

# Suchithra Rajendran

Assistant Professor

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## Core Faculty (Aug 2017 - Present)

Department of Industrial and Manufacturing Systems Engineering (IMSE), College of Engineering

Department of Marketing, Trulaske College of Business

## Affiliate Faculty

University of Missouri Informatics Institute (MUII)

June 2018 - Present

Department of Bioengineering, University of Missouri

March 2019 - Present

## EDUCATION

Ph.D. and MS in Industrial Engineering and Operations Research, The Pennsylvania State University

BE in Industrial Engineering, College of Engineering Guindy, Anna University

## SELECTED PUBLICATIONS

### Refereed Journal Publications

1. **Rajendran, S.,** & Harper, A. (2020). A simulation-based approach to provide insights on Hyperloop network operations. *Transportation Research Interdisciplinary Perspectives*, 100092.
2. **Rajendran, S.,** & Srinivas, S. (2020). Hybrid ordering policies for platelet inventory management under demand uncertainty. *IIEE Transactions on Healthcare Systems Engineering*, 10(2), 113-126.
3. **Rajendran, S.,** & Shulman, J. (2020). Study of emerging air taxi network operation using discrete-event systems simulation approach. *Journal of Air Transport Management*, 87, 101857.
4. **Rajendran, S.** (2020). Improving the performance of global courier & delivery services industry by analyzing the voice of customers and employees using text analytics. *International Journal of Logistics Research and Applications*, 1-21.
5. **Rajendran, S.,** & Ravindran, A. R. (2020). Multi-criteria approach for platelet inventory management in hospitals. *International Journal of Operational Research*, 38(1), 49-69.
6. **Rajendran, S.,** & Pagel, E. (2020). Insights on Next-Generation Manufacturing of Smart Devices using Text Analytics. *Heliyon* (In press)
7. Sinha, A., **Rajendran, S.,** Nazareth, R., Lee, W., and Ullah, S. Improving the Service Quality of Telecommunication Companies using Online Customer and Employee Review Analysis. *Quality Management Journal* (In press)
8. **Rajendran, S.** and Chamundeswari, S. (2019). Understanding the Impact of Lifestyle on the Academic Performance of Middle- and High-School Students. *Journal of Sociological Research*.
9. Shih, H., and **Rajendran, S.** (2019). Comparison of Time Series Methods and Machine Learning Algorithms for Forecasting Taiwan Blood Services Foundation's Blood Supply. *Journal of Healthcare Engineering*, 2019.

10. **Rajendran, S.**, and Zack, J. (2019). Insights on strategic air taxi network infrastructure locations using an iterative constrained clustering approach. *Transportation Research Part E: Logistics and Transportation Review*, 128, 470-505.
11. **Rajendran, S.**, and Ravindran, A. R. (2019). Inventory management of platelets along blood supply chain to minimize wastage and shortage. *Computers & Industrial Engineering*, 130, 714-730.
12. Srinivas, S., and **Rajendran, S.** (2019). Topic-based knowledge mining of online student reviews for strategic planning in universities. *Computers & Industrial Engineering*, 128, 974-984.
13. **Rajendran, S.**, Ansaripour, A., Kris Srinivasan, M., and Chandra, M. J. (2019). Stochastic goal programming approach to determine the side effects to be labeled on pharmaceutical drugs. *IISE Transactions on Healthcare Systems Engineering*, 9(1), 83-94.
14. Srinivas, S., **Rajendran, S.**, Anand, K., and Chockalingam, A. (2018). Self-reported depressive symptoms in adolescence increase the risk for obesity and high BP in adulthood. *International Journal of Cardiology*, 269, 339-342.
15. **Rajendran, S.**, and Ravindran, A. R. (2017). Platelet ordering policies at hospitals using stochastic integer programming model and heuristic approaches to reduce wastage. *Computers & Industrial Engineering*, 110, 151-164.
16. **Rajendran, S.**, Rajendran, C., and Leisten, R. (2017). Heuristic rules for tie-breaking in the implementation of the NEH heuristic for permutation flow-shop scheduling. *International Journal of Operational Research*, 28(1), 87-97.
17. **Rajendran, S.** (2016). Finite and Infinite Time Horizon Inventory Models to Minimize Platelet Wastage at Hospitals. *International Journal of Operations and Quantitative Management*. 22(2), 119 – 140.
18. **Rajendran, S.**, Srinivas, S. and Saha, C. (2015). Analysis of Operations of Port using Mathematical and Simulation Modeling. *International Journal of Logistics Systems and Management*, 20(3), 325 – 347.

#### **Papers Currently under Review/Submitted**

1. Bradley, J., and **Rajendran, S.** Increasing Adoption Rates at Animal Shelters: A Two-phase Approach to Predict Length of Stay and Optimal Shelter Allocation (1<sup>st</sup> round of revisions submitted to the *BMC Veterinary Research*)
2. **Rajendran, S.** Application of Blockchain Technique to Reduce Platelet Wastage and Shortage by Forming Hospital Collaborative Networks. (1<sup>st</sup> round of review in *IISE Transactions on Healthcare Systems Engineering*)
3. **Rajendran, S.** Centralized Routing Framework for Massive Air Taxi Cyber-Physical Systems. (Under review in *Operations Research Perspectives*)
4. **Rajendran, S.**, and Grimshaw, T. A Decision Support System to Predict Air Taxi Demand using Machine Learning Algorithms (Under review in *Journal of Air Transport Management*)
5. **Rajendran, S.**, and Pagel, E. Recommendations for Emerging Air Taxi Network Operations based on Online Review Analysis of Helicopter Services (Under review in *Heliyon*)

6. Shih, H., and **Rajendran, S.** Stochastic Inventory Model for Minimizing Blood Shortage and Outdating in a Blood Supply Chain under Supply and Demand Uncertainty (Under review in the *Journal of Healthcare Engineering*)
7. **Rajendran, S.**, and Pagel, E. Analyzing Employee and Customer Online Reviews to Enhance Service Quality of Insurance Companies (Under review in *IEEE Transactions on Systems, Man and Cybernetics: Systems*)
8. **Rajendran, S.**, and Fennewald, J. Improving Services Offered by Internet Providers by Analyzing Online Reviews using Text Analytics. (Under review in *Heliyon*)

### Book Editor

- Currently co-editing a book titled “Supply Chain Management in Manufacturing and Service Systems: Advanced Analytics for Smarter Decisions”, Expected publication: September 2020

### Book Chapters

1. Srinivas, S., and **Rajendran, S.** (2017). A Data-Driven Approach for Multi-Objective Loan Portfolio Optimization using Machine Learning Algorithms and Mathematical Programming. Big Data Analytics using Multiple Criteria Decision-Making Models, pp. 175 – 209, CRC Press.
2. **Rajendran, S.** (2016). Inventory Management at Hospitals to Minimize Platelet Wastage. Analytics in Operations/Supply Chain Management, pp. 302 – 313, New Delhi, India: I.K Publishers.
3. **Rajendran, S.**, Rajendran, C., and Ziegler, H. (2010). An Ant-Colony Algorithm to Transform Jobshops into Flowshops: A Case of Shortest-Common-Supersequence Stringology Problem. J. Suzuki and T. Nakano (Eds.) Bio-inspired Models of Network, Information, and Computing Systems: Lecture Notes of the Institute for Computer Sciences, Social Informatics and Telecommunications Engineering, pp. 413 – 424, Springer Berlin-Heidelberg.

### Conference Proceedings, Abstracts and Presentations

1. Srinivas, S., McGarvey, R., **Rajendran, S.**, Noble, J., Oveysi, Z. Tactical Decision-Making for Made-to-Order Electrical Hardware Products using Data Analytics. IISE Annual Conference, Orlando, FL, May 19 – 21, 2019.
2. Anand, K., Srinivas, S., **Rajendran, S.**, and Chockalingam, A. Moodiness and Depressive Symptoms in Adolescence Predicts Obesity and Hypertension in Adulthood. International Academy of Cardiology Annual Scientific Sessions 2018 23rd World Congress on Heart Disease, Boston, MA, July 27 – 29, 2018.
3. Anand, K., **Rajendran, S.**, Srinivas, S., and Chockalingam, A. Pessimistic Outlook in Adolescence Increases Risk for Obesity and Hypertension in Early Adulthood. International Academy of Cardiology Annual Scientific Sessions 2018 23rd World Congress on Heart Disease, Boston, MA, July 27 – 29, 2018.

4. **Rajendran, S.**, and Srinivas, S. Determining Risk Type of Customers at Financial Institutions using Machine Learning Algorithms. INFORMS Annual Meeting, Houston, TX, October 22-25, 2017.
5. **Rajendran, S.**, and Ravindran, A. Platelet Inventory Management at Hospitals. INFORMS Annual Meeting, Houston, TX, October 22-25, 2017.
6. Srinivas, S., **Rajendran, S.**, and Prabhu V. An Experiential Learning Approach to Teach Undergraduate Students. IISE Annual Conference, Pittsburgh, PA, May 19-22, 2017.
7. **Rajendran, S.**, and Ravindran, A. Platelet Ordering Policies at Hospitals using Stochastic Programming. INFORMS Annual Meeting, Nashville, Tennessee, Nov 13 – 16, 2016.
8. **Rajendran, S.**, and Ravindran, A. Inventory Management at Hospitals to Minimize Platelet Wastage. IISE Annual Conference, Nashville, Tennessee, May 30 – Jun2, 2015.
9. **Rajendran, S.** Inventory Management at Hospitals to Minimize Platelet Wastage. International Symposium in Honor of Dr. A. Ravi Ravindran, Bangalore, India, Mar 12 – 13, 2015 (Best Paper Award).
10. **Rajendran, S.**, Schleich, B., Yoon, S.W. Inventory Sharing Protocol to Minimize Blood Platelet Wastage in Hospital Network. Industrial and Systems Engineering World Conference, Washington, D.C., Sept 16 – 18, 2012.
11. Srinivas S., and **Rajendran, S.** Comparative Study of Genetic Algorithm based Approaches for Balancing Assembly Line. Proceedings of Industrial and Systems Engineering World Conference, Washington, D.C., Sept 16 – 18, 2012.
12. **Rajendran, S.**, Rajendran, C., and Leisten, R. New Rules for Tie-Breaking in the Implementation of the NEH Heuristic for Permutation Flowshop Scheduling. International Conference on Operational Research for Urban and Rural Development, Madurai, India, Dec 15 – 17, 2010.
13. **Rajendran, S.**, Rajagopal, P., and Rajmohan, M. Application of Analytic Hierarchy Procedure in Selecting Suppliers for Automated Welding Machine Manufacturer. International Conference on Operational Research for Urban and Rural Development, Madurai, India, Dec 15 – 17, 2010.

## FUNDING

### Funded Proposals

*Project/Proposal Title:* Application of Systems Engineering Tools to Aid the COE in Space Allocation Problems

- *Time range:* Jan – Dec 2020
- *Source of support:* College of Engineering (COE), University of Missouri
- *Role:* PI
- *Collaborators:* None
- *Effort:* 100%
- *Award Amount:* \$30,000

*Project/Proposal Title:* CELDi – Schneider Electric

- *Time range:* Sept 1, 2019 – Mar 20, 2020

- *Source of support:* Schneider Electric
- *Role:* Co-PI
- *Collaborators:* Dr. Ronald McGarvey, Dr. James Noble and Dr. Sharan Srinivas
- *Effort:* 30%
- *Award Amount:* \$ 35,000

*Project/Proposal Title:* On-demand Air Taxi Services – Study of Facility Location Decisions and Pricing Strategies

- *Time range:* May – July 2019
- *Source of support:* Trulaske College of Business, University of Missouri
- *Role:* PI
- *Collaborators:* Dr. Srinath Gopalakrishna
- *Effort:* 95%
- *Award Amount:* \$2,500

*Project/Proposal Title:* CELDi – Schneider Electric

- *Time range:* August 2018 – July 2019
- *Source of support:* Schneider Electric
- *Role:* Co-PI
- *Collaborators:* Dr. Ronald McGarvey, Dr. James Noble and Dr. Sharan Srinivas
- *Effort:* 17%
- *Award Amount:* \$65,000

*Project/Proposal Title:* Healthcare Operations Management and Engineering Analytics Consortium

- *Time range:* April 2018 – Present
- *Source of support:* College of Engineering, University of Missouri
- *Role:* PI
- *Collaborators:* Dr. Anand Chockalingam, Dr. Sheila Grant, Dr. Jung Hyup Kim, Dr. Cerry Klein, Dr. James Noble, Dr. Luis Occena, Dr. Kangwon Seo, Dr. Lincoln Sheets, Dr. Chi-Ren Shyu, Dr. Sharan Srinivas
- *Effort:* 50%
- *Award Amount:* \$20,000

*Project/Proposal Title:* Inventory Management of Blood Platelets at Hospitals to Minimize Wastage and Shortage

- *Time range:* Dec 2017 – Dec 2018
- *Source of support:* University of Missouri
- *Role:* PI
- *Collaborators:* None
- *Effort:* 100%
- *Award Amount:* \$2,700

**Proposals to Revise and Resubmit**

*Project/Proposal Title:* Predicting Burnouts among Teachers in Public Schools using Machine Learning

- *Time range:* Sept 1, 2020 – Jan 31, 2022
- *Source of support:* Research and Creative Works Strategic Investment Program
- *Role:* PI
- *Collaborators:* Dr. Sharan Srinivas
- *Effort:* 70%
- *Award Amount:* \$58,668.59

**Proposals Currently Under Review**

*Project/Proposal Title:* Developing Classification Models to Predict Patient Risk for Disc Degeneration

- *Time range:* Sept 1, 2020 – Aug 31, 2022
- *Source of support:* National Institutes of Health (NIH)
- *Role:* PI
- *Collaborators:* Dr. Theodore Choma and Dr. Muhammad Mirza
- *Effort:* 70%
- *Award Amount:* \$ 162,873

*Project/Proposal Title:* Collaborative Research: REU Site: Logistics and Distribution Analytics

- *Time range:* Feb 1, 2020 – Jan 31, 2023
- *Source of support:* The National Science Foundation
- *Role:* Co-PI
- *Collaborators:* Dr. James Noble
- *Effort:* 20%
- *Award Amount:* \$ 94,855

**HONORS & AWARDS**

Winemiller Excellence Award	March 2020
1907 Women in Engineering Faculty Award	Nov 2018
Honorable Mention, Winemiller Excellence Award	March 2018
Service Enterprise Engineering (SEE) Fellowship	Jan 2017 – Jun 2017
Nominated and Finalist, Gilbreth Memorial Fellowship	Jun 2016
Best paper award, International Symposium held in Honor of Prof. Ravindran	Mar 2015
Center for Integrated Healthcare Delivery Systems Scholarship	Aug 2012 – May 2013
German Academic Exchange Service (DAAD-WISE) Fellowship	May – Jul 2010

**RESEARCH INTERESTS**

Big Data Analytics; Healthcare Systems; Mathematical and Simulation Modeling; Quality Analytics; Multiple Criteria Decision Making; Scheduling; Supply Chain Management

## TEACHING EXPERIENCE

### Instructor, University of Missouri

- Supply Chain Modeling and Analysis (Spring 2020)
- Engineering Quality Control (Spring 2020; Spring 2019)
- Marketing Supply Chain Analytics (Fall 2019; Fall & Spring 2018)
- Systems Simulation (Fall 2017)

## CURRENT STUDENT ADVISEE

### Ph.D.:

- Akhouri Sinha, IMSE, Role: Advisor
- Han Shih, IMSE, Role: Advisor
- Janae Bradley, Bioengineering, Role: Co-advisor
- Rakhmat Himawan, IMSE, Role: Committee Member

### Masters:

- Austin Laramie, IMSE, Role: Committee Member
- Lakshmanaprakash Murugesan, IMSE, Role: Committee Member
- Rohith Reddy, IMSE, Role: Committee Member

### Undergraduate:

- Mary Catherine Brown, IMSE, Role: Project Mentor
- Trenton Grimshaw, IMSE, Role: Undergraduate Honors Thesis Advisor
- John Fennewald, IMSE, Role: Project Mentor
- Matthew Furrer, IMSE, Role: Project Mentor
- Aidan Harper, IMSE, Role: Undergraduate Honors Thesis Advisor
- Nathaniel McMahon, IMSE, Role: Project Mentor
- Emily Pagel, IMSE, Role: Undergraduate Honors Thesis Advisor
- Nicholas Pentz, Marketing, Role: Project Mentor
- Jake Shulman, IMSE, Role: Project Mentor
- Abdulah Sibalo, EECS, Role: Project Mentor
- Corey Wands, IMSE, Role: Project Mentor
- Joshua Zack, IMSE, Role: Project Mentor

## VISITING FACULTY

University of Passau, Germany (Summer 2018 and 2019)

## INVITED TALKS

- Rajendran, S. A Decision Support System to Reduce Platelet Wastage and Shortage by Forming Hospital Collaborative Networks, College of Engineering New Faculty Seminar Series, University of Missouri, February 15, 2019

- Rajendran, S. Machine Learning Algorithm for Degenerative Disc Risk Prediction, Industrial Engineering Graduate Seminar Series, University of Missouri, September 24, 2018
- Rajendran, S. A DSS to Reduce Platelet Wastage and Shortage by Forming Hospital Collaborative Networks. Industrial Engineering Graduate Seminar Series, University of Missouri, February 19, 2018
- Rajendran, S. Platelet Inventory Management in Blood Supply Chain. Industrial Engineering Graduate Seminar Series, University of Missouri, September 25, 2017
- Rajendran, S. Applications of Machine Learning in the Service Sector. EECS Seminar Series, April 11, 2018
- Rajendran, S. Supply Chain Analytics. Guest Speaker in Business-to-Business Marketing MBA Course, March 12, 2018
- Rajendran, S. Inventory Management at Hospitals to Minimize Platelet Wastage. Enterprise Integration Consortium Industry Advisory Board Meeting, Penn State, October 28, 2013

### ACADEMIC-INDUSTRY COLLABORATIVE EXPERIENCE

**Consultant, Taiwan Blood Services Foundation** Jun 2018 – Jun 2019

- Developed forecasting models to effectively predict daily blood supply using machine learning algorithms

**Consultant, Roche** Aug – Nov 2018

- Evaluated cost effectiveness of a tumor board solution software using propensity score matching technique

**Research Assistant, Department of Industrial and Manufacturing Engineering, Penn State**

*Case New Holland (CNH), PA, USA* May 2013 – May 2014

- Worked with Logistics Innovation & New Technologies team to select carriers for parts transportation
- Designed a screening model to identify erroneous and missing data from 100,000 bids
- Shortlisted best carriers using multiple criteria optimization models
- Developed models to analyze scenarios based on different cost and time settings

### INDUSTRY EXPERIENCE

**Logistics, Service and Operations Intern, Case New Holland (CNH)** Jun – Dec 2014

- Constructed models and developed dashboards to visually display statistical results
- Evaluated third party logistics service providers using past historical information
- Selected best providers based on on-time fulfillment rate, cost, quality and delivery time

### ACADEMIC PROJECTS

**Machine Learning Algorithm to Predict Intervertebral Disc Degeneration (IDD)** Jan 2018 – Present

- Early detection of IDD can avoid chronic lower back pain condition that leads to a major cause of disability
- Identified factors that significantly contribute to IDD using machine learning algorithms

**Platelet Inventory Management in Blood Supply Chains**

Aug 2012 – Present

- Hospitals and blood centers main high platelet inventory to minimize shortage resulting in a significant wastage
- Formulating stochastic mathematical models and heuristic approaches to determine platelet ordering policies

**Predict Length of Stay of Animals at Shelters**

Jan – Dec 2019

- Nearly 1.5 million shelter animals are euthanized every year
- Used machine learning algorithms to increase the adoption rate of animals at shelters by predicting the length of stay of an animal considering several factors such as breed, gender, color and age

**Prevention of Cardio-vascular Disease by Analyzing Self-reported Depressive Symptoms**

Jan – May 2018

- Investigated whether self-reported depressive symptoms in adolescence affect adulthood obesity and high BP

**Text Analysis of Online Student Reviews**

Aug 2017 – June 2018

- Analyzed online student reviews to identify student experience at universities
- Used text analytics to perform strength, weakness, opportunities and threats (SWOT) analyses
- Provided efficient & economic performance summary of university and its competitors

**Loan Portfolio Optimization using Machine Learning Approaches**

Jun 2015 – Aug 2016

- Designed a two-phase decision support system by analyzing millions of loan approval records
- Used machine learning algorithms for classifying customers based on risk type in Phase-I
- Developed a goal programming model for constructing an optimal loan portfolio in Phase-II

**Analysis of Drug Manufacturing and Packaging Process in Pharmaceutical Companies**

Aug – Dec 2011

- Studied different stages in drug development
- Analyzed current manufacturing practices and standards for drug packaging
- Reviewed and summarized drug storage regulations across the globe

**REVIEWER**

- Computers and Industrial Engineering
- Computers and Operations Research
- Heliyon
- IEEE Transactions on Systems, Man and Cybernetics: Systems
- Institute of Industrial and Systems Engineers Annual Conference
- International Journal of Operational Research
- International Journal of Logistics Research and Applications
- International Journal of Logistics Systems and Management
- Omega
- Operational Research
- Transportation Research Part E: Logistics and Transportation Review

**PROFESSIONAL SERVICE**

- Committee Chair, Graduate Focus Area Committee, IMSE Department
- Member, Funding Proposal Review Committee, Department of Marketing
- Member, Awards Committee, College of Engineering
- Member, Space Council, College of Engineering
- Member, Institute of Industrial and Systems Engineers (IISE)
- Member, Institute for Operations Research and the Management Sciences (INFORMS)
- Session chair, IISE Annual Meetings
- Session chair, INFORMS Annual Meetings