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Donghyun Lee, Ph.D.

Division of Social Science & AI, Hankuk University of Foreign Studies
107, Imun-ro, Dongdaemun-gu, Seoul, 02450, Republic of Korea | Tel: +82-2-2173-3054 |
donghyun.lee@hufs.ac.kr | donghyunlee-ai.github.io

RESEARCH INTERESTS

Methods: Trustworthy AI (Explainable AI, Uncertainty Quantification), Physics-AI Hybrid Modeling, MLOps for Real-World AI Deployment.
Domains: Health Informatics & Infectious Disease Surveillance (Zoonotic & Emerging Diseases), Environmental AI (Water/Air Quality, Algal Blooms), AI for Computational Social Science & Public Policy.

EDUCATION

Korea Advanced Institute of Science and Technology (KAIST) — *Daejeon, Republic of Korea*
Ph.D. in Engineering (College of Business, Graduate School of Technology and Innovation Management) — Feb. 2012 – Aug. 2016

- *Dissertation*: "Essays on big data analytics in industrial research: Green energy policy and patent litigation."
- *Advisor*: Prof. Minki Kim

Korea Advanced Institute of Science and Technology (KAIST) — *Daejeon, Republic of Korea*
Master of Engineering (College of Business, Graduate School of Technology and Innovation Management) — Sep. 2009 – Aug. 2011

Korea Advanced Institute of Science and Technology (KAIST) — *Daejeon, Republic of Korea*
Bachelor of Engineering (Information and Communication Engineering; IT Business minor) — Feb. 2005 – Aug. 2009

WORK EXPERIENCE

Hankuk University of Foreign Studies — *Seoul, Republic of Korea*
Associate Professor, Division of Social Science & AI — Sep. 2025 – Present

Tech University of Korea — *Siheung-si, Republic of Korea*
Associate/Assistant Professor, Department of Business Administration — Mar. 2017 – Aug. 2025

- Director, SW Education Center (Sep. 2022 – Jul. 2024)
- Chief Professor, Venture Entrepreneurship Integration Major (Nov. 2019 – Sep. 2022)
- Chief Professor, Smart Factory Integration Major (Sep. 2018 – Aug. 2019)

AI Korea Inc. — *Incheon, Republic of Korea*
CEO and Founder — Dec. 2022 – Aug. 2025

- Developed and commercialized AI prediction solutions for environmental monitoring agencies, bridging academic research and operational deployment.

Korea Environment Institute — *Sejong, Republic of Korea*
Research Fellow, Big Data Research Team — Jul. 2016 – Feb. 2017

PROFESSIONAL SERVICE

Journal of Innovation & Knowledge (IF 15.5, JCR Top 0.5%) — *Amsterdam, Netherlands*
Editorial Board Member — Apr. 2025 – Present

Ministry of Environment — *South Korea*
Committee Member, Environmental Economics Division — Jul. 2022 – Jul. 2024

PUBLICATIONS

Articles (Selected)

〔1〕 **D. Lee***, H. Jeon (2025). "Reinforced explainable AI for algal bloom forecasting under climate change: A multi-run class activation mapping (CAM) approach." *Journal of Cleaner Production*, 146805. (SCIE, IF 10.0 / JCR Top 6.0%)

〔2〕 **D. Lee***, B. Lee (2024). "Building Reliable AI for Quantifying Uncertainty in Particulate Matter Predictions with Deep Learning." *Journal of Cleaner Production*, 143457. (SCIE, IF 10.0 / JCR Top 6.0%)

〔3〕 **D. Lee***, M. Kim, B. Lee, S. Chae, S. Kwon, S. Kang (2022). "Integrated explainable deep learning prediction of harmful algal blooms." *Technological Forecasting and Social Change*, 185, 122046. (SSCI, IF 13.3 / JCR Top 0.9%)

〔4〕 S. Chae, J. Shin, S. Kwon, S. Lee, S. Kang, **D. Lee*** (2021). "PM10 and PM2.5 real-time prediction models using an interpolated convolutional neural network." *Scientific Reports*, 11(1), 11952. (SCIE, IF 3.9 / JCR Top 18%)

〔5〕 S. Chae, S. Jang, S. Lee, **D. Lee*** (2020). "Complex System Analysis of Korean Peninsula Earthquake Data." *Scientific Reports*, 10(1), 2686. (SCIE, IF 3.9 / JCR Top 18%)

〔6〕 S. Huh, H. Lee, J. Shin, **D. Lee**, J. Jang (2018). "Inter-fuel substitution path analysis of the Korea cement industry." *Renewable and Sustainable Energy Reviews*, 82, 4091-4099. (SCI, IF 16.3 / JCR Top 2.4%)

〔7〕 J. Shin, S. Kang, **D. Lee***, B. Hong (2018). "Analysing the failure factors of eco-friendly home appliances based on a user-centered approach." *Business Strategy and the Environment*, 27(8), 1399-1408. (SSCI, IF 13.3 / JCR Top 1.1%)

〔8〕 **D. Lee**, M. Kim, J. Lee (2016). "Adoption of green electricity policies: Investigating the role of environmental attitudes via big data-driven search-queries." *Energy Policy*, 90, 187-201. (SSCI, IF 9.2 / JCR Top 1.5%)

〔9〕 **D. Lee**, H. Lee, M. Choi (2016). "Examining the relationship between past orientation and US suicide rates: An analysis using big data-driven Google search queries." *Journal of Medical Internet Research*, 18(2), e35. (SCIE, IF 6.0 / JCR Top 6.1%)

Book Chapters

〔1〕 S. Kang, **D. Lee*** (2022). "Use of artificial intelligence for predicting infectious disease." In P. Keikhosrokiani, *Big Data Analytics for Healthcare: Datasets, Techniques, Life Cycles, Management, and Applications*, Elsevier. ISBN: 9780323985161 (SCOPUS).

Research Reports

〔1〕 **D. Lee**, J. Shin, M. Kim (2025). "Predicting the Spread of Avian Influenza in Wild Birds (II)." Research Report, NIWDCP.

〔2〕 **D. Lee**, J. Shin, M. Kim (2024). "Predicting the Spread of Avian Influenza in Wild Birds (I)." Research Report, NIWDCP.

〔3〕 S. Kang, **D. Lee**, G. Ko, D. Jin, H. Hong, D. Kim, S. Kang (2023). "Big Data Analysis: Application to Environmental Research and Service VII." Policy Research Report, Korea Environment Institute.

〔4〕 S. Kang, **D. Lee**, J. Pyo, G. Ko, Y. Cho, G. Han, D. Jin, S. Kang (2022). "Big Data Analysis: Application to Environmental Research and Service VI." Policy Research Report, pp. 1-108, Korea Environment Institute.

〔5〕 H. Hong, **D. Lee**, G. Ko, D. Jin, S. Kang, S. Kang, D. Kim (2021). "Big Data Analysis: Application to Environmental Research and Service V." Policy Research Report, pp. 1-195, Korea Environment Institute.

〔6〕 S. Kang, **D. Lee**, G. Ko, D. Jin, H. Hong, G. Han, S. Kang, D. Kim (2019). "Big Data Analysis: Application to Environmental Research and Service III." Policy Research Report, pp. 1-288, Korea Environment Institute.

〔7〕 S. Kang, **D. Lee**, K. Jang, D. Jin, H. Hong, G. Han, J. Kim, S. Kang, D. Kim (2018). "Big Data Analysis: Application to Environmental Research and Service II." Policy Research Report, pp. 1-271, Korea Environment Institute.

〔8〕 S. Kang, **D. Lee**, K. Jang, D. Jin, H. Hong, G. Han, J. Kim, S. Kang, D. Kim, E. Jung (2017). "Big Data Analysis: Application to Environmental Research and Service." Policy Research Report, pp. 1-465, Korea Environment Institute.

〔9〕 D. Kim, S. Song, S. Park, J. Kim, **D. Lee**, S. Jo (2017). "A Study on Expansion of Pro-Environmental Consumption Using Social Economy." Policy Research Report, pp. 1-246, Korea Environment Institute.

〔10〕 S. Kwak, J. Shin, **D. Lee**, S. Kang (2016). "A Study on Promoting Environmental Consumption by Developing the Environmental Attitude-Behavior Model." Policy Research Report, pp. 1-226, Korea Environment Institute.

Conferences (Domestic)

〔1〕 "On-Device Agentic AI Framework for Predicting Spatial Jumps of Emerging Infectious Diseases: A Lumpy Skin Disease (LSD) Case Study" (On-Device Agentic AI 프레임워크를 활용한 신종 감염병의 공간적 점프 예측: 럼피스킨병(LSD) 사례 연구). *Korean Society of Zoonoses* (인수공통감염병학회), Oct. 2025.

〔2〕 "Explainable AI-Based Avian Influenza Outbreak Prediction Considering Uncertainty" (불확실성을 고려한 설명 가능한 인공지능 기반 조류 인플루엔자 발생 예측 연구). *Joint Conference on Economics*, Feb. 2025.

〔3〕 “Analysis of Industrial Workforce Market Trends and Demand Using Big Data and Large Language AI Models” (채용 빅데이터와 대형 언어 인공지능 모델을 활용한 산업 인력 시장 동향 및 수요 분석). *Summer Conference of the Korea Technology Innovation Society*, Aug. 2024.

〔4〕 “Spatiotemporal Modeling and Factor Analysis for Predicting Avian Influenza Spread” (조류 인플루엔자 확산 예측을 위한 시공간 모델링 및 영향 요인 분석). *Annual Conference of the Korea Environmental Economics Association*, Aug. 2024.

〔5〕 “Automation of Algal Bloom Prediction Through a Deep Learning-Based MLOps Pipeline: AI Model Serving for Policy Utilization” (딥러닝 기반 MLOps 파이프라인을 통한 녹조 예측 자동화: 정책적 활용을 위한 인공지능 모델 서빙 접근). *Summer Conference of the Korea Technology Innovation Society*, Jul. 2024.

〔6〕 “(Session for Emerging Researchers) Development and Application of AI for Environmental and Infectious Disease Predictions” ((신진연구자 세션) 환경 및 감염병 예측을 위한 인공지능의 개발과 실제). *Korea Software Congress*, Dec. 2023.

〔7〕 “Explainable Deep Learning Integration for Algal Bloom Prediction and MLOps Implementation” (설명 가능한 녹조 통합 딥러닝 예측과 MLOps). *Spring Conference of the Korean Society of Analytical Science*, May 2023.

〔8〕 “Fine Dust Prediction Using Convolutional Neural Network Deep Learning” (컨벌루션 신경망 딥러닝을 활용한 미세먼지 예측). *Summer Conference of the Korea Environmental Economics Association*, Aug. 2018.

〔9〕 “Stock Price Prediction and Profitability Evaluation Using Deep Learning Analysis of Financial Big Data” (재무 빅데이터의 딥러닝 분석을 통한 주가예측 및 수익률 평가). *Summer Conference of the Korea Technology Innovation Society*, Jul. 2018.

〔10〕 “Risk Prediction for Fine Dust Using Deep Learning Technology” (딥러닝 기술을 활용한 미세먼지 리스크 예측). *Summer Conference of the Korea Technology Innovation Society*, Jun. 2017.

〔11〕 “Complex System Analysis of Earthquake Big Data: Focusing on Regional Concentration Phenomena” (지진 빅데이터를 활용한 복잡계 현상 분석:지진의 지역 집중화 현상을 중심으로). *Summer Conference of the Korea Regional Information Society*, Jun. 2017.

〔12〕 “Application of Deep Learning Technology in Environmental Research: Predicting Eco-Friendly Consumption Indices” (딥러닝 기술의 환경 연구에의 적용: 친환경 소비 지표 예측을 중심으로). *Summer Conference of the Korea Technology Innovation Society*, Jun. 2016.

〔13〕 “A Farewell to Arms? Patent War in the Smartphone Industry.” *Joint Economics Conference*, Feb. 2015.

PATENTS

〔1〕 “**Method for Predicting Air Quality Using Artificial Intelligence.**” Patent Application No. 10-2022-0015727, Feb. 2022. (Filed)

〔2〕 “**Improved Device and Method for Predicting Fine Dust Concentration.**” Patent No. 10-2022-0082928, Jul. 2022. (**Registered**)

〔3〕 “**Method and Device for Predicting Infectious Diseases Using Artificial Intelligence.**” Patent Application No. 10-2022-0132078, Oct. 2022. (Filed)

〔4〕 "**Method and Device for Predicting Algal Bloom Occurrences Using an Artificial Intelligence Model.**" Patent Application No. 10-2022-0172370, Dec. 2022. (Filed)

〔5〕 "**Method and Device for Modeling Generation for Time Series Prediction.**" Patent Application No. 10-2023-0010001, Jan. 2023. (Filed)

PROJECTS

Current Projects

〔1〕 **Institute for Information & Communications Technology Planning & Evaluation (IITP)** *Apr. 2026 – Dec. 2033*

Principal Investigator, "Development of an Ultra-Fast, High-Reliability Physics-AI Hybrid Disaster Response Technology Based on MambaFlow Matching" (Digital Columbus Project)

〔2〕 **National Research Foundation of Korea (NRF)** *Mar. 2026 – Feb. 2029*

Principal Investigator, "Development of Physics-AI Integrated Dynamic Graph Meta-Learning Based Algal Bloom Prediction Technology for Overcoming Data Scarcity" (Outstanding Young Scientist Grant)

〔3〕 **National Wildlife Disease Control and Prevention Agency** *Aug. 2025 – May 2026*

Co-Investigator, "Wild Bird Avian Influenza Spread Prediction Research (III)"

Past Projects

〔4〕 **National Wildlife Disease Control and Prevention Agency** *Jul. 2024 – May 2025*

Principal Investigator, "Wild Bird Avian Influenza Spread Prediction Research (II)"

〔5〕 **National Research Foundation of Korea** *Mar. 2020 – Feb. 2025*

Principal Investigator, "Simulation of Infectious Disease Prediction Using Transfer Learning Deep Learning"

〔6〕 **Tech University of Korea** *Oct. 2023 – Oct. 2024*

Principal Investigator, "Development of Advanced Algal Bloom Prediction Model Using Explainable AI" (1st Place, Research Competition)

〔7〕 **Office of Strategic R&D Planning** *Jul. 2024 – Sep. 2024*

Principal Investigator, "Utilizing Big Data and Large Language Models for Analyzing Trends and Demand in the Industrial Workforce Market"

〔8〕 **National Wildlife Disease Control and Prevention Agency** *Jul. 2023 – May 2024*

Principal Investigator, "Wild Bird Avian Influenza Spread Prediction Research"

〔9〕 **National Research Foundation of Korea** *Nov. 2023 – Mar. 2024*

Co-Investigator, "Development of Performance Indicators and Management System for LAMP Project"

〔10〕 **Kookmin University** *Oct. 2023 – Dec. 2023*

Principal Investigator, "Development of ML-Based Performance Prediction Model for Seawater Desalination Plants"

〔11〕 **Kookmin University** *Sep. 2023 – Nov. 2023*

Principal Investigator, "Development of ML-Based Prediction Model for Water Quality and Energy Consumption in Sewage Treatment Plants"

〔12〕 **Korea Test Laboratory** *Jun. 2023 – Oct. 2023*

Principal Investigator, "Test Data Analysis for Remaining Life Measurement of Electric Vehicle Lithium-Ion Batteries"

〔13〕 **Korea Environment Institute** *Mar. 2023 – Oct. 2023*

Principal Investigator, "Construction of Automated Data Pipeline for Algal Bloom Prediction Using Deep Learning for MLOps"

〔14〕 **National Wildlife Disease Control and Prevention Agency** *Aug. 2022 – Nov. 2022*

Principal Investigator, "Establishment of a Rapid Response System for Avian Influenza"

〔15〕 **Korea Test Laboratory** *Jun. 2022 – Oct. 2022*

Principal Investigator, "Research on Application of Functional Safety Standards in HVAC Using AI"

〔16〕 **Korea Environment Institute** *Apr. 2022 – Oct. 2022*

Principal Investigator, "Development of a New Fine Dust Prediction Module Based on Explainable AI"

〔17〕 **Exabyte Inc.** *Feb. 2022 – Jul. 2022*

Principal Investigator, "Development of Object Detection Model Using Deep Learning"

〔18〕 **Korea Environment Institute** *Mar. 2021 – Nov. 2021*

Principal Investigator, "Deep Learning-Based Prediction of Fine Dust Concentration and Uncertainty"

〔19〕 **Korea Design Promotion Institute** *Jun. 2020 – Dec. 2020*

Co-Investigator, "Support for Multidisciplinary Education Courses Led by Design"

〔20〕 **National Research Foundation of Korea** *Mar. 2017 – Feb. 2020*

Principal Investigator, "Application of Deep Learning Technology in Environmental and Industrial Research"

〔21〕 **Korea Environment Institute** *Feb. 2019 – Nov. 2019*

Principal Investigator, "Deep Learning-Based Integrated Prediction of Environmental Pollution"

〔22〕 **Jeongseok Logistics Academic Foundation** *Jan. 2019 – Dec. 2019*

Principal Investigator, "Deep Learning-Based Traffic Prediction for Logistics Optimization"

〔23〕 **Tech University of Korea** *Jul. 2018 – Nov. 2018*

Principal Investigator, "Quantitative Analysis of Factors Influencing Dropout Rates Based on Big Data"

〔24〕 **National Research Foundation of Korea** *Mar. 2018 – Feb. 2019*

Principal Investigator, "Application of Deep Learning Technologies — Initial Innovation Laboratory"

〔25〕 **Korea Environment Institute** *Mar. 2018 – Nov. 2018*

Principal Investigator, "Fine Dust Prediction Using Convolutional Neural Networks"

〔26〕 **Korea Industrial Technology Promotion Agency** *Mar. 2018 – Feb. 2022*

Co-Investigator, "Smart Factory Operation Design and Professional Personnel Training Project"

〔27〕 **National Research Foundation of Korea** *Mar. 2018 – Aug. 2019*

Co-Investigator, "LINC+ Leading University for Innovation in the 4th Industrial Revolution"

〔28〕 **Korea Environment Institute** *Jul. 2017*

Principal Investigator, "Natural Language Analysis and Advisory of Water Source Related Complaint Data"

〔29〕 **National Research Foundation of Korea** *Jul. 2017 – Jun. 2019*

Principal Investigator, "Predicting Epidemic Spread Using Deep Learning Analysis of Query Big Data"

〔30〕 **Korea Environment Institute** *Apr. 2017 – Sep. 2017*

Principal Investigator, "Analysis of Eco-Friendly Consumption Using Social Networking Services (SNS)"

〔31〕 **Tech University of Korea** *Apr. 2017 – Mar. 2019*

Principal Investigator, "Application of Deep Learning Technology in Social Science Research"

〔32〕 **Korea Environment Institute** *Mar. 2017 – Nov. 2017*

Principal Investigator, "Environmental Risk Prediction Using Deep Learning"

TEACHING EXPERIENCE

GIE = Global Instructor Evaluation (course evaluation score).

Hankuk University of Foreign Studies *Seoul, Republic of Korea*
Associate Professor Sep. 2025 – Present

- **Fundamentals of Social Data Programming** (M04103201). Fundamental concepts of programming using Python: data types, operators, conditionals, loops, functions, classes, modules, packages, exception handling. Fall 2025: M04103201 (GIE: 4.8/5, Univ. Avg: 4.61).
- **Industrial Data Visualization** (M04111101). Data preprocessing with Python (Numpy, Pandas); visualization with Matplotlib, Streamlit, Github for interactive dashboard. Fall 2025: M04111101 (GIE: 4.7/5, Univ. Avg: 4.61).
- **Understanding Technology Development Research** (M04112101). Technology management and high-tech industry; technology development methodologies (consumer preference, market analysis); commercialization of new technologies. Fall 2025: M04112101 (GIE: 4.23/5, Univ. Avg: 4.61).
- **Object-Oriented Programming** (M04107101). Principles and practical applications of Object-Oriented Programming (OOP) through Python; object-oriented design skills for social science data modeling. Spring 2026.
- **Deep Learning and Applications** (M04114101). Theory and practice of artificial neural networks from individual neurons to modern deep learning architectures (CNN, LSTM, etc.); implementing core mechanisms from scratch with NumPy, then building practical models with PyTorch for data analysis. Spring 2026.

Tech University of Korea *Siheung-si, Republic of Korea*
Associate/Assistant Professor Mar. 2017 – Aug. 2025

11 distinct courses across undergraduate and graduate levels (60+ sections). Consistently above department average. Representative courses:

- **Big Data Analysis** (R programming, statistics, visualization). 14 sections over 7 years. Best GIE: 4.77/5.
- **Fundamentals of Programming** (Java). 8 years. Peak GIE: 4.99/5 (Spring 2023).
- **Programming and Data Analysis** (Python, OOP, data preprocessing). 6 semesters.
- **Advanced IT Service Techniques** (Deep learning/ML with Python). 5 semesters. GIE: 4.73/5.
- **Graduate: Information Strategy and Management Innovation** (MIS, big data, AI). 2 semesters.
- **Graduate: New Technology Management** (Technology management theories). 1 semester.
- **Management Capstone Design I/II/Planning** (Undergraduate research). 6 years.

KOCW (Korea OpenCourseWare) *South Korea, kocw.net*
Official Public Online Course

- **Python Programming**. Fundamental programming with Python (conditionals, loops). Online since Spring 2020. 26 lectures. GIE: 4.4/5, Views: 41,000. Link.
- **Python Programming 2**. Object-oriented Python, Numpy, Pandas. Online since Fall 2020. 26 lectures. Views: 19,000. Link.
- **Big Data Analysis**. R programming and data analysis for big data. Online since Fall 2019. 26 lectures. GIE: 4.5/5, Views: 28,000. Link.
- **Fundamentals of Programming**. JAVA, core programming concepts. Online since Spring 2020. 26 lectures. GIE: 5.0/5, Views: 11,000. Link.

K-DIGITAL Training Online Course *Siheung-si, Republic of Korea*
Instructor

- **Deep Learning**. Principles of deep learning; implementing models with Numpy and Python (without Tensorflow/PyTorch). Jun. 2021 – Aug. 2023 (Cohorts 1–6). 20 lectures.

HONORS & AWARDS

- **President's Award of the Korea Environment Institute** (한국환경연구원장상) (2024)
  Environmental Data Analysis Contest: Development of Multimodal LLM Interactive AI
- **Outstanding Researcher Award** (**Excellence in Academic Paper Category**) (2019)
  With the President's Commendation at Tech University of Korea
- **Presidential Award for the Korea Young Talent Award** (대한민국 인재상 대통령상) (2008)
  Presented by the President of South Korea

TECHNICAL COMPETENCIES

- **Programming:** Python, R, Java, SQL
- **AI/ML Frameworks:** PyTorch, TensorFlow, scikit-learn, NumPy, Pandas
- **Statistical Tools:** SPSS, Stata
- **MLOps & Infrastructure:** Docker, Streamlit, GitHub Actions, REST API deployment
- **Visualization:** Matplotlib, Streamlit dashboards, interactive web applications