# NSF Workshop at SMU on Future Directions in Service, Manufacturing, and Operations Research

Sponsored by the NSF Operations Engineering Program, March 29-31, 2019

Welcome to the NSF Workshop on Future Directions in Service, Manufacturing, and Operations Research sponsored by the NSF Operations Engineering (OE) Program. This workshop is funded by National Science Foundation (NSF) Grant Number CMMI 1650203. Workshop website can be found at https://people.smu.edu/nsfworkshop.

In this booklet, you will find information on the following:

A.  Workshop Program and SMU Map


B.  Keynote Speakers -        Bios

                             Presentations


C.  Break-out Sessions –      Discussion Topics and some sample questions

                             Time and Location of the session

                             Session topic and the session moderator

                             GoogleDocs address for the session document

                             Participants in each break out session


D.  Posters -                Poster Number and Presenter

                             Title and Abstract


Sponsored by

## A. Workshop Program

| DAY 1 FRIDAY | March 29 | | Location |
|---|---|---|---|
| 10:00 - 11:30 | *Signup* | Check-in and poster placement | Caruth 2nd floor |
| 11:30 - 1:00 | *Session 0* | Working lunch – Overview | Caruth 4th floor Palmer Room |
| 1:00 - 2:00 | *Keynote* | Chelsea White, Georgia Tech | Caruth 1st floor Vester-Hughes |
| 2:00 - 3:00 | *Keynote* | Mark Van Oyen, U of Michigan | |
| 3:00 - 3:30 | *Break* | Refreshments/snacks & Posters | Caruth 2nd floor |
| 3:30 - 5:00 | *Session 1* | Breakouts (3 T1, 3 T2) | Caruth 2nd, 3rd, and 4th floors |
| 5:30 - 8:30 | *Social* | Museum Visit and Reception | Meadows Museum |
| **DAY 2  SATURDAY** | **March 30** | | |
| 7:30 - 8:30 | *Breakfast* | Catered | Palmer Room |
| 8:30 - 9:30 | *Keynote* | Jeff Camm, Wake Forest Univ | Vester-Hughes |
| 9:30 - 10:00 | *Break* | Refreshments/snacks & Posters | Caruth 2nd floor |
| 10:00 - 11:30 | *Session 2* | Break-outs (3 T1, 3 T2) | Caruth 2nd, 3rd, and 4th floors |
| 11:30 - 1:00 | *Lunch* | Catered | Palmer Room |
| 1:00 - 2:00 | *Posters* | Poster Presentations | Caruth 2nd floor |
| 2:00 - 4:00 | *Social* | Visit to Presidential Museum | G.W. Bush Museum |
| 4:00 - 4:30 | *Break* | Refreshments/snacks & Posters | Caruth 2nd floor |
| 4:30 - 6:00 | *Session 3* | Break-outs (2 T1, 2 T2, 2 T3) | Caruth 2nd, 3rd, and 4th floors |
| 7:00 - 9:00 | *Social* | Workshop Dinner | Mack Ballroom in Umphrey Lee Center, 3rd floor |
| **DAY 3 SUNDAY** | **March 31** | | |
| 7:30 - 8:30 | *Breakfast* | Catered | Palmer Room |
| 8:30 - 10:00 | *Session 4* | Break-outs (2 T1, 2 T2, 2 T3) | Caruth 2nd, 3rd, and 4th floors |
| 10:00 - 10:30 | *Break* | Refreshments/snacks & Posters | Caruth 2nd floor |
| 10:30 - 12:00 | *Session 5* | Break-outs (2 T1, 2 T2, 2 T3) | Caruth 2nd, 3rd, and 4th floors |
| 12:00 - 1:30 | *Lunch* | Farewell lunch – catered | Palmer Room |
| 1:30 - 2:30 | *Session 6* | Presentation of key points | Vester-Hughes |
| 2:30 - 5:30 | *Meetings* | Workshop committee meeting | Caruth Room 347 |

## Campus Map and Important Locations
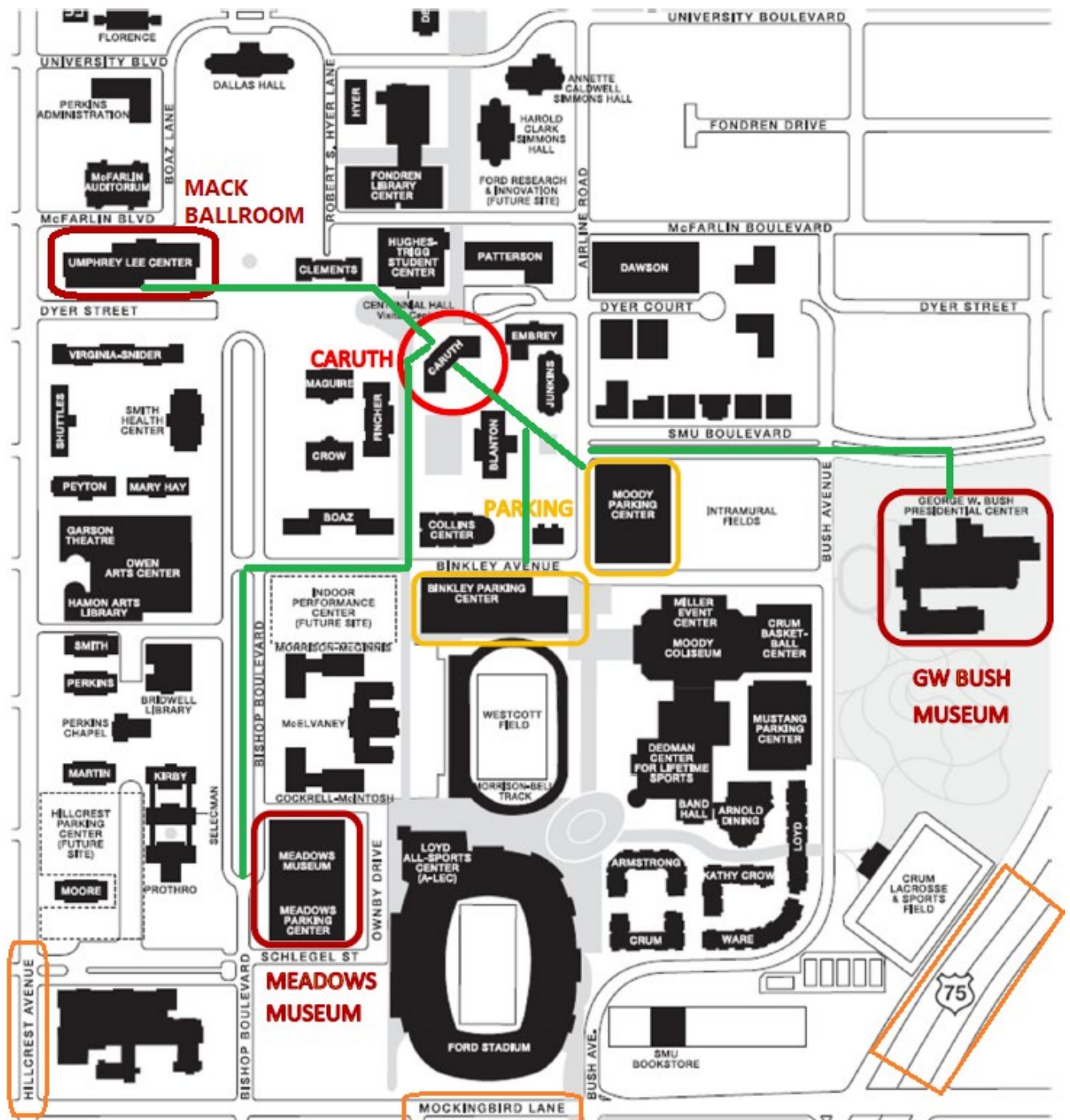
# B. Keynote Speakers

## Jeffrey Camm, Associate Dean of Business Analytics and the Inmar Presidential Chair of Analytics

## Wake Forest University School of Business on Analytics Education

**Jeffrey D. Camm** is Associate Dean of Business Analytics, the Inmar Presidential Chair in Analytics, and the Executive Director of the Center for Analytics Impact at the Wake Forest University School of Business. . He received his PhD in Management Science from Clemson University and a BS in Mathematics from Xavier University. Prior to joining Wake Forest, he held the Joseph S. Stern Chair in Business Analytics in the Lindner College of Business at the University of Cincinnati and he has been a visiting professor at the Tuck School of Business at Dartmouth College and the School of Engineering at Stanford University.

Professor Camm's scholarship is on the application of optimization modeling and solution algorithms to difficult decision problems in a diverse set of application areas including, operations planning and scheduling, supply chain optimization, product design, and conservation. His research has appeared in *Science, Management Science, Operations Research, Interfaces* and a variety of other journals.

Camm has coauthored nine textbooks in statistics, management science and analytics and previously served as the editor in chief of *Interfaces* (now the *INFORMS Journal on Applied Analytics*). He was the 2016 recipient of the Kimball Medal for service to the operations research profession and is an INFORMS Fellow.

A firm believer in practicing what he preaches, he has consulted for numerous corporations including among others, Procter and Gamble, Owens Corning, GE, Tyco, Ace Hardware, Boar's Head, Brooks Running Shoes and Kroger. His work in supply chain optimization with Procter & Gamble was a 1996 Edelman Award Finalist and is credited with helping P&G save over $250,000,000 annually in their North American supply chain. In 1998, his joint work on nature reserve site selection for efficient conservation was published in the journal Science and appeared in a brief to President Clinton.

Jeff's presentation is available in the Appendix.

## Mark P. Van Oyen, Professor

## Industrial and Operations Engineering at University of Michigan

**Mark Van Oyen** is a Professor of Industrial and Operations Engr. (IOE) at the University of Michigan. His interests include the analysis, design, prediction and control of stochastic systems. His current research emphasizes optimization and prescriptive analytics for healthcare operations and medical decision making. He co-authored papers that won the 2016 Manufacturing and Service Operations Management (MSOM) Best Paper award, 2016 MSOM Service Science SIG best paper award, 2010 Pierskalla Award, and two 1st and two 2nd place best paper awards from the POMS College of Healthcare Op's. Mgmt. He has served as Associate Editor for Operations Research, Management Science, Naval Research Logistics, and IIE Transactions, and IIE Trans. Healthcare Syst. Engr. and Senior Editor for Flexible Services & Manufacturing. He was a faculty member of the Northwestern Univ. Sch. of Engr. (1993-2005) and Loyola Univ. of Chicago's Sch. of Bus. Admin. (1999-2005). He has received grant funding from the NSF, ONR, NIH, EPRI, ALCOA, General Motors, and the VA. He received his Ph.D. from Electrical Engr. Systems from the University of Michigan and has worked in industry for GE Corporate R&D and Lear Siegler's Instrument & Avionic Sys. Div.

Mark's presentation (Title: Perspectives on Healthcare Delivery Systems Research) is available in the Appendix.

## Chelsea C. White III, Schneider National Chair in Transportation and Logistics and Professor Industrial and Systems Engineering, Georgia Tech

**Chelsea C. White** received his Ph.D. from the University of Michigan (UM) in 1974 in Computer, Information, and Control Engineering.  He has served on the faculties of the University of Virginia (1976 - 1990) and UM (1990 - 2001).  He has served as School Chair of the H. Milton Stewart School of Industrial & Systems Engineering (2005 - 10) and holds the Schneider National Chair of Transportation and Logistics at the Georgia Institute of Technology, where he is the former Director of the A.P. Sloan Foundation Trucking Industry Program and the former Executive Director of The Logistics Institute.  While at the University of Michigan, he was the founding Engineering Co-Director of what is now the Tauber Institute for Global Operations.

He serves on the boards of directors for the Industry Studies Association and is a former member of the board of directors of the Bobby Dodd Institute, Con-way, Inc. (NYSE: CNW, 2004-2015), the Logistics Institute-Asia Pacific, ITS America (a Utilized Federal Advisory Committee), and the ITS World Congress.  He is a member of the Board of Advisors for FreightWaves, a futures and options marketplace for transportation capacity.

His involvement with the IEEE includes serving as President of the Systems, Man, and Cybernetics (SMC) Society (1992 – 93).  He received the Norbert Wiener Award in 1999 and the Joseph G.Wohl Outstanding Career Award in 2005, both from the IEEE SMC Society, and an IEEE Third Millennium Medal. The Norbert Wiener Award is the SMC's highest award recognizing lifetime contributions in research.  He is the recipient of the 2008 IEEE ITSS ITS Outstanding Research Award for "significant contributions in research and development in global transportation and logistic systems".  He is a Fellow of the IEEE, a Fellow of INFORMS, an INFORMS Edelman Laureate, a former member of the Executive Board of CIEADH (Council of Industrial Engineering Academic Department Heads), and the founding chair of the IEEE TAB Committee on ITS (now an IEEE Society).  He is a former member of the World Economic Forum trade facilitation council and a former liaison for the Industry Studies Association to INFORMS.

Professor White is the former Editor of the IEEE Transactions on Systems, Man, and Cybernetics, Parts A and C, and was the founding Editor of the IEEE Transactions on Intelligent Transportation Systems (ITS).  He has served as the ITS Series book editor for Artech House Publishing Company.

He is co-author (with A.P. Sage) of the second edition of Optimum Systems Control (Prentice-Hall, 1977), co-editor (with D.E. Brown) of Operations Research and Artificial Intelligence: Integration of Problem Solving Strategies (Kluwer, 1990), and co-editor (with D.L. Belman) of Trucking in the Information Age (Ashgate, 2005).  He has published primarily in the areas of the control of finite stochastic systems and knowledge-based decision support systems.  His most recent research interests include analyzing the role and value of real-time information and enabling information technology for improved logistics and, more generally, supply chain productivity and risk mitigation, with special focus on the U.S. trucking industry.

He has been a keynote speaker at a variety of international conferences and meetings.  He has made presentations at the Council on Competitiveness and the Brookings Institution, both of which were concerned with the impact of information technology on international freight distribution, security, and productivity.  He has represented ITS America by providing testimony during a roundtable discussion entitled "Reauthorization of the Federal Surface Transportation Research Program", held by the U.S. Senate Committee on Environment and Public Works.  He has testified before the California Senate Committee on Transportation & Housing Public Hearing on ITS and before the

Joint Georgia State Senate/House Future of Manufacturing Study Committee on trends & challenges in supply chain & logistics engineering.

## C. Break-out Sessions

The break-out sessions are organized to focus on three main topics outlined as follows:

### Topic 1 (T1): Societal Impact

The focus is on future directions of research that develop and connect methodologies and applications through data availability (with both increased size and variety available today) in realistic applications for societal impact.

*A sample set of questions to be answered include (but not limited to)*

*+ How to measure societal impact; what are the critical areas (problem types vs. application areas) for impact; where are the opportunities for far-reaching impact via inter-disciplinary collaboration.*

*+ Recognizing that topics covered by the OE Program are enablers of new products, processes, and services, but not owners, how do we create/communicate a better understanding of what we (can) do; what areas are the most critical and offer the most opportunities towards this end; how can we create communities of OE researchers and users and creators of enabling technologies; what are the other mechanisms that NSF can foster such activities.*

### Topic 2 (T2): Interface of ORMS/Analytics with Human & Organizational Behavior and Change

The focus is on future directions of research for improved effectiveness and efficiency in providing products and services to individuals and organizations in settings where the provider is in direct touch with the customer as in online purchasing, consulting, financial services, healthcare services, etc.

*A sample set of questions to be answered include (but not limited to)*

*+ How can OR/MS contribute to improved quality and better design of interface at the front-end of high-touch services. How can the quality of high-touch services be measured and what design principles should be devised.*

*+ New paradigms for products/processes/systems for production and services (low- or high-touch) may also call for organizational changes and both have to go hand-in-hand, not necessarily one preceding the other. How can this be taken into account in crafting new paradigms; how can new approaches be reliably tested in a laboratory environment.*

*+ What are the effective ways and best practices to establish and/or nurture interaction among OR/MS researchers and human and organizational factors researchers to this end. How can NSF be instrumental specifically in facilitating such interactions.*

*+ What are the difficulties at the interface of OR/MS solutions and their implementation when humans are the users of the system in a distributed fashion and not necessarily in cooperation with each other; how to avoid and/or overcome these difficulties; what processes, tools, methods etc. to employ or develop towards pro-actively eliminate potential difficulties and/or to address them during or post-implementation.*

## Topic 3 (T3): Teaching ORMS/Analytics Theory and Practice

The focus is on identifying a roadmap for curricular changes in teaching ORMS/Analytics theory and practice, given the availability of big data and many recent industrial practices it facilitates, to next generation engineers and decision-makers.
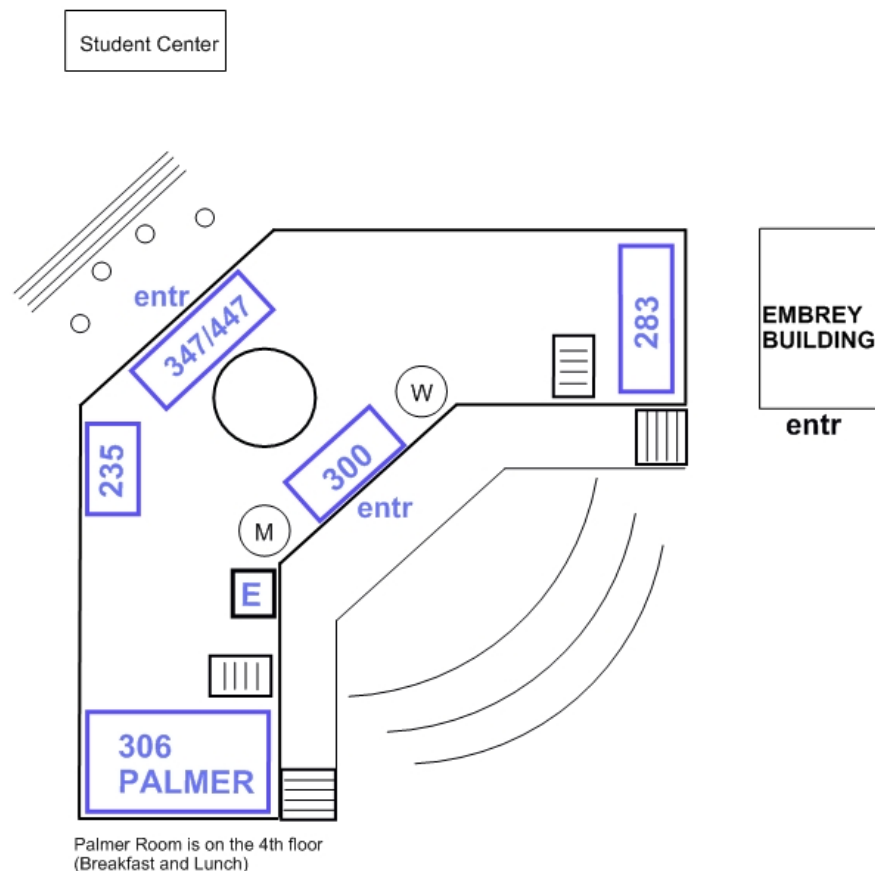
*A sample set of questions to be answered include (but not limited to)*

*+ How do descriptive, predictive, and prescriptive analytics interact; what kind of curriculum should be established for an integrated analytics curriculum; how does it affect existing curricula in undergraduate and graduate programs.*

*+ How can NSF support development and test of such curricula that can span multiple divisions as they also connect to STEM education.*

*+ Assuming that data storage capability is (almost) limitless at low cost and the computing speed is increasing at an exponential rate, how can OR can take advantage of these resources; what are the new problems that can be solved; what are the implications on impact of OR in practice; and how can these opportunities be incorporated into the analytics curricula.*

## Caruth Hall Floor Plan



7

| | | ROOMS in CARUTH HALL | | | | | |
|---|---|---|---|---|---|---|---|
| | | 235 | 283 | 300 | 306 | 347 | 447 |
| BREAK-OUT TRACKS | B1 Friday 3:30 - 5:00 | T1 1, 2, 3, 4, 5, 6, 7, 8, 9 | T1 10, 11, 12, 13, 14, 15, 16, 17, 18 | T1 19, 20, 21, 22, 23, 24, 25, 26, 27 | T2 28, 29, 30, 31, 32, 33, 34, 35, 36 | T2 37, 38, 39, 40, 41, 42, 43, 44, 45 | T2 46, 47, 48, 49, 50, 51, 52, 53 |
| | B2 Saturday 10:30 - 11:30 | T3 1, 10, 19, 4, 13, 22, 7, 16, 25 | T3 12, 28, 37, 15, 31, 40, 18, 34, 43 | T1 20, 29, 48, 23, 51, 32, 26, 35 | T1 30, 38, 46, 33, 41, 49, 36, 44, 52 | T2 2, 11, 21, 5, 14, 24, 8, 17, 27 | T2 3, 39, 47, 6, 42, 50, 9, 45, 53 |
| | B3 Saturday 4:30 - 6:00 | T3 2, 20, 29, 5, 23, 32, 8, 26, 35 | T3 11, 38, 47, 14, 41, 50, 17, 44, 53 | T1 1, 21, 39, 4, 24, 42, 7, 27, 45 | T1 3, 10, 28, 6, 13, 31, 9, 16, 34 | T2 12, 19, 46, 15, 22, 49, 18, 25, 52 | T2 30, 37, 48, 33, 40, 51, 36, 43 |
| | B4 Sunday 8:30 - 10:00 | T3 3, 12, 21, 6, 15, 24, 9, 18, 27 | T3 30, 39, 48, 33, 42, 51, 36, 45 | T1 2, 19, 46, 5, 22, 49, 8, 25, 52 | T1 11, 37, 47, 14, 40, 50, 17, 43, 53 | T2 1, 10, 28, 4, 13, 31, 7, 16, 34 | T2 20, 29, 38, 23, 32, 41, 26, 35, 44 |
| | B5 Sunday 10:30 - 12:00 | T1 28, 29, 30, 37, 38, 39, 46, 47, 48 | T1 31, 32, 33, 40, 41, 42, 49, 50, 51 | T1 34, 35, 36, 43, 44, 45, 52, 53 | T2 1, 2, 3, 10, 11, 12, 19, 20, 21 | T2 4, 5, 6, 13, 14, 15, 22, 23, 24 | T2 7, 8, 9, 16, 17, 18, 25, 26, 27 |

For each break-out session XX-YYY (**B1-235 … B5-447**) the cell includes

topic number (**T1, T2, T3**) and the participant numbers (1…54)

Posters will be placed on the second floor.

Breaks with snacks and refreshments are also on the second floor.

## List of Participants

| | | | | |
|---|---|---|---|---|
| 1. Adam Elmachtoub | Columbia University | 28. Ronald Askin | Arizona State University |
| 2. Xiao Liu | University of Arkansas | 29. Jay Rosenberger | Univ of Texas at Arlington |
| 3. Shuai Huang | University of Washington | 30. Giulia Pedrielli | Arizona State University |
| 4. Bryan Norman | Texas Tech University | 31. Reha Uzsoy | North Carolina State Univ |
| 5. Chip White | Georgia Tech | 32. Harsha Gangammanavar | SMU |
| 6. Yanling Chang | Texas A&M University | 33. Taewoo Lee | University of Houston |
| 7. Elif Akcali | University of Florida | 34. Ehsan Salari | Wichita State University |
| 8. Jianqiang Cheng | University of Arizona | 35. Zhijie Dong | Texas State University |
| 9. Ying Lin | University of Houston | 36. Chun-An (Joe) Chou | Northeastern University |
| 10. Cigdem Gurgur | Purdue Univ Fort Wayne | 37. Mingyang Li | University of South Florida |
| 11. Yongjia Song | Clemson University | 38. Alejandro Toriello | Georgia Tech |
| 12. Turgay Ayer | Georgia Tech | 39. Alba Rojas-Cordova | SMU |
| 13. Kayse Maass | Northeastern University | 40. Mohammad Dehghani | Northeastern University |
| 14. Larry Snyder | Lehigh University | 41. Xiang Zhong | University of Florida |
| 15. Weihang Zhu | University of Houston | 42. Xiaofeng Nie | Texas A&M University |
| 16. Robert Hendler | SMU-EMIS Advisory Board | 43. Miju Ahn | SMU |
| 17. Yisha Xiang | Texas Tech University | 44. Eli Olinick | SMU |
| 18. Metin Cakanyildirim | Univ of Texas at Dallas | 45. Andrew Trapp | Worcester Polytechnic Ins |
| 19. Mark Van Oyen | University of Michigan | 46. Bjorn Berg | University of Minnesota |
| 20. Burak Eksioglu | Clemson University | 47. Dick Barr | SMU |
| 21. Eugene Feinberg | Stony Brook University | 48. Ziteng Wang | Northern Illinois Univ |
| 22. Jiadong Wang | Sabre Airline Solutions | 49. Xiaodong Luo | Sabre Holdings, Inc |
| 23. Anahita Khojandi | University of Tennessee | 50. Jeff Camm | Wake Forest University |
| 24. Hadi Charkhgard | University of South Florida | 51. Sila Cetinkaya | SMU |
| 25. Feng Ju | Arizona State University | 52. Sunderesh Heragu | Oklahoma State Univ |
| 26. Aurelie Thiele | SMU | 53. Michael Hahsler | SMU |
| 27. Mehmet Ayvaci | Univ of Texas at Dallas | 54. Halit Uster | SMU |

## B1 - Friday 3:30-5:30pm

### B1-235
Topic 1 (T1): Societal Impact
GoogleDocs Site: https://tinyurl.com/y5zzprum
Session Chair:     1. Adam Elmachtoub
Participants:

| | | | |
|---|---|---|---|
| 2. Xiao Liu | 3. Shuai Huang | 4. Bryan Norman | 5. Chip White |
| 6. Yanling Chang | 7. Elif Akcali | 8. Jianqiang Cheng | 9. Ying Lin |

### B1-283
Topic 1 (T1): Societal Impact
GoogleDocs Site: https://tinyurl.com/y6436z84
Session Chair:     14. Larry Snyder
Participants:

| | | | |
|---|---|---|---|
| 10. Cigdem Gurgur | 11. Kayse Maass | 12. Turgay Ayer | 13. Yongjia Song |
| 15. Weihang Zhu | 16. Robert Hendler | 17. Yisha Xiang | 18. Metin Cakanyildirim |

### B1-300
Topic 1 (T1): Societal Impact
GoogleDocs Site: https://tinyurl.com/yy9oypot
Session Chair:     20. Burak Eksioglu
Participants:

| | | | |
|---|---|---|---|
| 19. Mark Van Oyen | 21. Eugene Feinberg | 22. Jiadong Wang | 23. Anahita Khojandi |
| 24. Hadi Charkhgard | 25. Feng Ju | 26. Aurelie Thiele | 27. Mehmet Ayvaci |

### B1-306
Topic 2 (T2): Interface of ORMS/Analytics with Human & Organizational Behavior and Change
GoogleDocs Site: https://tinyurl.com/y6szf7dq
Session Chair:     28. Ronald Askin
Participants:

| | | | |
|---|---|---|---|
| 29. Jay Rosenberger | 30. Giulia Pedrielli | 31. Reha Uzsoy | 32. Harsha Gangammanavar |
| 33. Taewoo Lee | 34. Ehsan Salari | 35. Zhijie Dong | 36. Chun-An (Joe) Chou |

### B1-347
Topic 2 (T2): Interface of ORMS/Analytics with Human & Organizational Behavior and Change
GoogleDocs Site: https://tinyurl.com/y447ac48
Session Chair: 39. Alba Rojas-Cordova
Participants:

| | | | |
|---|---|---|---|
| 37. Mingyang Li | 38. Alejandro Toriello | 40. Mohammad Dehghani | 41. Xiang Zhong |
| 42. Xiaofeng Nie | 43. Miju Ahn | 44. Eli Olinick | 45. Andrew Trapp |

### B1-447
Topic 2 (T2): Interface of ORMS/Analytics with Human & Organizational Behavior and Change
GoogleDocs Site: https://tinyurl.com/y56yowol
Session Chair:     52. Sunderesh Heragu
Participants:

| | | | |
|---|---|---|---|
| 46. Bjorn Berg | 47. Dick Barr | 48. Ziteng Wang | 49. Xiaodong Luo |
| 50. Jeff Camm | 51. Sila Cetinkaya | 53. Michael Hahsler | 54. Joseph Geunes |

## B2 - Saturday 10:00-11:30am

### B2-235
Topic 3 (T3): Teaching ORMS/Analytics Theory and Practice
GoogleDocs Site: https://tinyurl.com/y4p26whr
Session Chair:     13. Yongjia Song
Participants:

| | | | |
|---|---|---|---|
| 1. Adam Elmachtoub | 10. Cigdem Gurgur | 19. Mark Van Oyen | 4. Bryan Norman |
| 22. Jiadong Wang | 7. Elif Akcali | 16. Robert Hendler | 25. Feng Ju |

### B2-283
Topic 3 (T3): Teaching ORMS/Analytics Theory and Practice
GoogleDocs Site: https://tinyurl.com/y6qdrkd8
Session Chair:     12. Turgay Ayer
Participants:

| | | | |
|---|---|---|---|
| 28. Ronald Askin | 37. Mingyang Li | 15. Weihang Zhu | 31. Reha Uzsoy |
| 40. Mohammad Dehghani | 18. Metin Cakanyildirim | 34. Ehsan Salari | 43. Miju Ahn |

### B2-300
Topic 1 (T1): Societal Impact
GoogleDocs Site: https://tinyurl.com/y582o7t6
Session Chair:     26. Aurelie Thiele
Participants:

| | | | |
|---|---|---|---|
| 20. Burak Eksioglu | 29. Jay Rosenberger | 48. Ziteng Wang | 23. Anahita Khojandi |
| 51. Sila Cetinkaya | 32. Harsha Gangammanavar | 54. Joseph Geunes | 35. Zhijie Dong |

### B2-306
Topic 1 (T1): Societal Impact
GoogleDocs Site: https://tinyurl.com/yyt8owwj
Session Chair:     38. Alejandro Toriello
Participants:

| | | | |
|---|---|---|---|
| 30. Giulia Pedrielli | 46. Bjorn Berg | 33. Taewoo Lee | 41. Xiang Zhong |
| 49. Xiaodong Luo | 36. Chun-An (Joe) Chou | 44. Eli Olinick | 52. Sunderesh Heragu |

### B2-347
Topic 2 (T2): Interface of ORMS/Analytics with Human & Organizational Behavior and Change
GoogleDocs Site: https://tinyurl.com/y3y37j4c
Session Chair:     11. Kayse Maass
Participants:

| | | | |
|---|---|---|---|
| 2. Xiao Liu | 21. Eugene Feinberg | 5. Chip White | 14. Larry Snyder |
| 24. Hadi Charkhgard | 8. Jianqiang Cheng | 17. Yisha Xiang | 27. Mehmet Ayvaci |

### B2-447
Topic 2 (T2): Interface of ORMS/Analytics with Human & Organizational Behavior and Change
GoogleDocs Site: https://tinyurl.com/y5j28w4b
Session Chair:      45. Andrew Trapp
Participants:

| | | | |
|---|---|---|---|
| 3. Shuai Huang | 39. Alba Rojas-Cordova | 47. Dick Barr | 6. Yanling Chang |
| 42. Xiaofeng Nie | 50. Jeff Camm | 9. Ying Lin | 53. Michael Hahsler |

### B3 - Saturday 4:30-6:00pm

### B3-235
Topic 3 (T3): Teaching ORMS/Analytics Theory and Practice
GoogleDocs Site: https://tinyurl.com/y5qtfxx6
Session Chair:       32. Harsha Gangammanavar
Participants:

| | | | |
|---|---|---|---|
| 2. Xiao Liu | 20. Burak Eksioglu | 29. Jay Rosenberger | 5. Chip White |
| 23. Anahita Khojandi | 8. Jianqiang Cheng | 26. Aurelie Thiele | 35. Zhijie Dong |

### B3-283
Topic 3 (T3): Teaching ORMS/Analytics Theory and Practice
GoogleDocs Site: https://tinyurl.com/y5da5lwr
Session Chair:       41. Xiang Zhong
Participants:

| | | | |
|---|---|---|---|
| 11. Kayse Maass | 38. Alejandro Toriello | 14. Larry Snyder | 47. Dick Barr |
| 50. Jeff Camm | 17. Yisha Xiang | 44. Eli Olinick | 53. Michael Hahsler |

### B3-300
Topic 1 (T1): Societal Impact
GoogleDocs Site: https://tinyurl.com/y3l78cq4
Session Chair:       4. Bryan Norman
Participants:

| | | | |
|---|---|---|---|
| 1. Adam Elmachtoub | 21. Eugene Feinberg | 39. Alba Rojas-Cordova | 24. Hadi Charkhgard |
| 42. Xiaofeng Nie | 7. Elif Akcali | 27. Mehmet Ayvaci | 45. Andrew Trapp |

### B3-306
Topic 1 (T1): Societal Impact
GoogleDocs Site: https://tinyurl.com/y5tn9ncc
Session Chair:       3. Shuai Huang
Participants:

| | | | |
|---|---|---|---|
| 10. Cigdem Gurgur | 28. Ronald Askin | 6. Yanling Chang | 13. Yongjia Song |
| 31. Reha Uzsoy | 9. Ying Lin | 16. Robert Hendler | 34. Ehsan Salari |

### B3-347
Topic 2 (T2): Interface of ORMS/Analytics with Human & Organizational Behavior and Change
GoogleDocs Site: https://tinyurl.com/yyx9vdxr
Session Chair:       18. Metin Cakanyildirim
Participants:

| | | | |
|---|---|---|---|
| 12. Turgay Ayer | 19. Mark Van Oyen | 46. Bjorn Berg | 15. Weihang Zhu |
| 22. Jiadong Wang | 49. Xiaodong Luo | 25. Feng Ju | 52. Sunderesh Heragu |

### B3-447
Topic 2 (T2): Interface of ORMS/Analytics with Human & Organizational Behavior and Change
GoogleDocs Site: https://tinyurl.com/yyqg8yuv
Session Chair:       54. Joseph Geunes
Participants:

| | | | |
|---|---|---|---|
| 30. Giulia Pedrielli | 37. Mingyang Li | 48. Ziteng Wang | 33. Taewoo Lee |
| 40. Mohammad Dehghani | 51. Sila Cetinkaya | 36. Chun-An (Joe) Chou | 43. Miju Ahn |

## B4 - Sunday 8:30-10:00pm

### B4-235
Topic 3 (T3): Teaching ORMS/Analytics Theory and Practice
GoogleDocs Site: https://tinyurl.com/y2e5rk2b
Session Chair:     21. Eugene Feinberg
Participants:

| | | | |
|---|---|---|---|
| 3. Shuai Huang | 12. Turgay Ayer | 6. Yanling Chang | 15. Weihang Zhu |
| 24. Hadi Charkhgard | 9. Ying Lin | 18. Metin Cakanyildirim | 27. Mehmet Ayvaci |

### B4-283
Topic 3 (T3): Teaching ORMS/Analytics Theory and Practice
GoogleDocs Site: https://tinyurl.com/y5x9xgxj
Session Chair:     30. Giulia Pedrielli
Participants:

| | | | |
|---|---|---|---|
| 39. Alba Rojas-Cordova | 48. Ziteng Wang | 33. Taewoo Lee | 42. Xiaofeng Nie |
| 51. Sila Cetinkaya | 36. Chun-An (Joe) Chou | 45. Andrew Trapp | 54. Joseph Geunes |

### B4-300
Topic 1 (T1): Societal Impact
GoogleDocs Site:  https://tinyurl.com/y6t5g24j
Session Chair:     46. Bjorn Berg
Participants:

| | | | |
|---|---|---|---|
| 2. Xiao Liu | 19. Mark Van Oyen | 5. Chip White | 22. Jiadong Wang |
| 49. Xiaodong Luo | 8. Jianqiang Cheng | 25. Feng Ju | 52. Sunderesh Heragu |

### B4-306
Topic 1 (T1): Societal Impact
GoogleDocs Site: https://tinyurl.com/y4tq2all
Session Chair:     40. Mohammad Dehghani
Participants:

| | | | |
|---|---|---|---|
| 11. Kayse Maass | 37. Mingyang Li | 47. Dick Barr | 14. Larry Snyder |
| 50. Jeff Camm | 17. Yisha Xiang | 43. Miju Ahn | 53. Michael Hahsler |

### B4-347
Topic 2 (T2): Interface of ORMS/Analytics with Human & Organizational Behavior and Change
GoogleDocs Site: https://tinyurl.com/yy7p6hxp
Session Chair:     31. Reha Uzsoy
Participants:

| | | | |
|---|---|---|---|
| 1. Adam Elmachtoub | 10. Cigdem Gurgur | 28. Ronald Askin | 4. Bryan Norman |
| 13. Yongjia Song | 7. Elif Akcali | 16. Robert Hendler | 34. Ehsan Salari |

### B4-447
Topic 2 (T2): Interface of ORMS/Analytics with Human & Organizational Behavior and Change
GoogleDocs Site: https://tinyurl.com/y6nt9vrk
Session Chair:     44. Eli Olinick
Participants:

| | | | |
|---|---|---|---|
| 20. Burak Eksioglu | 29. Jay Rosenberger | 38. Alejandro Toriello | 23. Anahita Khojandi |
| 32. Harsha Gangammanavar | 41. Xiang Zhong | 26. Aurelie Thiele | 35. Zhijie Dong |

## B5- Sunday 10:30am-12:00pm

### B5-235
Topic 1 (T1): Societal Impact
GoogleDocs Site: https://tinyurl.com/y5hjlkq5
Session Chair:     29. Jay Rosenberger
Participants:

| | | | |
|---|---|---|---|
| 28. Ronald Askin | 30. Giulia Pedrielli | 37. Mingyang Li | 38. Alejandro Toriello |
| 39. Alba Rojas-Cordova | 46. Bjorn Berg | 47. Dick Barr | 48. Ziteng Wang |

### B5-283
Topic 1 (T1): Societal Impact
GoogleDocs Site: https://tinyurl.com/yyf3y6my
Session Chair:     33. Taewoo Lee
Participants:

| | | | |
|---|---|---|---|
| 31. Reha Uzsoy | 32. Harsha Gangammanavar | 40. Mohammad Dehghani | 41. Xiang Zhong |
| 42. Xiaofeng Nie | 49. Xiaodong Luo | 50. Jeff Camm | 51. Sila Cetinkaya |

### B5-300
Topic 1 (T1): Societal Impact
GoogleDocs Site: https://tinyurl.com/y5235yt4
Session Chair:     35. Zhijie Dong
Participants:

| | | | |
|---|---|---|---|
| 34. Ehsan Salari | 36. Chun-An (Joe) Chou | 43. Miju Ahn | 44. Eli Olinick |
| 45. Andrew Trapp | 52. Sunderesh Heragu | 53. Michael Hahsler | 54. Joseph Geunes |

### B5-306
Topic 2 (T2): Interface of ORMS/Analytics with Human & Organizational Behavior and Change
GoogleDocs Site: https://tinyurl.com/yy9eu6g5
Session Chair:     2. Xiao Liu
Participants:

| | | | |
|---|---|---|---|
| 1. Adam Elmachtoub | 3. Shuai Huang | 10. Cigdem Gurgur | 11. Kayse Maass |
| 12. Turgay Ayer | 19. Mark Van Oyen | 20. Burak Eksioglu | 21. Eugene Feinberg |

### B5-347
Topic 2 (T2): Interface of ORMS/Analytics with Human & Organizational Behavior and Change
GoogleDocs Site: https://tinyurl.com/y3f6pbba
Session Chair:     15. Weihang Zhu
Participants:

| | | | |
|---|---|---|---|
| 4. Bryan Norman | 5. Chip White | 6. Yanling Chang | 13. Yongjia Song |
| 14. Larry Snyder | 22. Jiadong Wang | 23. Anahita Khojandi | 24. Hadi Charkhgard |

### B5-447
Topic 2 (T2): Interface of ORMS/Analytics with Human & Organizational Behavior and Change
GoogleDocs Site: https://tinyurl.com/yyvj8c46
Session Chair:     17. Yisha Xiang
Participants:

| | | | |
|---|---|---|---|
| 7. Elif Akcali | 8. Jianqiang Cheng | 9. Ying Lin | 16. Robert Hendler |
| 18. Metin Cakanyildirim | 25. Feng Ju | 26. Aurelie Thiele | 27. Mehmet Ayvaci |

## D. Posters (Place Number, Presenter, and University)

### 1  Reha Uzsoy, North Carolina State University

**Title**  Combinatorial Auctions for Decentralized Resource Allocation in New Product Introductions

**Abstract**  Motivated by applications in the semiconductor industry, we develop decentralized resource allocation schemes for new product introductions that mediate between manufacturing and product development organizations. The manufacturing organization must provide some capacity to product engineering for prototype fabrication, while it depends on product engineering for new products in the future. We develop approaches based on combinatorial auctions that will support negotiations between different groups and result in a desirable outcome for the firm as a whole, as opposed to the individual agents.

### 2  Siavash Tabrizian,  Southern Methodist University (SMU)

**Title**  Adaptive Cluster Sampling Approximation for Two-Stage Stochastic Programs

**Abstract**  We present enhancements to the L-shaped method to solve large-scale two-stage stochastic programs with continuous recourse. First, we build the theory for classifying the continuous recourse function, and afterward, we apply sampling techniques within optimization to achieve computational improvement. We demonstrate these results on classical problems in the literature.

### 3  Bjorn Berg, University of Minnesota

**Title**  Evaluating Opportunities for Real Time Locating Systems in Outpatient Care Delivery Systems

**Abstract**  Real time locating systems (RTLS) technology allows for near-constant monitoring of resources, individuals, and system states. Within healthcare environments its use has focused on locating valuable equipment as well as staff and patients in urgent situations. However, the use of RTLS technology in supporting operational decision-making planning in outpatient settings represents a novel opportunity for the technology. Particularly, RTLS afford a unique view of patient activities and flows, staff availability, and resource utilization within complex multidisciplinary outpatient settings. This research leverages high-fidelity operational data from RTLS in a multidisciplinary outpatient care setting and identifies new opportunities for use with electronic medical record systems which focus on improving quality of care measures and patient outcomes.

| 4 | **Yanling Chang, Texas A&M University** |
|---|---|

**Title**   Next-Generation of Human-Technology Partnership: AI-Enhanced Dynamic Decision Making and Control

**Abstract**   The manufacturing industry is going through fundamental changes known as Industry 4.0 with the key enablers including machine learning, 3D printing, robotics, automation, smart factory with IoT, and blockchain. Unlike the widely held perspective on autonomy/machine as a substitute for human agency, this undergoing revolution presents a historical and unique opportunity to human in the creation of creative and intelligent workplace for enhanced productivity and augmented human performance. The proposed research is going to design and analyze a hybrid agent, where an AI-enabled machine operates in harmony with a human worker with the aim of improving human's performance and working capabilities. Specifically, we want to: (i) first develop a deep neural network (DNN) representation of the worker's cognitive ability (encompassing all cognitive processes such as perception, attention, memory, information processing) for predicting and analyzing human's dynamic decision; (ii) examine the interaction between the trained DNN and the human worker to analyze proper working mechanisms (such as learning/teaching, intervention of a task) for improving human's working performance and capabilities. A concerted and coherent coordination between human and machine should consider the dynamic nature of human's cognitive ability; (iii) design algorithmic schemes for AI-based assistance enabling online implementation; (iv) analyze the potential risks in security and algorithmic biases introduced by the proposed approaches. The proposed work will improve our understanding of the human-technology frontier in workplaces and workforce preparation. This research will affect education as the proposed hybrid AI agents have the potential to be customized to human individuals (some of whom may have physical or cognitive impairment) to create additional working and learning opportunities.

| 5 | **Alejandro Toriello, Georgia Tech** |
|---|---|

**Title**   Dynamic Relaxations for Online Bipartite Matching

**Abstract**   Online bipartite matching (OBM) is a fundamental model underpinning many important applications, including search engine advertisement, website banner and pop-up ads, and ride-hailing. We study the i.i.d. OBM problem, where one side of the bipartition is fixed and known in advance, while nodes from the other side appear sequentially as i.i.d. realizations of an underlying distribution, and must immediately be matched or discarded. We introduce dynamic relaxations of the set of achievable matching probabilities, show how they theoretically dominate lower-dimensional, static relaxations from previous work, and perform a polyhedral study to theoretically examine the new relaxations' strength. We finally present a computational study to demonstrate the empirical quality of the new relaxations and policies.

**6**      **Amin Ziaeifar, Southern Methodist University (SMU)**

**Title**    Relay Network Design Problem Under Demand Uncertainty

**Abstract**    The truckload industry faces a serious problem of high driver turnover rate, typically about 100%. Among the major causes of this problem are extended on-the-road times where drivers handle several truckload pickup and deliveries successively, non-regular schedules and get-home rates and low equipment's utilization. A strategic design of a relay network that may potentially help to alleviate this issue is studied in this work. Specifically, in order to explicitly address the uncertainty in truckload shipment requirements, we propose and solve a two-stage stochastic programming model to determine strategic level network design for long-run operational efficiency.

**7**      **Adam Elmachtoub, Columbia University**

**Title**    Pricing Analytics for Reusable Resources

**Abstract**    We consider the problem of pricing for reusable resources, which are items that can be consumed and reused afterwards such as hotel rooms, cloud computing, shared vehicles, and rotable parts. We develop a model to maximize a combination of profit rate, market share, and service level, which also captures the special dynamics of reusable resources. We prove that a static pricing policy achieves strong performance guarantees compared to a fully dynamic pricing policy. We also discuss a large scale implementation of the pricing model at at Dassault Falcon Jet in the context of rotable spare parts.

**8**      **Xiao Liu, University of Arkansas**

**Title**    Statistical learning from large recurrent event data

**Abstract**    A statistical learning method for large recurrent event data with covariate information is presented.

**9**      **Zohreh Raziei, Southern Methodist University (SMU)**

**Title**    Data Forensics with Machine Learning

**Abstract**    We apply Convolutional Neural Networks (CNN) to identify fake photographs. Using medium-to-high-resolution images, we combine an auto-encoder-based neural network with explicit facial modeling to generate swapped faces of celebrities and compare the CNN's performance to approximate pairwise rankings inferred from judgement of human subjects.

## 10       Ehsan Salari, Wichita State University

**Title**   Radiotherapy Planning for Real-time Organ Motion Management

**Abstract**   Radiotherapy is one of the most effective and commonly used modalities for cancer treatment. However, if unaccounted for, internal organ motion during radiation delivery may lead to underdosing of cancer cells or overdosing of normal tissue. This could potentially cause treatment failure or normal-tissue toxicity. Organ motion is of particular concern in the treatment of lung and abdominal cancers, where breathing induces large tumor displacement and organ deformation. A new generation of intensity-modulated radiotherapy devices is equipped with on-board MRI scanners to acquire a real-time visualization of the patient's anatomy during radiation delivery. The goal of this research is to enable use of real-time MRI visualization to control the progress of radiation delivery in order to correct for any dose discrepancy due to organ motion, thus allowing radiotherapy plans to actively adjust to anatomical changes during irradiation. As part of this research, we develop, calibrate, and test motion predictive models that employ real-time MRI images to provide the short-term trajectory of anatomical motion during radiation delivery. Accurate motion predictions could help overcome the lag between motion detection and corrective-action planning and actuation, thus facilitating the realization of real-time tracking and re-optimization of intensity-modulated radiation delivery.

## 11       Feng Ju, Arizona State University

**Title**   Real-Time Analytics and Proactive Control for Smart Manufacturing Systems

**Abstract**   The objective of this research is to build a novel analytical framework for real-time monitoring and control in smart manufacturing systems. The rapid development of Cyber-Physical Systems (CPS) has provided unprecedented opportunities for the sensing and control in advanced manufacturing systems. For instance, process sensing data and production operation data are made vastly available to the decision makers in real time through industrial communication networks, which could be potentially turned into actionable insights timely. The goal of this research is to establish an automated and intelligent monitoring and control scheme that translates sensing, operational, and performance related information into smart and timely decisions by connecting, modeling and optimizing the manufacturing system at both the unit and system levels.

**12**      **Anahita Khojandi, University of Tennessee**

**Title**    Real-Time Prediction Of Sepsis In Hospitalized Adults Using Continuous Bedside Physiological Data Streams

**Abstract**    Sepsis is an acute, life-threatening condition, often acquired in the hospital. Undetected, sepsis can progress to severe sepsis and septic shock, with a risk of death as high as 30% to 80%. Early detection of sepsis can improve patient outcomes. We use a multi-layer machine learning algorithm to analyze continuous, high frequency physiological data, such as vital signs, to identify at risk patients before sepsis onset. In our analysis of a cohort of 1,300 patients, the model only failed to predict 3.16Â±3.16% of sepsis patients earlier than Systemic Inflammatory Response Syndrome (SIRS) criteria. Sepsis patients were predicted on average 211.47Â± 5.08 minutes earlier than SIRS criteria.

**13**      **Metin Cakanyildirim, University of Texas at Dallas**

**Title**    Post-Surgery Opioid Use Management

**Abstract**    Postoperative pain management is a serious and important problem where opioids (narcotic pain-killers) are common agents in relieving pain. If opioids are underprescribed, a patient may experience painful recovery period. Conversely, overprescription can leave a patient with opioid side effects, possibly even severer pain when Opioid-Induced Hyperalgesia (OIH) condition occurs. Both under- and overprescription may turn acute postoperative pain to chronic pain which then necessitates aggressive opioid-use. These trade-offs of opioid-use have been frequently recognized but not modeled in the literature. Our post-surgery pain model provides optimal opioid prescription duration to manage post-surgical pain by incorporating opioid side effects and OIH.

**14**      **Weihang Zhu, University of Houston**

**Title**    Applied Optimization in Improving Energy Efficiency in Process Industries

**Abstract**    This poster will present two optimization applications in improving energy efficiency in process industries. The first application is a multi-objective optimization of natural gas pipeline operations. Natural gas is transported by pipeline networks which serve as the most cost effective transportation means over long distances. Compressors installed in pipeline networks provide the propelling force necessary to boost the pressure of the gas to reach its destination. The two objectives considered are to minimize the fuel consumption of the compressor stations and maximize the throughput of the system. A set of constraints are developed based on the flow equations and operating conditions of the compressors. The second application is a production scheduling optimization for an ice cream processing facility. Energy efficiency has become an important aspect in

manufacturing facilities including those in food processing. Traditional scheduling approaches typically do not consider energy efficiency with the optimization objectives such as make-span and tardiness. This research attempts to improve the scheduling by incorporating energy conservation constraints into the optimization model. It is proposed to adapt schedule to lower in-process product storage that requires electricity in order to maintain a low storage temperature. The model has been tested with a set of cases from the literature, and compared with the results from the scheduling models without considering energy efficiency.

| 15 | **Ronald Askin, Arizona State University** |
|---|---|
| **Title** | Production Scheduling for Multimodel, Multifacility Manufacturing Considering Shift Schedule, Down Periods and Run Rate |
| **Abstract** | We describe a mathematical formulation for medium range production scheduling with multiple products produced at multiple facilities each with limited product mix flexibility. The schedule determines planned shift schedules, down periods, run rates and planned overtime while adhering to organizational rules and implementing planning delays. Relevant costs of labor, inbound and outbound logistics, inventory, production rate changes and shortages are considered. The mixed integer programming formulation with cubic constraints is linearized. An iterative, restriction-based solution procedure is compared to direct optimization. |

| 16 | **Yisha Xiang, Texas Tech University** |
|---|---|
| **Title** | Maintenance Planning for Complex Systems in Dynamic Environments |
| **Abstract** | Equipment failures in capital-intensive industries, such as oil and gas exploration, aerospace, and power generation, may threaten human lives and have significant environmental and economic impact. Many of these equipment failures can be traced to poor equipment maintenance. One criticism of existing maintenance planning is that the existing predictive failure models are not rich enough to accurately reflect degradation in dynamic environments. This study addresses the need for better planning models and analysis to enhance equipment reliability in capital-intensive industries. |

| 17 | **Cigdem Gurgur, Purdue University Fort Wayne** |
|---|---|
| **Title** | Demand Management and Capacity Control with Interpretable Data Mining in the Intelligence Connected Era: An Application in Medical Wire and Device Manufacturing |
| **Abstract** | Demand Management and Capacity Control with Interpretable Data Mining in the Intelligence Connected Era: An Application in Medical Wire and Device Manufacturing |

**18**    **Miju Ahn, Southern Methodist University (SMU)**

**Title**   Nonconvex sparse sample average approximation: properties of d-stationary solutions

**Abstract**   In today's world, massive amount of data is gathered and stored with increased capability of storage. These data need to be effectively managed to gain reliable inference and predictions to improve decision making. Statistical learning refers to the study of data with the goal of constructing models so that they can be exploited to make future predictions. Sparse representation is a fundamental methodology in statistical learning that constructs a sparse structure in the predictive models. The method aims to build robust and efficient models by solving optimization problems with sparsity functions and select significant variables to serve in the model. We introduce a unified difference-of-convex formulation for sparse representation under the setting of sample average approximation and study the properties of the directional stationary solutions. The stationary solutions are compared to a vector which is possibly the global optimum of an underlying expectation minimization problem. We provide a bound for the distance between the two solutions, a bound on the difference between their model outcomes, and a result showing inclusion relationships among their support sets.

**19**    **Farnaz Nourbakhsh, Southern Methodist University (SMU)**

**Title**   Process reengineering in healthcare systems: Shifting the way we treat the uninsured

**Abstract**   Uninsured patients suffering from chronic diseases have access to medical treatment only under "emergency" conditions. That is, these patients are subject to a reject-accept mechanism in the ER. Motivated by our observations at Parkland Hospital, we have developed quantitative models of the underlying treatment process for this vulnerable patient population, and we have examined the impact of reject-accept mechanism on various performance measures. Next, we are interested in alternative approaches to treatment access under hypothetical changes to the existing mechanism. Hence, we extend our modeling efforts to consider three alternative service protocols that rely on (i) patient scheduling, (ii) patient batching, and (iii) patient prioritization. We quantify the benefits of these alternatives relative to the treatment delays associated with the existing mechanism.

**20**  **Burak Eksioglu¸Clemson University**

**Title**  Infectious Disease Control in Metapopulations with Limited Resources

**Abstract**  Motivated by unique challenges faced in containing the 2014 Ebola outbreak in West Africa, we develop a framework to dynamically allocate limited resources to several possibly connected populations where the disease transmission is stochastic. We formulate this problem as a stochastic dynamic program; however, as the state and action spaces grow exponentially with the size of the problem, the standard techniques do not apply. We propose three solution methodologies along with three intuitive policies. The first approach is based on a weakly coupled relaxation, and adopts an approximate dual linear programming (LP) formulation, which provides a lower bound in the relaxed setting in addition to a feasible policy. The second approach uses the weakly coupled relaxation and a restless bandit interpretation to create an index policy by adopting a first-order LP formulation. The third approach considers a dynamic one-step look-ahead policy which becomes a nonlinear integer knapsack that scales well with the problem size. In addition to testing the proposed policies in a simulation setting of the optimization framework, we develop a large-scale stochastic simulation for Ebola in a case study, which we calibrate and validate it with real-world data from Sierra Leone. Our results provide novel insights on efficient prioritization and resource allocation in this setting.

**21**  **Eugene Feinberg, Stony Brook University**

**Title**  Comparison of neoadjuvant and adjuvant therapy for resectable pancreatic cancer using Markov decision modeling

**Abstract**  By using Markov modeling, this study compares two approaches to treating resectable pancreatic cancer: adjuvant and neoadjuvant therapies.  The adjuvant therapy consists of conducting surgery followed by chemotherapy.  This is the common way to treat resectable pancreatic cancer.  According to the neoadjuvant approach, chemotherapy is conducted first, and it is followed by the surgery. A recently published study, based on meta-analysis of small studies by using Markov modeling, indicated that that neoadjuvant chemotherapy is more beneficial for patients with resectable pancreatic cancer than upfront surgery because the neoadjuvant strategy leads to higher life expectancy (LE) and quality-adjusted life expectancy (QALE).

We studied the same published statistical data by conducting Markov modeling and simulation. It was showed that the mean life expectancy (MLE) and quality-adjusted mean life expectancy (QAMLE) are the same for adjuvant and neoadjuvant therapies.  We also studied the data for adjuvant treatments conducted at the Stony Brook Hospital with more advanced medicines used for chemotherapy.  These results are much better in terms of LE, QAMLE, MLE, and QAMLE.  The following step will be to conduct medical trials to compare adjuvant and neoadjuvant therapies with more advanced medicines.

**22**        **Aurelie Thiele, Southern Methodist University (SMU)**

**Title**    Robust Portfolio Optimization with European Options

**Abstract**    We consider the problem of maximizing the worst-case return of a portfolio when the manager can invest in stocks as well as European options on those stocks, and the stock returns are modeled using an uncertainty set approach. Specifically, the manager has a range forecast for each factor driving the returns and a budget of uncertainty limiting the scaled deviations of these factors from their nominal values. Our goal is to understand the impact of options on the optimal portfolio allocation. We present theoretical results regarding the structure of the optimal allocation, in particular with respect to diversification. We compare our robust portfolio to several benchmarks in numerical experiments and analyze how the optimal allocation varies with the budget of uncertainty. Our results indicate that our approach performs very well in practice.

**23**        **Yongjia Song, Clemson University**

**Title**    Adaptive Algorithms for Stochastic Programming

**Abstract**    We will present two classes of adaptive algorithms for stochastic programming problems. First, we present the adaptive partition-based framework for solving the sample average approximation (SAA) of a two-stage stochastic programs with fixed recourse. A partition-based formulation is a relaxation of the original stochastic program, and we study a finitely converging algorithm in which the partition is adaptively adjusted until it yields an optimal solution. A solution guided refinement strategy is developed to refine the partition by exploiting the intermediate relaxation solutions obtained from a partition. We also show that for stochastic linear programs with fixed recourse, there exists a partition that yields an optimal solution, whose size is independent of the sample size. Next, we present an adaptive sequential SAA algorithm. In this iterative algorithm, an SAA problem is generated and solved only imprecisely, to within a tolerance chosen adaptively, by balancing the estimated statistical error against solution error. The solutions from prior iterations serve as warm starts to aid efficient solution of SAA problems on subsequent iterations. We characterize the convergence behavior of the generated stochastic iterates as well as the convergence rate, and correspondingly a sample size schedule that results in the best possible work complexity rate of the resulting iterates; the latter rate is in turn seen to be Monte Carlo canonical. The framework can be stopped in finite-time to return a solution endowed with a probabilistic guarantee on quality. Extensive computational results will be presented to show the advantages of the proposed adaptive algorithms compared with the state of the art.

**24**        **Turgay Ayer, Georgia Tech**

**Title**    An Analytics Approach To Hypertension Management

**Abstract**    Blood pressure (BP) is a significant controllable risk factor for cardiovascular disease (CVD), the leading cause of death worldwide. BP comprises two interrelated measurements: systolic and diastolic BP. CVD risk is minimized at intermediate BP values, a notion known as the J-curve effect. The J-curve effect imposes fundamental tradeoffs in simultaneous management of systolic and diastolic BP; however, assessing a comprehensive set of joint systolic/diastolic BP treatment thresholds while explicitly considering the J-curve effect via randomized controlled trials (RCTs) is not feasible, due to the time and cost prohibitive nature of RCTs. In this study, we propose an analytics approach to identify promising joint systolic/diastolic BP threshold levels for antihypertensive treatment. More specifically, using one of the largest longitudinal BP progression datasets, we first build and fit a Gaussian mixture model to capture simultaneous progression of systolic/diastolic BP at the population level, and externally validate our model on unseen data. We then analytically characterize the expected value of the hazard ratio, which enables us to compute the optimal treatment decisions. Finally, building upon the optimal joint BP treatment thresholds, we devise a practical and easily implementable approximate policy. We estimate the potential impact of our findings through a simulation study, which indicates that explicitly considering the J-curve effect and joint systolic/diastolic BP in treatment decisions could prevent between approximately twelve and fifteen thousand premature deaths from cardiovascular disease annually. Our findings may be helpful in guiding future RCT designs in BP management and merit further testing in clinical trials.

**25**        **Kayse Maass, Northeastern University**

**Title**    A Broader Perspective: Integrating Societal Factors Into Human Trafficking Shelter Location Models

**Abstract**    Rehabilitative shelters play a critical role in the safety and long-term recovery of human trafficking survivors. We develop a budget-constrained optimization model that maximizes the societal value of locating additional shelters, discuss methods for quantifying societal factors affecting the placement of shelters, and present computational insights of our study.

**26**     **Nadere Mansouri, Southern Methodist University (SMU)**

**Title**  Cost-Effective Evacuation Network Design under Uncertainty

**Abstract**  We consider a strategic evacuation network design problem, which mainly determines open potential shelter locations and evacuee routes (road segments) under uncertainty in the number of people evacuating the sources. We develop a chance-constrained two-stage mean-risk stochastic programming model. Specifically, in order to soften the road capacity limitations, we relax arc capacity constraints in a controlled fashion by both enforcing a joint chance constraint on the feasibility of the second-stage problem and penalizing the violations in the objective function. To solve our model, we devise a BD based algorithm. We also present some numerical results on the algorithmic efficiency as well as on the effectiveness of the solutions under varying problem parameters.

**27**     **Larry Snyder, Lehigh University**

**Title**  Optimization Models for Supply Chains and Energy Systems

**Abstract**  We present an overview of recent work by our research group on optimization models for supply chains and energy systems. Topics include multi-echelon inventory optimization, reinforcement learning models for inventory optimization (including the beer game) and vehicle routing, optimal layout and control of ocean wave energy farms, and cybersecurity models for electricity grids.

**28**     **Mohammad Dehghani, Northeastern University**

**Title**  A Multi-objective Outpatient Appointment Scheduling: A Data-Table Input Simulation-Optimization Approach

**Abstract**  Appointment scheduling (AS) is one of the key factors to enhance patient satisfaction in healthcare services. A practical and robust appointment scheduling pattern allows clinics to utilize medical assets, equipment, and resources in an efficient manner. In this study, a multi-objective simulation-optimization (MSO) approach is applied to determine the most preferred appointment scheduling pattern for an outpatient clinic system with stochastic parameters including patient-no-show and service time. The developed MSO model is using the concept of table-experiment (appointments table) in a simulation environment which is improved with an iterative optimization algorithm.

**29**　　　**Yulan Bai, Southern Methodist University (SMU)**

**Title**　Computational Study of Two Models for the Backhaul Profit Maximization Problem

**Abstract**　The Backhaul Profit Maximization Problem (BPMP) is a computationally challenging logistics problem. We present techniques that significantly improve solution time for the node-arc and triples MIP formulations of BPMP proposed in the literature. A comprehensive Composite Index Method (CIM) is developed to measure the performance of the two models. It is found that the triples formulation is more efficient than the node-arc formulation; 696 times faster on average for 40-node instances.

**30**　　　**Xiang Zhong, University of Florida**

**Title**　Implementability Analysis of Primary Care Delivery with Electronic Visits

**Abstract**　An electronic visit (e-visit) is a service offered by care providers to established patients through secure messaging from patient portals. E-visits offer a horizontal substitute to office visits for a segment of the patient population which exhibits heterogeneity in care preferences and time sensitivity. We consider a medical institution who employs service providers (e.g., primary care physicians and other clinicians) and offers both office and e-visits to their panel patients. A key planning problem is to determine the medical resource capacity that can improve access to care for patients and ensure profitability of the medical institution. A novel analytical framework for modeling a care delivery system with two horizontally substitutable channels and a heterogeneous patient population is proposed. The methodology and analysis put forth in this study provide actionable insights to care delivery planners engaged in facilitating e-visit.

**31**　　　**Giulia  Pedrielli, Arizona State University**

**Title**　Design and Operation of Individualized-Single Use Systems

**Abstract**　Novel technologies, such as 3D printing, immunotherapy, Internet of Things, AI, all are contributing to the mission of smarter and more independent systems able to produce a potentially infinite variety of products. While these techs constitute an enabler operating intelligent systems to allow them to response to one-time demands (individualized systems) is all but trivial. In this poster, we present the specific case of design and control of systems for the manufacturing and distribution of individualized cancer therapy. We formulate the individualized design and control problem as a learning enabled optimization in large dimension and we show a new set of techniques to simulate and control that can enable to scale up the production of individual therapies. In fact, major scientific challenges arise from individualized systems: (i) models need to be dynamically adaptive to the ever changing system structure and they need to embed mechanisms to automatically change, (ii) optimization needs to be performed in very high dimensions, (iii) like in online learning, we want to maximize the reward from each decision, but unlike traditional online learning the optimal solution changes over time thus requiring a different algorithmic and theoretical framework. We present our new methodological framework that addresses these challenges and our preliminary results.