Sunghoon Lim, Ph.D.

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http://sunghoonlim.unist.ac.kr/

Research Interests

Topics Machine Learning / Deep Learning, Industrial Artificial Intelligence (AI+X), (Unstructured) Data Mining

Applications Manufacturing (e.g., Smart Factory, Predictive Maintenance, Anomaly Detection, Additive Manufacturing), Safety Management, Customer Feedback Analysis (e.g., Social Media, Online Customer Reviews, Recommender Systems), Healthcare (e.g., Disease Discovery)

Academic Appointments

Jun. 2021 – Present **Head**, Institute for the 4th Industrial Revolution
Ulsan National Institute of Science and Technology (UNIST), Ulsan, Republic of Korea

Aug. 2018 – Present **Assistant Professor**, Department of Industrial Engineering
Ulsan National Institute of Science and Technology (UNIST), Ulsan, Republic of Korea

Education

Jan. 2014 – May 2018 **Ph.D.** Industrial Engineering
The Pennsylvania State University, University Park, Pennsylvania, United States (Advisor: Dr. Conrad S. Tucker)
Dissertation Title: EVENT DETECTION AND PREDICTION USING ONLINE USER GENERATED DATA
Dissertation Committee: Dr. Conrad S. Tucker, Dr. Soundar Kumara, Dr. Ling Rothrock, Dr. Nilam Ram

Aug. 2012 – Dec. 2013 **M.S.** Industrial Engineering
The University of Pittsburgh, Pittsburgh, Pennsylvania, United States (Advisor: Dr. Jayant Rajgopal)

Mar. 2006 – Jan. 2009 **M.S.** Industrial Engineering
KAIST, Daejeon, Republic of Korea (Advisor: Dr. Chang Sup Sung)

Mar. 2001 – Aug. 2005 **B.S.** Industrial Engineering
KAIST, Daejeon, Republic of Korea

Peer-reviewed Journal Publications (†: Corresponding Author, #: Equal Contribution)

Kim, Kyudong, Heena No, Kijung Park†, Hyun Woo Jeon, and **Sunghoon Lim**. "Characterization of Power Demand and Energy Consumption for Fused Filament Fabrication Using CFR-PEEK." *Rapid Prototyping Journal* (In press)

Hwang, Seong Wook, and **Sunghoon Lim†**. "The Charging Infrastructure Design Problem with Electric Taxi Demand Prediction Using Convolutional LSTM." *European Journal of Industrial Engineering* 16, no. 1 (2022): 1.

Kim, Gyeongho#, Jae Gyeong Choi#, Minjoo Ku, Hyewon Cho, and **Sunghoon Lim†**. "A Multimodal Deep Learning-Based Fault Detection Model for a Plastic Injection Molding Process." *IEEE Access* 9 (2021): 132455-132467.

Tuarob, Suppawong, Poom Wettayakorn, Ponpat Phetchai, Siripong Traivijitkhun, **Sunghoon Lim**, Thanapon Noraset, and Tipajin Thaipisutikul†. "DAViS: A Unified Solution for Data Collection, Analyzation, and Visualization in Real-time Stock Market Prediction." *Financial Innovation* 7 (2021): 56.

Lim, Sunghoon†, Sun Jun Kim, YoungJae Park, and Nahyun Kwon. "A deep learning-based time series model with missing value handling techniques to predict various types of liquid cargo traffic." *Expert Systems with Applications* 184 (2021): 115532.

Choi, Jae Gyeong, Chan Woo Kong, Gyeongho Kim, and **Sunghoon Lim†**. "Car crash detection using ensemble deep learning and multimodal data from dashboard cameras." *Expert Systems with Applications* 183 (2021): 115400.

Tama, Bayu Adhi, and **Sunghoon Lim†**. "Ensemble learning for intrusion detection systems: A systematic mapping study and cross-benchmark evaluation." *Computer Science Review* 39 (2021): 100357.

Nkenyereye, Lewis, Bayu Adhi Tama, and **Sunghoon Lim†**. "A Stacking-based Deep Neural Network Approach for Effective Network Anomaly Detection." *Computers, Materials & Continua* 66, no. 2 (2021): 2217-2227.

Tama, Bayu Adhi, and **Sunghoon Lim†**. "A Comparative Performance Evaluation of Classification Algorithms for Clinical Decision Support Systems." *Mathematics* 8, no. 10 (2020): 1814.

Chatterjee, Sujoy, and **Sunghoon Lim†**. "A Multi-objective Differential Evolutionary Method for Constrained Crowd Judgment Analysis." *IEEE Access* 8 (2020): 87647-87664.

Lim, Sunghoon, and Conrad S. Tucker†. "Mining Twitter data for causal links between tweets and real-world outcomes." *Expert Systems with Applications: X* 3 (2019): 100007.

Lim, Sunghoon, Conrad S. Tucker†, Kathryn Jablokow, and Bart Pursel. "A semantic network model for measuring engagement and performance in online learning platforms" *Computer Applications in Engineering Education* 26, no. 5 (2018): 1481-1492.

Tuarob, Suppawong, **Sunghoon Lim**, and Conrad S. Tucker†. "Automated Discovery of Product Feature Inferences within Large Scale Implicit Social Media Data." *Journal of Computing and Information Science in Engineering* 18, no. 2 (2018): 021017.

Lim, Sunghoon, and Conrad S. Tucker†. "Mitigating Online Product Rating Biases Through the Discovery of Optimistic, Pessimistic, and Realistic Reviewers." *Journal of Mechanical Design* 139, no. 11 (2017): 111409.

Lim, Sunghoon, Conrad S. Tucker†, and Soundar Kumara. "An unsupervised machine learning model for

discovering latent infectious diseases using social media data." *Journal of Biomedical Informatics* 66 (2017): 82-94.

Lim, Sunghoon, and Conrad S. Tucker†. "A Bayesian Sampling Method for Product Feature Extraction From Large-Scale Textual Data." *Journal of Mechanical Design* 138, no. 6 (2016): 061403.

Peer-reviewed Journal Publications: Under Review (†: Corresponding Author, #: Equal Contribution)

Kim, Gyeongho, and **Sunghoon Lim†**. "Development of an Interpretable Maritime Accident Prediction System Using Machine Learning Techniques." *IEEE Access* (Under Review)

Tama, Bayu Adhi#, Malinda Vania#, Iljung Kim, and **Sunghoon Lim†**. "An EfficientNet-based Weighted Ensemble Model for Industrial Machine Malfunction Detection Using Acoustic Signals." *IEEE Access* (Under Review)

Chatterjee, Sujoy, and **Sunghoon Lim†**. "A TOPSIS-inspired ranking method using constrained crowd opinions for urban planning." *Entropy* (Under Review)

Tama, Bayu Adhi, Seungchul Lee†, and **Sunghoon Lim†**. "Recent Advances in the Application of Deep Learning Techniques for Fault Detection Using Vibration Signals: A Systematic Review." *Artificial Intelligence Review* (Under Review)

Peer-reviewed Conference Proceedings (†: Corresponding Author)

Chatterjee, Sujoy, and **Sunghoon Lim†**. "A TOPSIS-based Multi-objective Model for Constrained Crowd Judgment Analysis", In *Eighth AAAI Human Computation and Crowdsourcing (HCOMP-2020)*, 2020. [Works-in-Progress]

Lim, Sunghoon, Conrad S. Tucker†, Kathryn Jablokow, and Bart Pursel. "Quantifying the Mismatch between Course Content and Students' Dialogue in Online Learning Environments." In *ASME 2017 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference*, American Society of Mechanical Engineers, 2017. [**Design Education (DEC) Technical Committee Best Paper**]

International Conference Presentations (*: Presenter, †: Corresponding Author)

Hwang, Seong Wook*, and **Sunghoon Lim**†. "The Charging Infrastructure Design Problem with Electric Taxi Demand Prediction Using Convolutional LSTM." *INFORMS Annual Meeting*, Seattle, Washington, 2019.

Lim, Sunghoon*, and Conrad S. Tucker†. "Population Health Data Mining with a Real-time Social Network Map." *CHOT Fall Industry Advisory Board Meeting 2017*, The Center for Health Organization Transformation (CHOT), Birmingham, Alabama, 2017.

Lim, Sunghoon*, Conrad S. Tucker†, and Harriet B. Nembhard. "Sensing Systems for Personalized Telehealth Wellness Management." *2016 Fall Penn State CHOT Symposium*, The Center for Health Organization Transformation (CHOT), University Park, Pennsylvania, 2016.

Tucker, Conrad S.*,†, **Sunghoon Lim**, Yifeng Yu, and Harriet B. Nembhard. "Sensing Systems for Personalized Telehealth Wellness Management." *CHOT Spring Industry Advisory Board Meeting 2016*, The Center for Health Organization Transformation (CHOT), Houston, Texas, 2016.

Domestic Conference Presentations (*: Presenter, †: Corresponding Author)

Kim, Gyeongho, Jae Gyeong Choi, Minjoo Ku, Hyewon Cho, and **Sunghoon Lim**[*,†]. "Developing a deep learning-based fault detection model for plastic injection molding for car parts companies." *KSQM Spring Conference*, Seoul, Republic of Korea, 2021.

Kim, Sun Jun[*], and **Sunghoon Lim**†. "A deep learning-based hybrid recommender system with fake review filtering for e-commerce customers." *KIIE Fall Conference*, Seoul, Republic of Korea, 2020.

Choi, Jae Gyeong[*], Chan Woo Kong, and **Sunghoon Lim**[†]. "Developing machine-learning-based car crash detection systems using video and audio data." *KIIE Fall Conference*, Seoul, Republic of Korea, 2019.

Baek, DaeSeon, and **Sunghoon Lim**[*,†]. "Smart farming: Developing growth programs and reforming environmental conditions for hog raising using machine vision and deep learning." *KIIE/KORMS/KSS Joint Spring Conference*, Gwangju, Republic of Korea, 2019.

Research Grants

Dec. 2021 – Feb. 2022 "인공지능 기반의 평가모델 및 추천시스템 개발에 관한 기술자문" (Technical Advisement), (주)맘편한세상.

Oct. 2021 – Mar. 2023 "Route optimization for wheelchair users (휠체어 사용자를 위한 경로 최적화)" (Co-Principal Investigator), The Commercializations Promotion Agency for R&D Outcomes (과학기술일자리진흥원).

Nov. 2021 – May. 2022 "가속수명시험 데이터를 이용한 AI 기반의 UV램프 수명예측모델 개발" (Principal Investigator), InterX.

Sep. 2021 – Oct. 2021 "공정 데이터를 이용한 AI 기반의 UV램프 수명예측모델 개발" (Principal Investigator), InterX.

Sep. 2021 – Dec. 2021 "자유목적 제조 AI 데이터셋 구축" (Principal Investigator), Ministry of SMEs and Startups (중소벤처기업부).

Jun. 2021 – Feb. 2024 "Development of an AI-based fault prediction and cause analysis model for small-sized automobile parts companies (인공지능(AI)을 활용한 자동차 부품 중소제조기업의 불량예측 및 불량원인분석 모델 개발)" (Principle Investigator), The National Research Foundation of Korea (한국연구재단).

Jun. 2021 – Dec. 2021 "인공지능(AI)을 활용한 울산 소재 자동차 부품 중소제조기업의 불량예측 및 불량원인분석 모델 개발" (Principle Investigator), Ulsan National Institute of Science and Technology (UNIST).

Apr. 2021 – Mar. 2022 "3D Pose Estimation Motion Data Development based on the Fusion of 3D Data and AI (3D 데이터와 AI의 기술융합을 기반한 3D Pose Estimation Motion Data 개발)" (Co-Principle Investigator), Institute of Information & communications Technology Planning & evaluation (IITP, 정보통신기획평가원).

Mar. 2021 – Feb. 2023 "Improvement of input accuracy and convenience on VR/AR using AI and wearable soft sensors (AI와 웨어러블 소프트 센서 시스템을 이용한 VR/AR에서의 입력 정확성/편의성 향상)" (Principle Investigator), Ulsan National Institute of Science and Technology (UNIST) & Feel the Same.

Feb. 2021 – Dec. 2021 "인공지능(AI) 기반의 질환 발병 예측모델 개발 및 생체나이 계산" (Principal Investigator), U2medtek.

Nov. 2020 – Dec. 2020 "Logic development for simulation in shipbuilding" (Co-Principal Investigator), Unity Technologies Korea.

Oct. 2020 – Dec. 2020 "반복 동작으로 인한 근로자 부상 패턴 분석 및 재활프로그램 개발" (Co-Principal Investigator), Ulsan Industry University Convergence Institute (울산산학융합원).

Sep. 2020 – Nov. 2020 "지정설비 제조 AI 데이터셋 구축" (Principal Investigator), Ministry of SMEs and Startups (중소벤처기업부).

Sep. 2020 – Jan. 2021 "융착 공정 제조데이터 분석 및 AI 모델개발" (Principal Investigator), InterX.

Aug. 2020 – Dec. 2020 "2020 년 데이터인프라구축 AI 컨설팅 및 AI 솔루션 실증지원" (Consultant), Ministry of SMEs and Startups (중소벤처기업부).

Jun. 2020 – Nov. 2020 "제조데이터 분석 및 AI 모델개발" (Co-Principal Investigator), InterX.

Apr. 2020 – Aug. 2020 "제조업 근로자 부상 방지를 위한 인공지능 기반 알고리즘 개발" (Co-Principal Investigator), Ulsan Industry University Convergence Institute (울산산학융합원).

Jul. 2019 – Dec. 2019 "Curriculum development for students in smart port logistics (빅데이터 분석 기반의 항만물류 융합인재 양성을 위한 표준 커리큘럼 개발)" (Principle Investigator), UNIST-Ulsan Port Authority Smart Port Logistics Data Center (스마트항만물류지원센터).

Jun. 2019 – Feb. 2022 "Development of an automated system using machine learning and commercial sensors for identifying whether manufacturing workers wear protective gear (기계학습 및 상용센서 기반의 제조업 근로자들의 보호장비 착용여부 확인 자동화 시스템 개발)" (Principle Investigator), The National Research Foundation of Korea (한국연구재단).

May 2019 – Dec. 2019 "Development of a machine learning model to predict liquid cargo traffic and demands for storage facilities using port logistics big data (항만물류 빅데이터를 이용한 울산항 액체화물의 종류별 물동량 예측 및 탱크저장시설 수요 예측을 위한 기계학습모델 개발)" (Principle Investigator), UNIST-Ulsan Port Authority Smart Port Logistics Data Center (스마트항만물류지원센터).

Nov. 2018 – Oct. 2021 "A Study on Trend Analysis of Customers and Competitors for the Enhancement of the Competitiveness of Local Manufacturers in Industry 4.0: Trend Analysis Model Development Based on Unstructured Big Data Analysis and Artificial Intelligence (AI) (Industry 4.0 환경에서의 국내 제조기업 경쟁력 강화를 위한 고객/경쟁사 동향분

석 연구: 비정형 빅데이터분석 및 인공지능(AI)을 기반으로 한 동향분석모델 개발)" (Principle Investigator), Ulsan National Institute of Science and Technology (UNIST).

Patents

Lim, Sunghoon, Jae Gyeong Choi, Sun Jun Kim, Minjoo Ku. "SYSTEM AND METHOD FOR ESTIMATING THREE-DIMENSIONAL POSE USING VISIBILITY SCORE (가시성 지표를 활용한 3차원 포즈 추정 시스템 및 방법)." Pending, 2022.

Kweon, Sang Jin, Yong Ung Kwon, and **Sunghoon Lim**. "근로자의 반복적인 근무 활동 동안 근육 부상을 예측하는 방법 및 장치." Pending, 2020.

Kweon, Sang Jin, Yong Ung Kwon, and **Sunghoon Lim**. "반복 회전동작으로 인한 부상 방지 재활 방법 및 부상 방지 재활 장치." Pending, 2020.

Columns

Lim, Sunghoon. "인공지능과 제조도시의 재도약, 피츠버그와 울산." *UNIST Magazine 2021 Autumn*, 2021.

Honors and Awards

Nov. 2017	**Completion Certificate**, *Course in College Teaching*, The Schreyer Institute for Teaching Excellence, The Pennsylvania State University
Aug. 2017	**Design Education (DEC) Technical Committee Best Paper Award ($1,000)**, *ASME 2017 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference*
Dec. 2016	**Certificate of Award**, Penn State CHOT (The Center for Health Organization Transformation)
Aug. 2016 – May 2018	**CHOT Scholar**, Penn State CHOT (The Center for Health Organization Transformation)
Mar. 2006 – Dec. 2008	**Government Scholarship**, KAIST, Republic of Korea
Mar. 2001 – Dec. 2004	**Government Scholarship**, KAIST, Republic of Korea

Invited Talks

Lim, Sunghoon. "Directions and strategies for advanced manufacturing in Ulsan (울산의 제조혁신 방향과 과제), *2021 Ulsan Advanced Manufacturing (AM) Hub Forum (울산 글로벌 제조혁신 포럼)*, Republic of Korea, 2021.

Lim, Sunghoon. "Pose Estimation을 위한 AI Algorithm 소개." *2021년 인공지능 연계 콘텐츠 창의인재 양성사업 오픈특강*, (주)케이넷이엔지, Republic of Korea, 2021.

Lim, Sunghoon. "Improvement of input accuracy and convenience on VR/AR using AI and wearable soft sensors." *UNIST AI Technology Open Workshop*, Ulsan National Institute of Science and Technology (UNIST), Republic of

Korea, 2021.

Lim, Sunghoon. "Dependent and Constrained Judgement Analysis for Crowdsourcing." *KU-IAI Expert Seminar*, The School of Industrial Management Engineering, Korea University, Republic of Korea, 2021.

Lim, Sunghoon. "Dependent and Constrained Judgement Analysis for Crowdsourcing." *IBS Data Science Talk Series*, IBS Data Science Group, Institute for Basic Science (IBS), Republic of Korea, 2020.

Lim, Sunghoon. "A Bottom-Up Machine Learning Model for Real-Time Population Health Management Using Social Media Data." *Special Seminar*, The Department of Industrial and Management Engineering, Pohang University of Science and Technology (POSTECH), Republic of Korea, 2017.

Lim, Sunghoon. "Clustering-based Real-time Population Health Management Using Online User-generated Data." *IE 590: Industrial Engineering Colloquium*, The Pennsylvania State University, University Park, Pennsylvania, 2017.

Teaching Experience

Ulsan National Institute of Science and Technology (UNIST)

Instructor: *UNI108 Industrial Engineering Relay Seminar* (Fall 2020)

IE201 Operations Research I (Fall 2018)

IE406 Applied Machine Learning (Spring 2019, Spring 2020, Spring 2021, Spring 2022)

IE422 Social Network Analysis (Fall 2019, Fall 2020, Fall 2021)

IE450 Project Lab (Spring 2020, Spring 2021)

MGE551 Special Topics in ME I (*Machine Learning: Real-world Applications*) (Spring 2019)

The Pennsylvania State University

Guest Lecturer: *EDSGN 100 Introduction to Engineering Design* (Fall 2017)

The University of Pittsburgh

Teaching Assistant: *IE 2001 Operations Research* (Spring 2013)

***** All courses were taught in English.

Professional Societies and Services

Committee Member	중소벤처기업부(Ministry of SMEs and Startups) 스마트제조혁신추진단 AI 제조데이터 전략위원회 위원
Committee Chair	중소벤처기업부(Ministry of SMEs and Startups) 스마트제조혁신추진단 서비스분과위원회 위원장
Committee Member	The World Economic Forum (WEF) Advanced Manufacturing (AM) Hub
Membership	The American Society of Mechanical Engineers (ASME), Korean Institute of Industrial Engineers (KIIE)
Evaluation Committee	Division of ICT and Convergence Research, National Research Foundation of Korea (NRF)
Committee Member	K-인공지능 제조데이터 분석 경진대회, 중소벤처기업부(Ministry of SMEs and Startups) (2021)

Forum Host 2021 Ulsan Advanced Manufacturing (AM) Hub Forum (울산 글로벌 제조혁신 포럼), Ulsan Metropolitan City (2021)

Conference Session Chair IISE Annual Conference & Expo (2021), KIIE/KORMS/KSS Joint Spring Conference (2019), KIIE Fall Conference (2019, 2020)

Committee Member Academic Affairs Committee, Ulsan National Institute of Science and Technology (UNIST) (2020)

Committee Member Undergraduate Admissions Committee, Ulsan National Institute of Science and Technology (UNIST) (2019, 2020)

Committee Member Faculty Recruitment Committee (External), The Department of Industrial Engineering, Inha University (2020)

Committee Member Faculty Recruitment Committee (External), The Department of Industrial Engineering, The University of Ulsan (2020)

Committee Member Faculty Recruitment Committee (External), The Department of Industrial and Management Engineering, Incheon National University (2019)

Committee Member Organizing Committee, *The 4th Industrial Revolution Forum in Ulsan*, Ulsan National Institute of Science and Technology (UNIST) (2018)

Journal Reviewer *Expert Systems with Applications*, *IEEE Access*, *Studies in Higher Education, ASME Journal of Computing and Information Science in Engineering, Computer Applications in Engineering Education, Industrial Engineering & Management Systems, Machine Learning with Applications*

Conference Reviewer *ACM CHI Conference on Human Factors in Computing Systems, IISE Annual Conference*

Work Experience

Feb. 2009 – Jul. 2012 Defense Agency for Technology and Quality, Seoul, Republic of Korea
Researcher in the Reliability Analysis Team

Aug. 2010 – Oct. 2010 Raytheon Company, Tucson, Arizona, United States
Training Program for Reliability and Quality Control

Apr. 2007 – Feb. 2008 Tokyo Institute of Technology, Tokyo, Japan
Researcher in the Department of Industrial Engineering and Management