalist, Georgia Institute of Technology, 2011 (one nominee for each School at GT)
18. Outstanding Research Poster Presentation Award, Georgia Tech Research and Innovation Conference, 2011
19. Wall George Stipend Fellowship, Department of Industrial and System Engineering, Georgia Institute of Technology, 2009 – 2010

20. *Champion*, Hong Kong Society for Quality Student Project Competition, 2009
21. *Institute of Industrial Engineers (Hong Kong) Scholarship Award*, in recognition of outstanding scholastic ability and potential to serve the industrial engineering profession, 2009
22. *Padma and Hari Harilela Scholarship*, Department of Industrial Engineering and Engineering Management, Hong Kong University of Science and Technology, 2005

### **Research Grants Funded**

Dr. Liu has been a PI or Co-PI on \$2,923,899 in total external funding. He is the principal investigator (PI) of five federal grants. For the external grants, Dr. Liu's personal share amount is \$1,608,835.

#### **External Grants**

1. 3M, "Online anomaly detection and fault localization for heterogeneous data streams", Sole PI, 11/2019-10/2020, \$135,267.
2. DOE, "Big data analytics solutions to improve nuclear power plant efficiency: Online monitoring, visualization, prognosis, and maintenance decision making", PI (with Po-Ling Loh (Co-PI), Todd Allen (Co-PI) and Chris Comfort (Co-PI)), 10/01/2018 - 09/30/2021, \$797,820. (Dr. Liu receives amount: \$433,942)
3. AFOSR, "Dynamic Data-Driven Modeling, Sampling and Monitoring of Big Spatial-Temporal Data Streams for Real-Time Solar Flare Detection", PI (with Shuai Huang (sub-awardee)), 02/2018 – 02/2019, \$120,001. (Dr. Liu receives amount: \$67,001)
4. ONR, "Internet of Things-enabled Condition-based Monitoring, Diagnosis, and Prognostics for Navy Equipment", Sole PI, 04/2017 – 03/2021, \$274,551.
5. NSF-CNS, "CRISP Type 2/Collaborative Research: Harnessing Interdependency for Resilience: Creating an "Energy Sponge" with Cloud Electric Vehicle Sharing," Co-PI (with Xin Wang (PI) and Emilia Tjernstroem (Co-PI)), 09/2016 – 08/2020, \$874,801 (Dr. Liu receives amount: \$273,526).
6. NSF-CMMI with a REU supplement, "Collaborative Research: Data-Driven Smart Monitoring of Alzheimer's Disease via Data Fusion, Personalized Prognostics, and Selective Sensing," PI, 09/2014 – 08/2017, \$155,729.
7. NSF-CMMI with a REU supplement, "Collaborative Research: Online Monitoring of High-Dimensional Streaming Data Using Adaptive Order Shrinkage," PI, 08/2014 – 07/2018, \$155,729.
8. Toyota Material Handling North America University Research Program, "Data-Driven Failure Predictive Analytics for Internet of Things (IoT) enabled Service Systems", Co-PI (with Raj Veeramani (PI) and Shiyu Zhou (Co-PI)), 11/2016-10/2017, \$410,001 (Dr. Liu receives amount: \$113,090).

## **Intramural Grants**

1. UW-Madison Campus Fall Competition, “Internet of Things (IoT)-enabled data analytics for service decision making”, PI, 07/2016-06/2017, \$38,823.

## **Teaching Experience**

**Instructor**, Undergraduate course, “Methods of Quality Improvement,” ISYE 3039, GT, Summer 2012.

**Instructor**, Graduate course (*newly developed*), “Data Mining and Analytics,” ISyE 691, UW-Madison, Spring 2014.

This newly developed graduate-level course will help students understand the advanced data mining and analytics tools, such as Ordinary/Penalized Linear Regression, dimension reduction, model assessment and selection, clustering, classification, ensemble methods, and undirected/directed graphical models. Also, it teaches several popular data analytics software, like R, MATLAB, and Tableau for better visualization of the data structures and decision making. After taking this course, students are expected to establish a strong foundation for both applying data mining techniques to complex real-world problems and for addressing core research topics in data mining and analytics through developing a real data analytics project.

**Instructor**, Undergraduate/Graduate course, “Inspection, Quality Control and Reliability,” ISyE 512, UW-Madison, Fall 2014, Fall 2015, Fall 2016.

**Instructor**, Undergraduate course (*newly developed*), “Fundamentals of industrial data analytics,” ISyE 691, UW-Madison, Spring 2015; ISyE 601, UW-Madison, Spring 2016; ISyE 412, UW-Madison, Spring 2017, Spring 2018.

This newly developed undergraduate-level course will provide students with understanding of the fundamentals of using data mining and analytics techniques to transform from data-rich into decision-smart. It focuses on training students with the ability to formulate and solve real-world industrial problems with appropriate modeling strategies and scientific principles. This course includes three components: (1) learning fundamental industrial data mining and analytics theory; (2) implementation of industrial data analytics techniques with lab demonstration; and (3) project experience for solving a real-life industrial data analytics problem.

**Instructor**, Online industry course (*newly developed*), “Fundamentals of industrial data analytics,” ISyE 412, UW-Madison, Spring 2018, Spring 2019.

I have also developed a new online industry class based on the course materials of ISyE 412 through collaboration with the department of Engineering Development Program at UW-Madison. The course was first offered in Spring 2018, and attracted in total 31 students, ranging in age from the late 20s to the mid-50s and living in 16



different states and three other countries (Canada, Nigeria and United Arab Emirates). All students of this course are working engineers, such as from 3M, Harley-Davidson, Intel, Siemens, Boeing and John Deere, just name a few. Through this class, those working engineers can now catch up on important data analytics skills, which may not have been offered as part of their original training.

**Instructor**, Undergraduate course/Graduate course, “Information Sensing and Analysis for Manufacturing Processes,” ISyE 612, UW-Madison, Spring 2016, Spring 2018.

**Guest Lecturer**, Ph.D. course, “Informatics in Production and Service System,” ISYE 7204, GT.

<i>Sem. and Year</i>	<i>Course No.</i>	<i>No. Enrolled</i>	<i>Instructor Evaluation</i>	<i>Instructor Rating “This instructor compared to all instructors you have had is Top 20%”</i>	<i>Course Evaluation</i>
Spr. 2014	ISyE 691	19	3.48 / 4	4.22 / 5	3.31 / 4
Fall 2014	ISyE 512	49	3.29 / 4	3.68 / 5	3.15 / 4
Spr. 2015	ISyE 691*	36	3.62 / 4	4.34 / 5	3.39 / 4
Fall 2015	ISyE 512	49	3.60 / 4	3.96 / 5	3.42 / 4
Spr. 2016	ISyE 601*	14	3.77 / 4	4.88 / 5	3.43 / 4
Spr. 2016	ISyE 612	10	3.73 / 4	4.57 / 5	3.47 / 4
Fall 2016	ISyE 512	51	3.63 / 4	4.12 / 5	3.46 / 4
Spr. 2017	ISyE 412	28	3.70 / 4	4.35 / 5	3.51 / 4
Spr. 2018	ISyE 612	21	3.63 / 4	3.85 / 5	3.25 / 4
Spr. 2018	ISyE 412	55	3.54 / 4	3.79 / 5	3.37 / 4
Spr. 2019	ISyE 412	57	3.56 / 4	3.78 / 5	3.43 / 4

\*ISyE 412 was formerly listed as ISyE 691 and ISyE 601 in spring 2015 and spring 2016 before it becomes a new course.

### **Technical Presentations**

1. IEEE International Conference on Automation Science and Engineering, “Data Science for Degradation Systems”, Aug. 2019, Vancouver, BC, Canada.
2. IEEE International Conference on Automation Science and Engineering, “Spatiotemporal modeling and real-time prediction of origin-destination traffic demand”, Aug. 2019, Vancouver, BC, Canada.

3. "Industrial Big Data Analytics for Quality Improvement in Complex Systems", 3M company, August 2019, USA.
4. "Big Data Analytics for Real-time Complex System Monitoring and Prognostics", Shanghai Jiaotong University, July 2019, China.
5. "Multisensor Degradation Modeling and Prognostics", the 9th International Symposium on Quality Science and Reliability Technology, July 2019, China.
6. "Big Data Analytics for Real-time Complex System Monitoring and Prognostics", University of Southern California, Mar. 2019, USA.
7. "Industrial Big Data Analytics for Quality Improvement in Complex Systems", Machine-ground interaction consortium (MAGIC), Dec. 2018, USA.
8. "Data Science to Large Data Sets of Multivariable Data --- Help Identify the Key Variables", Johnson Controls International (JCI) Campus Visit, Nov. 2018, USA.
9. "Big Data Analytics for Real-time Complex System Monitoring and Prognostics", University of Iowa, Oct. 2018, USA.
10. "Big Data Analytics for Real-time Complex System Monitoring", IoT center industry event, Oct. 2018, USA.
11. "Dynamic Data-Driven Adaptive Sampling and Monitoring of Big Spatial-Temporal Data Streams", AFOSR PI Meeting, Sep. 2018, USA.
12. "Big Data Analytics for Real-time Complex System Monitoring and Prognostics", Wisconsin Institute for Discovery, Sep. 2018, USA.
13. "Industrial Analytics Research at UW-Madison IoT Systems Research Center", Kohler Company, Sep. 2018, USA.
14. "Big data for prognostics", Chinese academy of science, July 2018, China.
15. "Data-level fusion for multisensor degradation modeling and prognostics", Peking University, June 2018, China.
16. "Big Data Analytics for Real-time Complex System Monitoring and Prognostics", Argonne National Laboratory, June 2018, USA.
17. "Big Data Analytics for Real-time Complex System Monitoring and Prognostics", Virginia Tech, April. 2018, USA.
18. "Tutorial for Industrial Data Analytics Using R", IoT System Research Center, UW-Madison, Dec. 2017, USA.
19. "Big Data Analytics for Real-time Complex System Monitoring and Prognostics", Purdue University, Oct. 2017, USA.

20. "Data fusion for degradation modeling and prognostics", Chinese Academy of Science, Aug. 2017, China.
21. IEEE International Conference on Automation Science and Engineering, "A Nonparametric Adaptive Sampling Strategy for On-line Monitoring of Big Data Streams", Aug. 2017, Xi'an, China.
22. InfoSymbiotics/DDDAS Conference, "Dynamic Data-Driven Adaptive Sampling and Monitoring of Big Spatial-Temporal Data Streams for Real-Time Solar Flare Detection", Aug. 2017, Cambridge, Massachusetts.
23. "Big Data Analytics for Real-time Complex System Monitoring and Prognostics", Idaho National Lab, Jul. 2017, USA.
24. "Industrial Analytics Revolution-From Data to Action", Kohler Company, Jul. 2017, USA.
25. "Big Data Analytics for Real-time Complex System Monitoring and Prognostics", Beijing Jiaotong University, Jun. 2017, USA.
26. "Data Fusion for Degradation Modeling and Prognostics", Peking university, Jun. 2017, China.
27. "Big Data Analytics for Real-time Complex System Monitoring and Prognostics", Rutgers university, Jan. 2017, USA.
28. "Big Data Analytics for Real-time Complex System Monitoring and Prognostics", University of Washington, Dec. 2016, USA.
29. INFORMS Conference, "Integration of Data Fusion Methodology and Degradation Modeling Process to Improve Prognostics", Nov. 2016, Nashville, TN. (This talk was presented at the T-ASE invited session).
30. "Big Data Analytics for Real-time Complex System Monitoring and Prognostics", Arizona State University, Oct. 2016, USA.
31. IEEE International Conference on Automation Science and Engineering, "Integration of Data Fusion Methodology and Degradation Modeling Process to Improve Prognostics", Aug. 2016, Fort Worth, TX.
32. InfoSymbiotics/DDDAS Conference, "Dynamic Data-Driven Adaptive Sampling and Monitoring of Big Spatial-Temporal Data Streams for Real-Time Solar Flare Detection", Aug. 2016, Hartford, Connecticut.
33. "Data Analytics for Service Decision Making", Peking University, Dec. 2015, China.
34. "Big Data Analytics for System Monitoring and Prognostics", Xi'an Jiaotong University, Dec. 2015, China.

35. “Data Analytics for Service Decision Making”, Tsinghua University, Dec. 2015, China.
36. “Data Analytics for Service Decision Making”, Chinese Academy of Science, Jan. 2016, China.
37. INFORMS Conference, “Adaptive Sensor Allocation Strategy for Process Monitoring and Diagnosis in a Bayesian Network”, Nov. 2015, Philadelphia, PA. (This talk was presented at the T-ASE invited session).
38. INFORMS Conference, Invited panelist for “Panel Discussion on Big Data Science”, Nov. 2015, Philadelphia, PA.
39. Joint Statistical Meeting, “An adaptive sampling strategy for online high-dimensional process monitoring”, August 2015, Seattle, WA. (This talk was presented at the *Technometrics* invited session).
40. Spring Research Conference, “Recent advances in sensor system design and measurement strategy”, May 2015, Cincinnati, OH.
41. “System informatics and data analytics enabled by IoT”, Hitachi Big Data Lab, Hitachi Data Systems Corporation, April 2015, San Jose, CA.
42. “Data fusion for process monitoring, prognostics and management”, Prognostics Center of Excellence (PCoE), Ames Research Center, NASA, April 2015, San Jose, CA.
43. INFORMS Conference, “A Systematic Approach for Business Data Analytics with a Real Case Study”, Nov. 2014, San Francisco.
44. INFORMS Conference, “Integration of Data Fusion Methodology and Degradation Modeling Process to Improve Prognostics”, Nov. 2014, San Francisco.
45. “System informatics and data analytics”, Peking University, May 2014, China.
46. “Quality improvement via system informatics and data analytics”, Chinese Academy of Science, May 2014, China.
47. “System informatics and data analytics”, Tsinghua University, May 2014, China.
48. INFORMS Conference, “Adaptive sampling strategy for online high-dimensional process monitoring with swarming intelligence”, Oct. 2013, Minneapolis.
49. INFORMS Conference, “Dynamic Control of Residual Life Distribution through Production Rate Adjustment in Serial-Parallel Multistage Manufacturing Processes”, Oct. 2013, Minneapolis.
50. IEEE International Conference on Automation Science and Engineering, Workshop of System Informatics and Analytics, “An adaptive sampling strategy for online high-dimensional process monitoring”, Aug. 2013, Madison.

51. The Industrial and Systems Engineering Research Conference, “Adaptive Sensor Allocation Strategy for Process Monitoring and Diagnosis in a Bayesian Network”, May. 2013, Puerto Rico.
52. INFORMS Conference, “Health Index Development Based on Sensory Data Fusion for Degradation Modeling and Prognostic Analysis”, Oct. 2012, Phoenix.
53. INFORMS Conference, “Capability-Enhanced Adaptive Sensor Allocation Strategy for Process Monitoring and Diagnosis in a Bayesian Network”, Oct. 2012, Phoenix.
54. NSF Engineering Research and Innovation Conference, “Health index Development for Degradation Modeling and Prognostic Analysis”, Jul. 2012, Boston.
55. INFORMS Conference, “Healthcare Physician Performance Assessment and Evaluation Indices Study”, Nov. 2011, Charlotte.
56. INFORMS Conference, “Objectives-Oriented Optimal Sensor Allocation Strategy for Process Monitoring and Diagnosis by Multivariate Analysis in a Bayesian Network”, Nov. 2011, Charlotte.

## **Students Advised**

### **Graduated Ph.D. Students**

- *Abdallah Chehade* (graduated in summer 2017)
  - Thesis: “Data-Driven Approaches for Condition Monitoring and Predictive Analytics”
  - Current employment: Assistant professor, Department of Industrial and Manufacturing Systems Engineering, University of Michigan-Dearborn

### Academic achievements:

- Best Student Paper Finalist award (2<sup>nd</sup> place) in the QCRE Section of Industrial and Systems Engineering Research Conference (ISERC), 2016
- Best Student Poster award in the Quality, Statistics, and Reliability Section of INFORMS, 2015
- Winner for Student Research Grant Funds Competition, UW-Madison, 2015
- Winner for the Richard S. and Harriet K. Fein Scholarship, UW-Madison, 2016
- *Xiaochen Xian* (graduated in summer 2019)
  - Thesis: “Big Data Modeling and Monitoring in Complex Systems”
  - Current employment: Assistant professor, Department of Industrial and Systems Engineering, University of Florida

### Academic achievements:

- Best Student Poster award in the Quality, Statistics, and Reliability Section of INFORMS, 2016
- Winner for the Industrial Graduate Support Endowment Scholarship, UW-Madison, 2017

### **Current Ph.D. Students**

- *Changyue Song* (started in fall 2015)

#### Academic achievements:

- Best Student Paper Finalist in the Industrial and Systems Engineering Research Conference (ISERC), 2015
- Best Paper Finalist Award (theoretical track) in the Data Mining Section of INFORMS, 2017
- Winner for the Industrial Graduate Support Endowment Scholarship, UW-Madison, 2018
- Campus-Wide Best TA Award, 2018
- Mary G. and Joseph Natrella Scholarship by ASA, 2019
- Wisconsin Distinguished Graduate Fellowship, UW-Madison, 2019
- Best Paper award in the Quality, Statistics, and Reliability Section of INFORMS, 2019
- *Min Hee Kim* (started in fall 2017)
- *Honghan Ye* (started in spring 2018)

### **Master Students**

- Guangda Shi (2015 spring independent study)
- Qi Chen (2015 fall independent study)
- Quan Chen (2015 fall independent study)
- Swaminathan Ramesh-Sashi (2016 spring independent study)
- Sommer Ahmad (2016 spring independent study)
- Suraj Subhash Thatte (2016 summer independent study)
- Ting Lei (2016 fall independent study)
- Nam Young Kim (2017 spring independent study)
- Scott Bonk (2016-2017, research assistant): joined Belvedere Trading LLC
- Wenjun Zhu (2018 spring independent study): continued her Ph.D. study in ISyE department at UW-Madison in 2018 fall

- Congfei Zhang (2018 fall independent study): joined Kwai Inc.

### **Undergraduate Students**

- Bingjie Liu (2014 summer independent study): joined the IOE Ph.D. program at University of Michigan
- Jiamin Chen (funded by NSF REU, 2015): joined the master program in Operations Research at Columbia University
- Alyssa Krueger (funded by NSF REU, 2015)
- Claire Stamborski (funded by NSF REU, 2016)
- Scott Bonk (funded by NSF REU, 2016): continued his graduate study in ISyE department at UW-Madison in 2016-2017
- Yingxin Jia (undergraduate research assistant, 2019)

### **Visiting Scholars and Students**

- Di Wang, Peking University, 9/2018-11/2019
- Dr. Xi Zhang, Peking University, 7/2018 - 11/2018
- Dr. Xi Wang, Beijing Jiaotong University, 12/2017 - 12/2018
- Yue Liu, Zhejiang University, 9/2017-9/2018
- Andy Wang, Hong Kong University of Science and Technology, 12/2015-5/2016
- Dr. Baiyong Men, China University of Petroleum (Beijing), 12/2014 - 12/2015

## **Professional Services**

### **Service outside the University**

#### **Review Experience**

- Technometrics
- IEEE Transactions on Automation Science and Engineering
- IEEE Transactions on Reliability
- IEEE Transactions on Information Theory
- IISE Transactions
- Journal of Quality Technology
- Journal of the American Statistical Association
- International Journal for Quality in Health Care
- ASME Journal of Manufacturing Science and Engineering
- Journal of Manufacturing Systems
- IEEE Robotics and Automation Letters
- IEEE Internet of things

- Control Engineering Practice
- Quality and Reliability Engineering International
- Journal of Global Optimization
- Annals of Operation Research
- International Journal of Production Research
- Journal of Medical Systems
- Journal of Aerospace Computing, Information, and Communication;
- Robotics and Computer Integrated Manufacturing
- Journal of Mechanical Engineering Science
- Journal of Engineering Manufacture
- International Journal of Distributed Sensor Networks
- Robotics and Computer-Integrated Manufacturing
- Book Chapter, Healthcare Data Analytics (Wiley Series in Operations Research and Management Science)
- The Industrial and Systems Engineering Research Conference (ISERC)
- Best Paper Award Competition in Data Mining Section of INFORMS conference
- Best Student Paper Award Competition in Data Mining Section of INFORMS conference
- Best Student Paper Award Competition in Quality, Statistics, and Reliability Section of INFORMS conference
- Best Paper Award Competition in Quality, Statistics, and Reliability Section of INFORMS conference
- Best Student Poster Competition in Quality, Statistics, and Reliability Section of INFORMS conference
- Best Student Paper Award Competition in QCRE Section of the ISERC
- Best Paper Award Competition in QCRE Section of the ISERC
- NSF CMMI panel review (3 times)
- NSF CISE panel review (1 time)
- NSF Materials Research panel review (1 time)
- Hong Kong Research Grants Council (RGC) review (5 times)
- DOE NE review (2 time)

### **Professional Membership**

- Members of *INFORMS*, *IISE* (senior member), *ASQ*, *SME*, and *IEEE* (senior member)

### **Conference Organizing Activities**

- Organizer and Co-chair, panel discussion sessions on “Industrial Data Science,” INFORMS conference, Seattle, WA, 2019
- Organizer and Co-chair, panel discussion sessions on “Industry Job Hunting,” INFORMS conference, Seattle, WA, 2019
- Organizer and Co-chair, sessions on “Data Analytics for Engineering and Service System Improvement,” INFORMS conference, Seattle, WA, 2019
- Organizer and Co-chair, sessions on “Statistical Modeling and Inference in Smart and Connected Systems,” INFORMS conference, Seattle, WA, 2019
- Co-Chair, sessions on “Advances in Data Analytics, Modeling and Control for Intelligent



Engineering Systems,” IEEE CASE, Vancouver, BC, Canada, 2019

- Organizer and Co-Chair, workshop on “Data Science for Engineering Automation,” IEEE CASE, Vancouver, BC, Canada, 2019
- Organizer and Co-Chair, sessions on “Modeling, Monitoring, and Prediction in Complex Systems,” INFORMS Conference, Phoenix, AZ, 2018
- Organizer and Co-Chair, sessions on “Big Data Modeling and Monitoring,” INFORMS Conference, Phoenix, AZ, 2018
- Organizer and Co-Chair, sessions on “Data analytics for system improvement I,” INFORMS Conference, Houston, TX, 2017
- Organizer and Co-Chair, sessions on “Data analytics for system improvement II,” INFORMS Conference, Houston, TX, 2017
- Organizer and Co-Chair, sessions on “Data analytics for system improvement III,” INFORMS Conference, Houston, TX, 2017
- Organizer and Chair, sessions on “Data analytics for system improvement I,” INFORMS Conference, Nashville, TN, 2016
- Organizer and Co-Chair, sessions on “Data analytics for system improvement II,” INFORMS Conference, Nashville, TN, 2016
- Organizer and Co-Chair, sessions on “Data analytics for system improvement III,” INFORMS Conference, Nashville, TN, 2016
- Organizer and Chair, Panel Discussion Sessions on “IoT-enabled Data Analytics: Opportunities, Challenges and Applications,” INFORMS Conference, Nashville, TN, 2016
- Organizer and Chair, sessions on “Data Analytics for Enterprise System Improvement,” Spring Research Conference, Chicago, IL, 2016
- Organizer and Chair, Panel Discussion Sessions on “Industrial Data Analytics Education: Present and Future,” ISERC Conference, Anaheim, CA, 2016
- Organizer and Chair, Panel Discussion Sessions on “IoT-enabled data analytics: needs, opportunities and challenges,” ISERC Conference, Anaheim, CA, 2016
- Organizer and Co-Chair, sessions on “Data Analytics for Quality Control and Improvement II,” INFORMS Conference, Philadelphia, PA, 2015
- Organizer and Chair, sessions on “Data Analytics for Manufacturing and Healthcare Enterprise System,” INFORMS Conference, Philadelphia, PA, 2015
- Organizer and Chair, Panel Discussion Sessions on “IoT-enabled Data Analytics: Opportunities, Challenges and Applications,” INFORMS Conference, Philadelphia, PA, 2015
- Organizer and Chair, Panel Discussion Sessions on “Industrial Analytics Courses: the Needs, Contents and Expectations,” ISERC, Nashville, TN, 2015

- Organizer and Chair, Panel Discussion Sessions on “Present and Future of Analytics Programs,” ISERC, Nashville, TN, 2015
- Organizer and Chair, sessions on “Data Analytics for Manufacturing System Design,” INFORMS Conference, San Francisco, CA, 2014
- Organizer and Chair, sessions on “Data Fusion for Process Monitoring and Diagnosis,” INFORMS Conference, San Francisco, CA, 2014
- Organizer and Chair, sessions on “Data Fusion for Prognostics,” INFORMS Conference, San Francisco, CA, 2014
- Organizer and Co-Chair, sessions on “Smart Monitoring of Complex Systems,” INFORMS Conference, San Francisco, CA, 2014
- Organizer and Chair, sessions on “Data Fusion for Process Control,” INFORMS Conference, Minneapolis, MN, 2013

### **Society Activities**

- Website and Newsletter Editor, INFORMS Section on Data Mining, 2013-2015
- Council Member, INFORMS Section on Data Mining, 2015-2017
- Council Member, INFORMS Section on Quality, Statistics, and Reliability, 2017-2019
- Founder and Administrator, Industrial Engineering ERA (**IERA**), <http://iera.name/>, a web platform and home base for Industrial Engineers all over the world, 03/2015-now
- Scientific Committee to First European & American Conference on Business Analytics, Supply Chain and Logistics (EUSA-BASCL 2016)
- Associate Editor, IEEE Conference on Automation Science and Engineering, 12/2016-now
- Editorial review board, Journal of Quality Technology, 7/2017-12/2018
- Associate Editor, IEEE Transactions on Automation Science and Engineering, 7/2017-now
- SME faculty advisor, 2017-present
- Chair-Elect, INFORMS Quality, Statistics, and Reliability Section, 2019

### **Service within the University**

#### **Departmental committees**

- Departmental Colloquium Organizer, 2014-present
- Academic Affairs Cluster Committee, 2013-2017
- Qualifier Exam Committee, Manufacturing and Production Systems, 2015-present
- Manufacturing and Production Systems Area Group, 2013-present
- Faculty Affair Cluster Committee, 2013-2016, 2018

- Department scholarship committee, 2017
- Hiring committee, Industrial AI position, 2018

#### **College committees**

- Wendt Space Recommendation Committee, 2017
- Hiring committee, COE hiring in Machine Learning and AI, 2018

#### **Campus-wide committees**

- Faculty senate (or alternative), 2014, 2015, 2018 fall

#### **Ph.D. Dissertation Committees**

- Xiufeng Shao, Ph.D. 2017, “Ranking and Selection procedures for feasibility determination”, Committee Member.
- Qing Li, Ph.D. 2017, “Citywide Real-time Grid-based Traffic Emissions Estimation and Air Quality Inference Using Big Data”, Committee Member.
- Abdallah Chehade, Ph.D. 2017, “Data-Driven Approaches for Condition Monitoring and Predictive Analytics”, Committee Chair.
- Yuhang Liu, Ph.D. 2017, “Data Analytics Models and Methods for Fault Identification and Prognosis in Mechanical Structures and Manufacturing Processes”, Committee Member.
- Xilu Wang, Ph.D. 2017, “Statistical Shape Modeling for Custom Design and Analysis”, Committee Member.
- Raed Kontar, Ph.D. 2018, “Data-driven Modeling and Prognosis of Condition Monitoring Signals in Engineering Systems”, Committee Member.
- Mohammad Nabhan, Ph.D. 2019, “Dynamic Robust Sparse Modelling and Sampling of High-dimensional Data Streams for Online Process Monitoring”, Committee Member.
- Xiaochen Xian, Ph.D. 2019, “Big Data Modeling and Monitoring in Complex Systems”, Committee Chair.
- Chao Wang, Ph.D., 2019, “Data-driven Modeling, Monitoring and Control for Smart and Connected Systems”, Committee Member.