

Julie Simmons Ivy

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RESEARCH SUMMARY

My research interests are mathematical modeling of stochastic dynamic systems with emphasis on statistics and decision analysis as applied to health care, manufacturing, and service environments. The focus of my research is decision making under conditions of uncertainty with the objective of improving the decision quality. My research program seeks to develop novel concepts of maintenance and monitoring policies and associated scientific theories, and apply them specifically to two important application domains: industrial and medical decision making. The goals of this research are: 1) to develop “better” models of processes – whether industrial or medical – that will allow the discovery or evaluation of good, if not “optimal”, policies; and 2) to show how good models can produce implementable policies. My research applies to both manufacturing where the current focus is developing dynamic machine maintenance policies in a reconfigurable environment, and healthcare where the current focus is evaluating (in terms of lifetime mortality) and determining optimal (in terms of cost and utility) dynamic breast cancer screening policies under conditions in which both incidence, disease aggression, and test efficacy are impacted by patient age.

TEACHING INTERESTS

My teaching interest is in the integration of business, engineering, and medicine and the development of interdisciplinary courses to teach students to use data and mathematical modeling to make better decisions. Possible courses include: statistics, decision analysis, optimization, stochastic processes

EDUCATION

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| 1993 - 1998 | University of Michigan , Ann Arbor, Michigan
Ph.D. in Industrial and Operations Engineering, August 1998.
Advisor: Stephen M. Pollock, currently Professor Emeritus
Dissertation: <i>Determining Maintenance and Replacement Policies for a Multi-State Deteriorating Process with Probabilistic Monitoring</i> |
| 1991 - 1992 | Georgia Institute of Technology , Atlanta, Georgia
M.S. in Operations Research, December 1992. |
| 1987 - 1991 | University of Michigan , Ann Arbor, Michigan
B.S. in Industrial and Operations Engineering, May 1991; Cum Laude. |

ACADEMIC EXPERIENCE

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| Sept. 1998 – present | Assistant Professor
Stephen M. Ross School of Business at the University of Michigan
Operations and Management Science
Formerly Statistics and Management Science |
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Courses Taught:

Sept. 1998 – 2000

SMS 301: Statistics for Managers, the undergraduate BBA statistics Core course. SMS 301 combines optimization, decision analysis, regression and statistical hypothesis testing for the purpose of making better business decisions using Excel and SPSS.

Jan. 2001 – 2002

SMS 301 Course Coordinator: responsible for coordinating six sections of approximately 400 undergraduate students. In addition, I was also responsible for mentoring a PhD student instructor during the second year. In the second year of a two-year term, all six sections had the highest ratings for the course.

Jan. 2003 – present

SMS 502 (OMS 502): Business Statistics, graduate Day MBA Core statistics course. The course integrates cases, projects, and real-world examples to teach mathematical decision-making utilizing statistics. There are over 400 students in this course of which I teach approximately 200. In 2004, I co-developed the new Day MBA Quantitative Methods Core Course.

Mar. – April 2003 &
Mar. – April 2004

BA 553 Multidisciplinary Action Projects (MAP) Faculty Team Advisor for several for-profit and non-profit companies including: Alfa Romeo, the Carter Center, Citibank, Focus Hope, General Motors, Habitat for Humanity, Northwest Airlines, Thomson Medstat. These seven-week multidisciplinary projects involve teams of four to six first-year MBA students in complex business consulting projects within companies both domestic and international. Multidisciplinary faculty pairs advise eight student teams.

Summer 1999 – 2005

Tauber Manufacturing Institute (TMI) Project Team Faculty Advisor for several companies including: AT Kearney, Boeing, GE Healthcare, GE Power and Lighting, General Motors, and Pall Corporation. TMI Team projects are 14-week multidisciplinary, collaborative manufacturing-based internships.

PhD Student:

Jing Zhou

PhD Candidate in Mechanical Engineering

Dissertation: Integrated Reconfiguration and Maintenance Decision Making in Reconfigurable Manufacturing Systems

Co-Advisor: Prof. Jun Ni

PhD Dissertation Committees:

- Cheng-Hung Wu, Industrial and Operations Engineering, expected completion February 2006
- Masaru Hashimoto, Business Administration: Statistics and Management Science, expected completion 2006
- Cindy Chang, Doctorate of Engineering - Manufacturing, 2005
- Jun Qin, Business Administration: Statistics and Management Science, 2005
- Qing Chang, Doctorate of Engineering - Manufacturing, 2005
- Hongjbin Jia, Doctorate of Engineering – Manufacturing, 2005
- Max Yang, Mechanical Engineering, 2005

- Kingsley Reeves, Industrial and Operations Engineering, 2004
- Ming Li, Business Administration: Statistics and Management Science, 2002

Related Academic Experience:

- Jan. – April 1998 **Adjunct Lecturer**, University of Michigan Business School - Statistics and Management Science
- Jan. 1996 – Dec. 1997 **Research Assistant**, University of Michigan - Department of Mechanical Engineering and Applied Mechanics. Intelligent Resistance Spot Welding Project.
- Sept. - Dec. 1996 **Graduate Student Instructor**, University of Michigan - Department of Industrial and Operations Engineering (IOE). Teaching assistant for undergraduate level course in Engineering Statistics.
- April - Aug. 1995 **Research Assistant**, University of Michigan - IOE. Dr. Jeff Alden (General Motors Research Laboratory) and Dr. Stephen M. Pollock.
- Jan. - May 1995 **Teaching Assistant**, University of Michigan - IOE. Teaching assistant for graduate level course in Theories of Administration.
- Sept. 1993 - Dec. 1995 **Study Group Coordinator**, University of Michigan - Engineering Learning Resource Center (ELRC).
- Sept. 1990 - May 1991 **Engineering Learning Resource Center (ELRC) Coordinator**, University of Michigan - ELRC.

PUBLICATIONS

Refereed Articles:

1. “Classification of Spot Welds Using Power Factor Time Profiles”, *International Journal of Production Research*, Vol. 39, No. 3, 549-566, 2001.
2. “Maintenance of a Deteriorating Process with Probabilistic Monitoring and Silent Failures”, Special Issue, *American Mathematical Society Contemporary Mathematics Series*, Vol. 275, 69-93, 2001.
3. “A Modeling Approach to Maintenance Decisions Using Statistical Quality Control and Optimization” co-authored with Harriet Black Nembhard, *Quality and Reliability Engineering International*, Vol. 21, No. 4, 355 – 366, 2005.
4. “Maintenance for a Multi-state Deteriorating Machine with Probabilistic Monitoring and Silent Failures” co-authored with Stephen Pollock, *IEEE Transactions on Reliability*, Vol. 54, No. 3, 489 – 497, 2005.
5. “Childbirth and Pelvic Floor Dysfunction: An Epidemiologic Approach to Assessing Prevention Opportunities at Delivery”

with D. Patel, X. Xu, A. Thomason, S. Ransom, and J. DeLancey, to appear in the *American Journal of Obstetrics and Gynecology*.

Papers In Review: 6. “Balancing Patient and Payer Preferences: A Maintenance-based Model for Breast Cancer Treatment and Detection” Conditionally accepted pending minor revision with *Management Science*.

7. “Integrated reconfiguration and age-based preventive maintenance decision making” with J. Zhou, D. Djurdjanovic, J. Ni (under first review with *IIE Transactions*)

8. “An evaluation of cervical dysplasia among women veteran as compared to the civilian population.” With D. Patel, X. Xu, A. Pipari, K. Reynolds, and S. Ransom (under revision)

Working Papers: 9. “Assessing Dynamic Mammography Schedules: A Mathematical Modeling-based Approach” with L. Maillart, K. Diehl, and S. Ransom

10. “Modeling and Uncertainty in Breast Cancer Decision Making” with H. Nembhard, and K. Barron

11. “Model for Cost-effective Decisions for Evaluating Mode of Delivery in Childbirth and Pelvic Floor Dysfunction” with D. Patel, X. Xu, A. Thomason, S. Ransom, and J. DeLancey

12. “Cost Effective Monitoring Policies for a Multi-State Deteriorating Process with Probabilistic Monitoring and Silent Failures”

Book Chapter: “Can we do better? Optimization models for breast cancer screening” Invited book chapter for *Handbook of Optimization in Medicine* edited by Panos Pardalos and H. Edwin Romeijn (under revision)

Refereed Conference Proceedings: “Strategic Maintenance Decisions Using Statistical Quality Control and Optimization” co-authored with Harriet Black Nembhard, *IERC 2003 Conference proceedings*, 2003.

“Markov Decision Process for Dynamic Breast Cancer Screening” co-authored with Lisa Maillart and Scott Ransom, *NSF DMI Grantees and Research Conference Proceedings*, 2005.

“Balancing Patient and Payer Preferences: An Efficient Frontier for Breast Cancer Screening”, 2004 Society for Medical Decision Making Annual Conference, *Medical Decision Making*, Vol. 25, issue 1, 2005.

GRANTS

- Sept 2004 – Sept 2006 NSF DMII 0423090 & 0423410: Collaborative Research: Mathematical Modeling of Dynamic Breast Cancer Screening, Award: \$100,000
PIs: Julie Ivy and Lisa Maillart (Case Western Reserve University, Weatherhead School of Management, Operations Department), Co-PI: Scott Ransom (University of Michigan Medical School, Obstetrics and Gynecology)
- May 2001 – May 2003 TMI Faculty Fellows Program: Lockheed Martin project on variation management, Award: \$140,000
PIs: Julie Ivy, Jack Hu (Mechanical Engineering), and Jan Shi (Industrial and Operations Engineering)

RELATED INDUSTRIAL EXPERIENCE

- July 2004 **Consultant**, DTE Energy Services, Ann Arbor, Michigan. Energy Efficiency Analysis.
- 2001 – 2003 **Tauber Manufacturing Institute (TMI) Faculty Fellow**, Lockheed Martin, Dallas Texas
- Summer 1994, Jan. - Sept. 1993 **Quality Coordinator**, Argonne National Laboratory, Argonne, Illinois. Quality Coordinator for Environment, Safety and Health Division (ESH).

PRESENTATIONS

- November 2005 INFORMS 2005 Annual Conference – San Francisco, Invited Presentation for MSOM: “Mathematical Modeling of Dynamic Breast Cancer Screening Policies”
- November 2005 INFORMS 2005 Annual Conference – San Francisco, Invited Presentation for Quality and Reliability Section: “Modeling and Uncertainty in Breast Cancer Decision Making”
- November 3, 2005 The Pennsylvania State University, Department of Industrial and Manufacturing Engineering Distinguished Seminar Series: “Balancing Patient and Payer Preferences: A Maintenance-based Model for Breast Cancer Treatment and Detection”
- August 5, 2005 University of Washington, Industrial Engineering Invited Seminar: “Balancing Patient and Payer Preferences: A Maintenance-based Model for Breast Cancer Treatment and Detection”
- July 2005 IFORS 2005 – Hawaii, Invited Presentation for Health Applications Section: “Is Breast Cancer Screening One Size Fits All? Mathematical Modeling to Explore the Impact of Race on Screening Policy”

October 2004	INFORMS 2004 Annual Conference – Denver, Invited Presentation for Health Applications Section: “Breast Cancer Screening Policy Characterization”
October 2004	INFORMS 2004 Annual Conference – Denver, Quality and Reliability Section Sponsored – Session Organizer: “Reliability Based Proactive Scheduling of Maintenance and Reconfiguration Operations in Reconfigurable Manufacturing Systems”
October 2004	Society for Medical Decision Making 2004 Annual Conference – Atlanta: “Balancing Patient and Payer Preferences: An Efficient Frontier for Breast Cancer Screening”
May 2004	8 th Annual NSF Site Visit for NSF ERC for Reconfigurable Manufacturing Systems: “Optimal Maintenance/Reconfiguration Scheduling in Reconfigurable Manufacturing Systems”
November 2003	INFORMS 2003 Annual Conference – Atlanta, Invited Presentation for Health Applications Section: “Balancing Patient and Payer Preferences: An Efficient Frontier for Breast Cancer Detection and Treatment”
November 2003	INFORMS 2003 Annual Conference – Atlanta, Invited Presentation for Health Applications Section: “Integrated Screening Decisions: Cost-effective Management of Health Maintenance”
November 2003	INFORMS 2003 Annual Conference – Atlanta, Quality and Reliability Section Sponsored – Session Organizer: “Strategic Maintenance Decisions Using Statistical Quality Control and Optimization”
July 2003	Euro INFORMS - Istanbul, Invited Presentation: “Balancing Patient and Payer Preferences: An Efficient Frontier for Breast Cancer Detection and Treatment”
May 2003	Industrial Engineering Research Conference – Portland: “Strategic Maintenance Decisions Using Statistical Quality Control and Optimization”
March 2003	University of Michigan Decision Consortium: “Cost-Effective Management of Maintenance in Health Care (and Manufacturing)”
November 2002	INFORMS 2002 Annual Conference – San Jose, Health Applications Sponsored: “An Operations Research Approach to the Mammography Controversy”
October 2002	Industrial Advisory Board Meeting NSF – I/UCR Center on Intelligent Maintenance Systems – Milwaukee, WI, Invited Presentation: “Modeling for Cost-Effective Maintenance”

April 2002	Industrial Advisory Board Meeting NSF – I/UCR Center on Intelligent Maintenance Systems – University of Michigan, Invited Presentation: “Models for Determining “Cost-Effective” Monitoring and Maintenance Policies”
November 2001	INFORMS 2001 Annual Conference – Miami, Invited Presentation for Health Applications and Women in OR and MS Sponsored Session: “A Maintenance Model for Breast Cancer Treatment and Detection”
November 2001	INFORMS 2001 Annual Conference – Miami, Invited Presentation for Health Applications Sponsored Session: “Under Conditions of Uncertainty When to Pay for Information: Keeping Patients Healthy and Costs Down”
November 2000	University of Michigan Decision Consortium: “Under Conditions of Uncertainty When to Pay for Information: Keeping Patients Healthy and Costs Down”
October 2000	University of Michigan Business School Hosmer Lunch Series: “Under Conditions of Uncertainty When to Pay for Information: Keeping Patients Healthy and Costs Down”
May 2000	INFORMS Winter 2000 – Salt Lake City, Applied Probability Sponsored Session – Session Organizer, Applications of Markov Decision Processes: “Cost Effective Monitoring Policies for a Multi-State Deteriorating Process with Probabilistic Monitoring and Silent Failures”
April 2000	University of Michigan Decision Consortium: “Cost Effective Monitoring Policies for a Multi-State Deteriorating Process with Probabilistic Monitoring and Silent Failures – When to Pay for Additional Information when Conditions are Uncertain”
July 1999	10 th INFORMS Applied Probability Conference – Ulm, Germany: “Maintenance of a Deteriorating Machine with Probabilistic Monitoring and Silent Failures”
June 1999	5 th Annual Conference for African American Researchers in the Mathematical Sciences (CAARMS) – One of six invited speakers: “Maintenance of a Deteriorating Process with Probabilistic Monitoring and Silent Failures”
May 1998	INFORMS Winter 1998 - Montreal: “Maintenance Policy Structure Characterization for Three States of Deterioration with Probabilistic Monitoring”

MEMBERSHIPS

Institute for Operations Research and the Management Sciences (INFORMS): 1995 – present

- Future Academician Colloquium Chair for the INFORMS National Meeting (November 2005), New Orleans, Relocated to San Francisco
- Co-Chair for Invited Cluster on Health Applications for the INFORMS National Meeting (November 2005), New Orleans, Relocated to San Francisco
- Doctoral Colloquium Invited Speaker for the INFORMS National Meeting (October 2004), Denver
- Organizer of Invited Cluster on Applied Probability and Applied Statistics for INFORMS International Conference 2001 – Hawaii

INFORMS Health Application Section: 1998 – present

- Vice-President Elect, INFORMS Health Applications Section, 2006
- Secretary, INFORMS Health Applications Section, 2005
- Treasurer, INFORMS Health Applications Section, 2003 - 2004
- Health Applications Section Pierskalla Prize Committee 2003

INFORMS Applied Probability Society: 1998 – present

INFORMS Decision Analysis Society: 1998 – present

Society for Medical Decision Making: 2002 – present

University of Michigan Decision Consortium: 1998 – present

SERVICE

- NSF DMII SEE panelist
- NSF Course, Curriculum, and Laboratory Improvement program panelist
- Reviewer for *IIE Transactions*, *Medical Decision Making*, *Naval Logistics Research*, *Operations Research*, *Production Planning and Control*, and *Quality and Reliability Engineering International*.
- UMBS Curriculum Committee, 1999 – 2000

HONORS

- Tauber Manufacturing Institute Faculty Fellow 2001 - 2003
- SGA Nomination for BBA Teaching Excellence 1999, 2001, 2002, 2003
- Gant Fellowship 1997
- INFORMS Doctoral Colloquium 1995
- Rackham Merit Fellowship 1994 – 1998
- Graduate Engineering for Minorities Fellowship 1990 – 1992
- NSF-GEE Graduate Fellowship 1991 – 1992
- Tau Beta Pi: National Engineering Honor Society
- Alpha Pi Mu: National Industrial Engineering Honor Society