Sujee Lee, Ph.D.

2066 Seobu-ro, Jangan-gu, Suwon-si, Gyeonggi-do, Republic of Korea (16419)

sujeelee@skku.edu • +82 31-290-7592

PRESENT POSITION

Assistant Professor @ Sungkyunkwan University, Suwon, Republic of Korea   Mar. 2024 – Present

Department of Systems Management Engineering / Industrial Engineering

EDUCATION

University of Wisconsin - Madison, USA

Ph.D. Industrial & Systems Engineering   Sep. 2016 – Jan. 2021

- Thesis: A Smart and Connected Healthcare Delivery Process: From Prediction to Decision Support
- Focus: Machine learning and Operations research models in Healthcare systems

M.S. Computer Sciences   Sep. 2018 – Sep. 2020

Seoul National University, Seoul, Republic of Korea

M.S. Industrial Engineering   Mar. 2013 – Aug. 2016

- Thesis: A Study on Recurrent Neural Network Training Methods for Sequential Data
- Focus: Statistical learning methods including Clustering algorithms, Dimension reduction, and Deep learning

B.S. Industrial Engineering / Computer Science and Engineering   Mar. 2008 – Feb. 2013

RESEARCH INTERESTS

- Data Science, Machine Learning, Deep Learning, Operations Research, Healthcare Applications.
- Integration of machine learning and operations research methodologies (e.g. optimization, Markov decision process, stochastic process) for various applications including healthcare applications

TEACHING COURSES

Assistant Professor, Soongsil University

Artificial Intelligence and Machine Learning (graduate), Spring 2023

Deep Learning (graduate), Fall 2022

Data Analytics and Applications, Spring 2022

Data Structure and Algorithms, Spring 2021, Spring 2022, Spring 2023

Discrete Mathematics, Fall 2021, Fall 2022, Fall 2023

WORKING EXPERIENCE

Assistant Professor, Soongsil University

Department of Industrial and Information Systems Engineering   Mar. 2021 – Feb. 2023

Applied Scientist Intern, Amazon

Amazon Device-Demand Planning   May. 2019 – Aug. 2019

- Developed machine learning models and training pipelines for forecasting future demands of Amazon devices using the historical sales-related data and future prices
- Proposed Feature Grouping Sequence-to-Sequence deep learning model in order to facilitate a better use of the data specific to Amazon devices

Research Assistant Intern, Samsung Research America

Digital Health Team   May. 2018 – Aug. 2018

- Conducted a clinical research study collecting mobile sensor and audio data from COPD and asthma patients, and built machine learning models to detect cough or sounds related to the lung diseases

- Developed speech obfuscation algorithms to collect audio sounds, which can be used to detect health-related information, from wearable devices without any concern of privacy

Research Assistant, College of Medicine, Seoul National University
Smart Management Strategy for Health Laboratory   Jan. 2016 – May. 2017
- Conducted researches on machine learning based predictive models for survival of breast cancer
- Conducted text mining and sentiment analysis with news and customer review data for analyzing health-related public opinions on the top 100 Korean corporations
- Developed a brand-integrated sentiment-topic model based on Latent Dirichlet Allocation through an ongoing research cooperation

PROFESSIONAL ACTIVITIES

Associate Editor, IEEE International Conference on Automation Science and Engineering (CASE)

Associate Editor, IEEE Robotics and Automation Letters (RA-L)

Reviewer, Journal of Biomedical Informatics

Reviewer, IISE Transactions

Reviewer, IISE Transactions on Healthcare Systems Engineering

Reviewer, Flexible Services and Manufacturing Journal

Reviewer, Operations Research Forum

Reviewer, BMC Cancer

Member, Institute of Electrical and Electronics Engineers (IEEE)

Member, Institute for Operations Research and the Management Sciences (INFORMS)

Member, Institute of Industrial and Systems Engineers (IISE)

HONORS AND AWARDS

Outstanding Course Portfolio First Prize, Soongsil University	Jul. 2021
Rea C. and David H. Gustafson Scholarship, University of Wisconsin-Madison	Sep. 2018, Sep. 2019
Wisconsin Distinguished Graduate Fellowship, University of Wisconsin-Madison	Sep. 2018 – Aug. 2019
NSF Student Travel Award, National Science Foundation	Aug. 2019
IEEE RAS Travel Grant, IEEE Robotics and Automation Society	Aug. 2019
Graduate Student Travel Award from ISyE department, University of Wisconsin-Madison	May. 2018
Global Ph.D Fellowship, National Research Foundation, Republic of Korea	Mar. 2013 – Dec. 2015
Honor Society in College of Engineering (The 1st Member of STEM), Seoul National University	2010 – 2012
Lee Chung-Han Award (Excellence in Academics), Seoul National University	Aug. 2011
Superior Academic Performance & Eminence Scholarship, Seoul National University	2009 – 2011
National Scholarship for Science and Engineering, Korea Student Aid Foundation, Republic of Korea	2008 – 2010

PUBLICATIONS

Journal Papers

1. <u>S. Lee</u>, Y. Lim, and K. Lim, "Multimodal sensor fusion models for real-time exercise repetition counting with IMU sensors and respiration data", *Information Fusion*, doi: 10.1016/j.inffus.2023.102153, Apr 2024.

2. Y. Choe, <u>S. Lee</u>, Y. Lim, and S. Kim, "Machine learning-derived model for predicting poor post-treatment quality of life in Korean cancer survivors", *Supportive Care in Cancer*, vol. 32, doi: 10.1007/s00520-024-08347-z, Feb 2024.

3. <u>S. Lee</u>, P. Bain, A. Musa, C. Baker and J. Li, "A Causal Network-Based Markov Decision Process Model for Intervention Planning", *IEEE Transactions on Automation Science and Engineering*, vol. 21, no. 1, pp. 706-720, Jan 2024.

4. J. Yun, J. Sim, <u>S. Lee</u> and Y. Yun, "Stronger association of perceived health with socio-economic inequality during COVID-19 pandemic than pre-pandemic era", *BMC Public Health*, vol. 22, no. 1, pp. 1–13, Sep 2022.

5. <u>S. Lee</u>, L. Liu, R. Radwin and J. Li, "Machine Learning in Manufacturing Ergonomics: Recent Advances, Challenges, and Opportunities", *IEEE Robotics and Automation Letters*, vol. 6, no. 3, pp. 5745–5752, Jul 2021.

6. <u>S. Lee</u>, P. Bain, A. Musa, C. Baker and J. Li, "An Integrated Opioid Prescription Optimization Framework for Total Joint Replacement Surgery Patients", *IISE Transactions on Healthcare Systems Engineering*, vol. 11, no. 3, pp. 209–223, Jul 2021.

7. Y. Yun, S. Oh, S. Sim, <u>S. Lee</u> and E. Sohn, "Development and validation of the Health-Friendly Activity Index: an assessment tool to comprehensively measure health-friendly activities of corporations or organisations", *BMJ Open*, doi:10.1136/bmjopen-2021-048768, Jul 2021.

8. <u>S. Lee</u>, P. Bain, A. Musa and J. Li, "A Markov chain model for analysis of physician workflow in primary care clinics", *Health Care Management Science*, vol. 24, pp. 72–91, Mar 2021.

9. <u>S. Lee</u>, S. Wei, V. White, P. Bain, C. Baker and J. Li, "Classification of Opioid Usage through Semi-supervised Learning for Total Joint Replacement Patients", *IEEE Journal of Biomedical and Health Informatics*, vol. 25, no. 1, pp. 189–200, Jan 2021.

10. Y. Yun, J. Sim, Y. Kim, <u>S. Lee</u> and K. Kim, "Consumers' consciousness of health-friendly products and services and its association with sociodemographic characteristics and health status: a cross-sectional survey of the Korean general population", *BMJ Open*, doi: 10.1136/bmjopen-2019-035591, Jun 2020.

11. X. Zhong, <u>S. Lee</u>, C. Zhao, H. Lee, P. Bain, T. Kundinger, C. Sommers, C. Baker and J. Li, "Reducing COPD readmissions through predictive modeling and incentive-based interventions," *Health Care Management Science*, vol. 22, no. 1, pp. 121–139, Mar 2019.

12. <u>S. Lee</u>, S. Wang, P. Bain, T. Kundinger, C. Sommers, C. Baker and J. Li, "Modeling and Analysis of Postdischarge Intervention Process to Reduce COPD Readmissions," *IEEE Transactions on Automation Science and Engineering*, vol. 16, no. 1, pp. 21–34, Jan 2019.

13. <u>S. Lee</u>, S. Wang, P. Bain, C. Baker, T. Kundinger, C. Sommers and J. Li, "Reducing COPD Readmissions: A Causal Bayesian Network Model," *IEEE Robotics and Automation Letters*, vol. 3, no. 4, pp. 4046–4053, Oct 2018.

14. Y. Son, <u>S. Lee</u>, S. Park and J. Lee, "Learning representative exemplars using one-class Gaussian process regression," *Pattern Recognition*, vol. 74, pp. 185–197, Feb 2018.

15. <u>S. Lee</u>, B. Koo and K. Jung, "Comparative Study of Dimension Reduction Methods for Highly Imbalanced Overlapping Churn Data", *Industrial Engineering & Management Systems*, vol. 13, no. 4, pp. 454–462, Dec 2014.

Submitted Papers

1. Y. Lim, <u>S. Lee</u>, "Few-Shot Learning-Based Generalized Real-Time Exercise Repetition Counting Model," submitted to IEEE Journal Of Biomedical & Health Informatics.

2. K. Lim, <u>S. Lee</u>, "Development of Causality Extraction Models for COPD: A Pattern-Based Data Generation and BERT-Enhanced Deep Learning Approach," submitted to Expert Systems With Applications.

3. <u>S. Lee</u>, I. Cho, and E. Kim, "Development of Risk Prediction Models for Inpatient Peripheral Intravenous Catheters-related Complications: Focusing on the Occurrence of Phlebiti," submitted to IEEE Robotics and Automation Letters.

In Preparation

1. Y. Lim, I. Park, and <u>S. Lee</u>, "Batch-Constrained Reinforcement Learning Approaches for Optimizing Heparin Treatment," in progress (will be submitted soon).

2. K. Lim, J. Ha, S. Oh, and <u>S. Lee</u>, "Constructing a Causal Network for COPD Using Rule-Based Causality Extraction from Medical Literature", in progress (will be submitted soon).

3. <u>S. Lee</u>, J. Sim, J. Yun, and Y. Yun, "Development of a Deep Neural Network on Large-Dimensional Health Survey Data for Explainable Depression Risk Prediction and Interventions," in progress.

4. <u>S. Lee</u>, N. Lantz, Y. Kim, and J. Li, "Discovering Healthcare Utilization Patterns for COPD Patients and their dynamic transitions", in progress.

Peer-Reviewed Conference Proceedings

1. <u>S. Lee</u>, E. Nemati and J. Kuang, "Configurable Pulmonary-Tuned Privacy Preservation Algorithm for Mobile Devices", in *Proceedings of 2018 IEEE International Conference on Bioinformatics and Biomedicine (BIBM)*, Madrid, Spain, pp. 1107–1112, Dec 2018.
2. <u>S. Lee</u>, X. Zhong, H. Lee, C. Zhao, P. Bain, T. Kundinger, C. Sommers, C. Baker and J. Li, "Incentive-Based Optimal Intervention Policy to Reduce Hospital Readmissions for COPD Patients", in *Proceedings of the 13th Conference on Automation Science and Engineering*, Xi'an, China, Aug 2017.

CONFERENCE PRESENTATIONS

1. <u>S. Lee</u>, P. Bain, and J. Li, "A Machine Learning Integrated Opioid Prescription Optimization Framework", in *2021 INFORMS (The Institute for Operations Research and the Management Sciences) Annual Meetings*, Anaheim, California, USA, Oct 2021.

2. <u>S. Lee</u>, L. Liu, R. Radwin, and J. Li, "Machine Learning in Manufacturing Ergonomics:Recent Advances, Challenges, and Opportunities", in *2021 CASE (17th IEEE International Conference on Automation Science and Engineering)*, Virtual, Aug 2021.

3. <u>S. Lee</u>, P. Bain, and J. Li, "Integration of Machine Learning and Optimization Models for Opioid Prescriptions", in *2020 INFORMS (The Institute for Operations Research and the Management Sciences) Annual Meetings*, Virtual, Nov 2020.

4. <u>S. Lee</u>, P. Bain, C. Baker and J. Li, "Opioid Prescription Optimization for Total Joint Replacement Surgery Patients ", in *2020 IISE (Institute of Industrial and Systems Engineers) Annual Conference*, Virtual, Nov 2020.

5. <u>S. Lee</u>, N. Lantz, Y. Kim and J. Li, "Analysis of Healthcare Utilization Patterns for COPD Patients", in *2020 CASE (16th IEEE International Conference on Automation Science and Engineering)*, Virtual, Aug 2020.

6. <u>S. Lee</u>, P. Bain, J. Goffinet, C. Baker and J. Li, "Opioid Usage Level Classification and Prescription Optimization Model For Total Joint Replacement Surgery Patients ", in *2019 INFORMS (The Institute for Operations Research and the Management Sciences) Annual Meetings*, Seattle, Washington, USA, Oct 2019.

7. <u>S. Lee</u>, S. Wei, V. White, P. Bain, C. Baker and J. Li, "A Semi-Supervised Classification Model for Predicting Opioid Usage after Total Knee and Hip Replacement Surgery ", in *2019 CASE (15th IEEE International Conference on Automation Science and Engineering)*, Vancouver, Canada, Aug 2019.

8. <u>S. Lee</u>, P. Bain, J. Goffinet, C. Baker and J. Li, "A Machine Learning Based Personalized Intervention Decision Model for Reducing COPD Readmissions", in *2018 INFORMS (The Institute for Operations Research and the Management Sciences) Annual Meetings*, Phoenix, Arizona, USA, Nov 2018.

9. <u>S. Lee</u>, S. Wang, P. Bain, C. Baker, T. Kundinger, C. Sommers,and J. Li, "Reducing COPD Readmissions: A Causal Bayesian Network Model", in *2018 CASE (14th IEEE International Conference on Automation Science and Engineering)*, Munich, Germany, Aug 2018.

10. <u>S. Lee</u>, P. Bain and J. Li, "Modeling a Primary Care Physician's Workflow Using a Terminating Markov Chain", in *2018 IISE (Institute of Industrial and Systems Engineers) Annual Conference*, Orlando, Florida, USA, May 2018.

11. <u>S. Lee</u>, P. Bain, C. Baker and J. Li, "Achieving Optimal Patient-centered Interventions to Reduce Readmission for COPD Patients", in *2017 INFORMS (The Institute for Operations Research and the Management Sciences) Annual Meetings*, Houston, Texas, USA, Nov 2017.

12. <u>S. Lee</u>, S. Park, Y. Son and J. Lee, "Multi-basin Support Vector Machine for Big Data Analysis Using Hadoop Systems", in *2014 Euro-Asia Conference on Computational Intelligence and Communication Networks*, Antalya, Turkey, Apr 2014.

13. <u>S. Lee</u>, B. Koo, K. Jung and J. Lee, "Using Deep-Learning Technique on Dimension Reduction for Efficient Churn Prediction", in *Korea Business Intelligence Data Mining Society 2014 Fall Conference*, Busan, Korea, Nov 2014.

14. <u>S. Lee</u>, S. Han and J. Lee, "Support Vector Clustering Using Hadoop and R", in *Korean Institute of Industrial Engineers 2013 Fall Conference*, Suwon, Korea, Nov 2014.

RESEARCH PROJECTS

Sep. 2023 – Feb. 2024,
Development of Activity Recognition Models Based on Pet-driven Data and Identification of Pet Care Service Concepts, Samsung Electronics (PI)

Jun. 2021 – Feb. 2024,
Development of a Data-Driven Causal Discovery System for Personalized Chronic Obstructive Pulmonary Disease (COPD) Intervention Planning, (Grant No. NRF-2021R1F1A1061093), National Research Foundation of Korea. (PI)

Jun. 2022 – Nov. 2022,
Development of Real-time Detection Algorithms for Exercise Repetition Counting, Samsung Electronics (PI)

Jul. 2021 – Jun. 2022,
Development of Algorithm for Robust Semi-Supervised Learning Based on Confidence of Estimates, Soongsil University (New Faculty Research Fund). (PI)

Sep. 2016 – Act. 2020,
Improving Access to Primary Care through E-Visits: Theory and Applications, (Grant No. NSF-CMMI-1536987), National Science Foundation (RA @ UW-Madison)

Mar. 2013 – Feb. 2016,
Development of Data Mining Technique for Real Time Financial Markets Analysis, (Grant No. NRF-2013H1A2A1033599), National Research Foundation of Korea. (PI)