# Douglas R. Bish (Website) Professor - Information Systems, Statistics, and Management Science, Culverhouse College of Business, University of Alabama <u>drbish@cba.ua.edu</u>

## Summary

I am a Professor of Operations Management in the Department of Information Systems, Statistics, and Management Science in the Culverhouse College of Business at the University of Alabama. My research interests are in the use of operations research (e.g., optimization, simulation, stochastic models) and data analytic tools to solve complex research problems with large societal impacts. Current research projects include improving public health screening, hospital evacuation management, disaster response management, and humanitarian supply chains. My objectives are to produce research that advances the fields of operations research and decision making while improving the current state of practice in the application areas studied. Towards these goals, I publish in leading operations research journals (e.g., Operations Research, Management Science, INFORMS Journal on Computing, Transportation Science, IISE Transactions, Naval Research Logistics) and application area journals, as well as cultivate external research collaborators, including collaborations with Carilion Clinics, the American Red Cross, the Los Angeles County Emergency Medical Services Agency, the New York Department of Health, and the North Carolina State Laboratory of Public Health. My research has been supported by multiple National Science Foundation grants, including the CAREER award, and by industry grants.

I teach a variety of courses, from methodological courses in optimization (e.g., linear and nonlinear optimization, network flows), to applied courses in supply chain management and logistics. I have graduated twelve PhD students, sending them to both industry and academia, including tenure track positions in Industrial Engineering at Texas A&M, Systems Engineering and Operations Research at George Mason University, Leavey School of Business at Santa Clara University, and School of Management, Binghamton University.

## Education

**PhD in Civil and Environmental Engineering**, Virginia Tech, Blacksburg, VA, Major: Transportation and Infrastructure Systems, Dissertation: *Staging and Routing Strategies in Evacuation Planning: Models, Insights, and Applications.* (Advisers: Antoine Hobeika and Hanif Sherali), 2006.

**MS in Industrial Engineering and Management Science**, Northwestern University, Evanston, IL.

**MS in BioMedical Engineering**, Northwestern University, Evanston, IL, Thesis: *Enzymatic reaction rate limits with constraints on equilibrium constants and experimental parameters.* 

**BS in Industrial and Manufacturing Engineering**, California Polytechnic State University, San Luis Obispo, CA.

### Work Experience

Professor of Operations Management (2020-present): Information Systems, Statistics,

and Management Science, Culverhouse College of Business, The University of Alabama

Associate Professor (2013-2020): Industrial and Systems Engineering, Virginia Tech (with appointments to the Virginia Tech Carilion School of Medicine and the Faculty of Health Sciences).

Assistant Professor (2006-2013): Industrial and Systems Engineering, Virginia Tech.

Instructor (2005): Department of Civil and Environmental Engineering, Virginia Tech.

Systems Analyst & Project Leader (1996-2003): United Airlines, R&D, Chicago, IL Led a team in research and development projects in revenue management and scheduling. These projects utilized operations research and related methodologies, including optimization, network analysis, experimental design, econometric models, large-scale simulation, and algorithmic techniques suitable for large-scale problems.

**Instructor (1996)**: Industrial Engineering and Management Science, Northwestern University, Evanston, IL.

**Research and Teaching Assistant (1994-1996)**: Biomedical Engineering and Industrial Engineering and Management Science, Northwestern University, Evanston, IL.

# Honors and Awards

- National Science Foundation **CAREER** Award Recipient for *CAREER: Decision support* models for hospital and regional evacuations. (#1055360).
- Runner-up, 2021 INFORMS Pierskalla Award for the Best Paper in Healthcare Management Science for the paper: El-Hajj<sup>\*</sup>, H., Bish, D.R., Bish, E.K., and and Kay, D. (2022). *Novel pooling strategies for genetic testing, with application to newborn screening*. <u>Management</u> <u>Science</u> - Articles in Advance.
- Honorable mention, 2020 Best Application Paper in the IISE Transactions Focus Issue on Operations Engineering and Analytics for the paper: Sadeghzadeh\*, S., Bish, D.R. and Bish, E.K. (2020). Optimal data-driven policies for disease screening under noisy biomarker measurement. <u>IISE Transactions</u> 52(2):166-180.
- Winner, 2019 Best Applications Paper in the IISE Transactions Focus Issue on Operations Engineering and Analytics for the paper: Aprahamian<sup>\*</sup>, H.Y., Bish, E.K., and Bish, D.R. (2018). *Adaptive risk-based pooling in public health screening*. <u>IISE Transactions</u> 50(9):753-766.
- Runner-up, 2017 INFORMS Pierskalla Award for the Best Paper in Healthcare Management Science for the paper: Aprahamian<sup>\*</sup>, H.Y., Bish, D.R., and Bish, E.K. (2019). *Optimal risk-based group testing*. Management Science 65(9):3949-4450.
- Finalist, 2015 INFORMS Pierskalla Award for the Best Paper in Healthcare Management Science for the paper: El-Amine<sup>\*</sup>, H., Bish, E.K., and Bish, D.R. (2017). *Robust post-donation blood screening under prevalence rate uncertainty*. Operations Research 66(1):1-17.
- Winner, 2016 Best Applications Paper in the IIE Transactions Focused Issue on Operations Engineering and Analytics for the paper: Bish, D.R., Bish, E.K., Xie\*, S.R., and Stramer, S.L., (2014). Going beyond "same-for-all" testing of infectious agents in donated blood. <u>IIE Transactions</u> 46(11):1147-1168.

- Winner, 2011 INFORMS Pierskalla Award for the Best Paper in Healthcare Management Science for the paper: Bish, D.R., Bish, E.K., Xie\*, S.R., and Slonim, A.D. (2011). *Optimal* selection of screening assays for infectious agents in donated blood. <u>IIE Transactions on</u> Healthcare Systems Engineering 1(2):67-90.
- Industrial & Systems Engineering Paul E. Torgersen Outstanding Teaching Award 2011.
- My PhD advisees have been selected for many student-focused research awards, including:
  - Winner, 2022 IISE Pritsker Doctoral Dissertation Award.
  - Winner, 2019 IISE Pritsker Doctoral Dissertation Award.
  - Second-place, 2019 INFORMS Health Application Society Student Paper Competition.
  - Winner, 2018 Paul E. Torgersen Graduate Research Award.
  - Finalist, 2017 INFORMS Seth Bonder Scholarship for Applied Operations Research in Health Services.
  - Second-place, 2017 IISE Pritsker Doctoral Dissertation Award.
  - 2015 INFORMS Seth Bonder Scholarship for Applied Operations Research in Health Services.

#### Publications (student advisees denoted with \*)

#### Journal Papers

- El-Hajj<sup>\*</sup>, H., Bish, D.R., Bish, E.K., and and Kay, D. (2022) Novel pooling strategies for genetic testing, with application to newborn screening. <u>Management Science</u> - Articles in Advance. Runner-up, 2021 INFORMS Pierskalla Award for the Best Paper in Healthcare Management Science.
- 37. El-Hajj\*, H., Bish, D.R., and Bish, E.K. (2022). Optimal genetic screening for cystic fibrosis. Operations Research 70(1):265-287.
   Second-place, 2019 INFORMS Health Application Society Student Paper Competition.
- 36. El-Hajj\*, H., Bish, D.R., Bish, E.K., and Aprahamian, H.Y. (2022). Screening multi-dimensional heterogeneous populations for infectious diseases under scarce testing resources, with application to COVID-19. Naval Research Logistics 69(1):3-20.
- 35. Rabil\*, M.J., Tunc, S., Bish, D.R. and Bish, E.K. (2022). *Benefits of integrated screening* and vaccination for infection control. PLOS ONE 17(4):e0267388.
- 34. Nguyen<sup>\*</sup>, N., Bish, E. K. and Bish, D.R. (2021). *Optimal pooled testing design for prevalence estimation under resource constraints.* Omega 105:102504.
- 33. Bish, D.R., Bish, E.K., El-Hajj<sup>\*</sup>, H., and Aprahamian, H.Y. (2021) A robust pooled testing approach to expand COVID-19 screening capacity. PLOS ONE 16(2):e0246285.
- 32. El-Hajj<sup>\*</sup>, H., Bish, D.R., and Bish, E.K. (2021). *Equity in genetic newborn screening*. Naval Research Logistics 68(1):44-64.

- 31. Aprahamian<sup>\*</sup>, H.Y., Bish, E.K., and Bish, D.R. (2020). *Static risk-based group testing* schemes under imperfectly observable risk. Stochastic Systems 10(4):361-390.
- 30. Aprahamian<sup>\*</sup>, H.Y., Bish, D.R., and Bish, E.K. (2020). *Optimal group testing: Structural properties and robust solutions, with application to public health screening.* <u>INFORMS</u> Journal on Computing 32(4):895-911.
- 29. Sadeghzadeh\*, S., Bish, D.R. and Bish, E.K. (2020). Optimal data-driven policies for disease screening under noisy biomarker measurement. <u>IISE Transactions</u> 52(2):166-180. Honorable Mention, Best Application Paper in the 2020 IISE Transactions Focus Issue on Operations Engineering and Analytics Featured in the January 2019 issue of ISE magazine.
- 28. Aprahamian\*, H.Y., Bish, D.R., and Bish, E.K. (2019). Optimal risk-based group testing. <u>Management Science</u> 65(9):3949-4450. Runner-up, 2017 INFORMS Pierskalla Award for the Best Paper in Healthcare Management Science.
- 27. Nguyen\*, N., Aprahamian\*, H.Y., Bish, E.K., and Bish, D.R. (2019). A methodology for deriving the sensitivity of pooled testing, based on viral load progression and pooling dilution. Journal of Translational Medicine 17:252.
- 26. Aprahamian\*, H.Y., Bish, E.K., and Bish, D.R. (2018). Adaptive risk-based pooling in public health screening. <u>IISE Transactions</u> 50(9):753-766.
  Winner, Best Applications Paper in the 2019 IISE Transactions Focused Issue on Operations Engineering and Analytics and featured in the August 2018 issue of IISE magazine.
- 25. El-Amine\*, H., Bish, E.K., and Bish, D.R. (2018). Robust post-donation blood screening under prevalence rate uncertainty. Operations Research 66(1):1-17. Finalist, 2015 INFORMS Pierskalla Award for the Best Paper in Healthcare Management Science.
- 24. Bish, D.R., Tarhini, H., Amara, R., Zoraster, R., Bosson, N., and Gausche-Hill, M. (2017). Modeling to optimize hospital evacuation planning in EMS systems. <u>Prehospital Emergency</u> <u>Care</u> 21(4):503-510.
- 23. Kamali<sup>\*</sup>, B., Bish, D.R., and Glick, R. (2017). *Optimal service order for mass-casualty incident response*. European Journal of Operational Research 261(1):355-367.
- 22. El-Amine\*, H., Bish, E.K., and Bish, D.R. (2017). Optimal pooling strategies for Nucleic Acid Testing of donated blood considering viral load growth curves and donor characteristics. <u>IISE</u> Transactions on Healthcare Systems Engineering 7(1):15-29.
- 21. Aprahamian<sup>\*</sup>, H.Y., Bish, D.R., and Bish, E.K. (2016). *Residual risk and waste in donated blood with pooled Nucleic Acid Testing.* Statistics in Medicine 35(28):5283-5301.
- 20. Tarhini<sup>\*</sup>, H. and Bish, D.R. (2016). Routing strategies under demand uncertainty. <u>Networks</u> and Spatial Economics 16(2):665-685.
- 19. Pereira\*, V.C. and Bish, D.R. (2015). Scheduling and routing for a bus-based evacuation with constant evacuee arrival rates. Transportation Science 49(4):853-867.

- 18. Bish, E.K., Moritz, E.D., El-Amine<sup>\*</sup>, H., Bish, D.R., and Stramer, S.L. (2015). Cost effectiveness of Babesia microti antibody and nucleic acid blood donation screening using results from prospective investigational studies. Transfusion 55(9):2256-2271.
- 17. Bish, D.R., Bish, E.K., Xie\*, S.R., and Stramer, S.L. (2014). Going beyond "same-for-all" testing of infectious agents in donated blood. <u>IIE Transactions</u> 46(11):1147-1168. Winner, Best Applications Paper in the IIE Transactions Focused Issue on Operations Engineering and Analytics for 2016 and featured in the October 2014 issue of IIE's Industrial Engineer magazine.
- 16. Bish, D.R., Agca<sup>\*</sup>, E., and Glick, R. (2014). Decision support for hospital evacuation and emergency response. Annals of Operations Research 221(1):89-106.
- Bish, E.K., Ragavan<sup>\*</sup>, P.K., Bish, D.R., Slonim, A.D., Stramer, S.L. (2014). A probabilistic method for the estimation of residual risk in donated blood. Biostatistics 15(4):620-635.
- 14. Bish, D.R., Sherali, H.D., and Hobeika, A.G. (2014). *Optimal evacuation planning using staging and routing*. Journal of the Operational Research Society 65:124-140.
- Glick, R., Bish, D.R., and Agca\*, E., (2013). Optimization-based decision support to assist in logistics planning for hospital evacuations. Journal of Emergency Management 11(4):261-270.
- 12. Bish, D.R., Chamberlayne<sup>\*</sup>, E.P., and Rakha, H.A. (2013). *Optimizing network flows with congestion-based flow reductions*. Networks and Spatial Economics 13(3):283-306.
- 11. Bish, D.R. and Sherali, H.D. (2013). Aggregate-level demand management in evacuation planning. European Journal of Operational Research 224(1):79-92.
- Bish, E.K., Zeng, X., Liu\*, J., and Bish, D.R. (2012). Comparative statics analysis of multi-product newsvendor networks under responsive pricing. <u>Operations Research</u> 60(5):1111-1124.
- 9. Chamberlayne\*, E.P., Rakha, H.A., and Bish, D.R. (2012). Modeling the capacity drop phenomenon at freeway bottlenecks using the INTEGRATION software. <u>Transportation</u> Letters: The International Journal of Transportation Research 4(4):227-242.
- Xie\*, S.R., Bish, D.R., Bish, E.K., Slonim, A.D., and Stramer, S.L. (2012). Safety and waste considerations in donated blood screening. <u>European Journal of Operational Research</u> 217(3):619-632.
- 7. Bish, D.R. (2011). Planning for a bus-based evacuation. OR Spectrum 33(3):629-654.
- 6. Bish, D.R., Bish, E.K., Xie\*, S.R., and Slonim, A.D. (2011). Optimal selection of screening assays for infectious agents in donated blood. <u>IIE Transactions on Healthcare Systems</u> Engineering 1(2):67-90. Winner, 2011 INFORMS Pierskalla Award for the Best Paper in Healthcare Management Science.
- 5. Bish, D.R., Bish, E.K., Liu\*, J., and Liao, L. (2011). Revenue management with aircraft re-assignment flexibility. Naval Research Logistics 58(2):136-152.

- 4. de la Garza, J.M., Akyildiz, S., Bish, D.R., and Krueger, D.A. (2011). *Network-level* optimization of pavement maintenance renewal strategies. <u>Advanced Engineering Informatics</u> 25(4):699-712.
- 3. Bish, E.K., Liu<sup>\*</sup>, J., and Bish, D.R. (2010). A note on resource flexibility with responsive pricing. Naval Research Logistics 57(2):119-126.
- 2. Bish, E.K., Suwandechochai, R., and Bish, D.R. (2004). Strategies for managing the flexible capacity in the airline industry. Naval Research Logistics 51(5):654-685.
- 1. Bish, D.R. and Mavrovouniotis, M.L. (1998). Enzymatic reaction rate limits with constraints on equilibrium constants and experimental parameters. BioSystems 47(1):37-60.

#### Papers under Review or Revision

- Bish, D.R., Bish, E.K., and El-Hajj<sup>\*</sup>, H. Disease Bundling or Specimen Bundling? Cost- and Capacity-Efficient Strategies for Multi-disease Testing with Genetic Assays. Under revision -Manufacturing & Service Operations Management.
- Rabil\*, M.J., Tunc, S., Bish, D.R. and Bish, E.K. Screening for safe opening of universities under Omicron and Delta variants of COVID-19: When less is more. Under first review.

#### Working Papers

- Hospital evacuation planning; efficiency and fairness.
- Logistic management under congestion-based flow reductions.
- Coordinating the response to a mass-casualty incident.
- The effect of seasonality on screening newborns for cystic fibrosis.
- Routing for disasters relief; efficiency and fairness.
- Equitable biomarker testing.

#### **Other Publications**

- Bish, E.K., Moritz, E.D., El-Amine<sup>\*</sup>, H., Bish, D.R., and Stramer, S.L. (2016). Letter to the editor: Cost-effectiveness of Babesia microti antibody and nucleic acid blood donation screening using results from prospective investigational studies. <u>Transfusion</u> 56(3):775-777 (peer-reviewed).
- Bish, E.K., H. El-Amine<sup>\*</sup>, D.R. Bish, S.L. Stramer, and A.D. Slonim, *Optimal selection of assays for detecting infectious agents in donated blood.* Chapter to appear in <u>Disease</u> Prevention and Treatment, Eds. N. Kong and S. Zhang, Wiley.
- Bish, D.R.,Bish, E.K., and Maddah, B. (2008). *Capacity planning and yield management*. Handbook of Logistics Engineering, Ed. G.D. Taylor, CRC Press.

- GOALI: Pooled screening design for disease biomarkers. National Science Foundation (#1761842); Role: PI (50% Responsibility).
- Optimal blood screening strategies for infectious agents: Mathematical models and decision support tools. National Science Foundation (#1129688); Role: Co-PI (50% Responsibility).
- CAREER: Decision support models for hospital and regional evacuations. National Science Foundation (#1055360); Role: PI (100% Responsibility).
- Planning decision support tools for large-scale pediatric emergencies. Carilion Clinic; Role: PI (100% Responsibility).
- Optimization-based decision support tools for hospital evacuations. Carilion Clinic; Role: PI (100% Responsibility).
- Review of hospital evacuation best practices. Carilion Clinic; Role: PI (100% Responsibility).
- Evacuation planning with demand management. National Science Foundation (#0825611); Role: PI (100% Responsibility).

## **Courses Taught**

- OM 602 Nonlinear Modeling and Optimization (graduate)
- OM 516 Operations Management (graduate)
- OM 517 Supply Chain Modeling and Analysis (graduate)
- ISE 6404 Graph Theory and Network Flows (graduate)
- ISE 5984 Strategic and Operational Decision Support Models for Logistics Systems (graduate)
- ISE 5984 Logistics Systems (graduate)
- ISE 5404 Optimization 1 (graduate)
- ISE 4424 Logistics Engineering (undergraduate)
- ISE 2404 Deterministic Operations Research (undergraduate)

### Service Activities

### University and College Service:

• Faculty Senate representing the Department of Information Systems, Statistics, and Management Science, University of Alabama

- Co-chair of the Research and Service Committee, University of Alabama Faculty Senate Committee
- Represented Virginia Tech for the state-level Smarter Care Virginia task-force, which was tasked with reducing unnecessary medical procedures and cost

## **Departmental Service:**

- OM PhD Coordinator, Department of Information Systems, Statistics, and Management Science, University of Alabama
- Chair-Website Committee, Graduate Admissions Committee, Graduate Policy Committee, Strategic Vision Committee, Undergraduate Curriculum Committee, Department of Industrial and Systems Engineering, Virginia Tech

# **Professional:**

- Journal Reviewer for Management Science, Operations Research, Transportation Science, European Journal of Operational Research, Transportation Research-B, European Journal of Operational Research, Health Care Management Science, Naval Research Logistics, Networks, Omega, and OR Spectrum, among others
- Judge for the INFORMS Health Application Society Student Paper Competition
- Proposal reviewer for the National Science Foundation and National Institutes of Health.
- Associate Editor for Heatlth Care Management Science, and previously Omega
- Reviewer for INFORMS Junior Faculty Interest Group paper competition
- Session Chair for INFORMS Annual Meetings
- Committee Co-chair for INFORMS Pierskalla Best Paper Award Committee
- Member INFORMS, IISE