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Senior Research Scientist

[Intelligent Wave Engineering Team](#),

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EDUCATION

Ph.D. in Civil Engineering, August 2020, UNIST, Ulsan, South Korea

- **Dissertation:** Probabilistic Assessment of Bridge Safety by Integrating Measurements with Computational Simulations

B.S. in Civil Engineering, August 2015, UNIST, Ulsan, South Korea

RESEARCH INTERESTS

- [Theoretical Interest] Uncertainty Quantification (UQ)
 - Forward UQ: Sampling-Based & Non-Sampling-Based & Bayesian Methods.
 - Inverse UQ: Bayesian Methods (e.g., Markov Chain Monte Carlo Method).
 - Model UQ: Quantification of Model Bias & Variance.
- [Application #1] Bayesian Deep Learning-Based Nondestructive Testing
- [Application #2] Bayesian Machine Learning-Based Structural Health Monitoring
- [Application #3] Finite Element Reliability Analysis for Lifetime Prediction of Infrastructures
- [Application #4] Deep Reinforcement Learning-Based Efficient Probabilistic Optimization

RESEARCH EXPERIENCE

Senior Research Scientist

June 2022 – Present

Intelligent Wave Engineering Team

Korea Research Institute of Standards and Science (KRISS), South Korea

Postdoctoral Researcher

September 2020 – June 2022

Structural Reliability & Disaster Risk Laboratory

Ulsan National Institute of Science and Technology (UNIST), South Korea

Advisor: Prof. Young-Joo Lee

Research Advisor

September 2020 – April 2021

THYROSCOPE INC. (Smart Healthcare Startup), South Korea

Research Advisor

September 2020 – June 2022

사단법인 맑은도시 (Corporation Aggregate), South Korea

Graduate Research Assistant

August 2015 – August 2018

Structural Reliability & Disaster Risk Laboratory

Ulsan National Institute of Science and Technology (UNIST), South Korea

Advisor: Prof. Young-Joo Lee

Visiting Student Researcher

January 2015 – February 2015

R4 Laboratory

University of Illinois Urbana-Champaign, US

Advisor: Prof. Eun Jeong Cha

RESEARCH PROJECTS

세종과학펠로우십

- Duration: March 2021 – February 2026
- Grants: KRW 563,664,000 / five years
- Funding code: NRF-2021R1C1C2008770
- Title: Development of lifetime prediction method for infrastructures using digital twin automatically updated by deep reinforcement learning
- Supported by the National Research Foundation (NRF) grant funded by the Korea Government (MSIT)

AWARDS AND HONORS

Excellent Paper Award

@ Korean Society of Civil Engineering 2021 Convention (October 2021)

Third Prize

@ The 1st International Project Competition for Structural Health Monitoring (IPC-SHM 2020) (January 2021)

Third Prize among 30 International teams

Best Paper Award

@ 2019 International Symposium on Sea-Crossing Bridges (October 2019)

Excellent Paper Award

@ Korean Society of Civil Engineering 2015 Convention (October 2015)

Seismic Simulation Test Center Award

@ The Seismic Structural Design Contest (July 2015)

Excellence Award

@ 2013 Ulsan Invention Contest (November 2013)

Excellence Award

@ App Development Contest for Technical Standards (March 2013)

Scholarship for Educational Expenses

March 2011 – August 2015

Grants: KRW 28,020,200

Excellence Entrance Award

High entrance score scholarship for undergraduate school (March 2011)

Funding for visiting UIUC

TEACHING EXPERIENCE

Graduate Teaching Assistant at UNIST

Probability concepts in engineering

Numerical modelling and analysis

Structural reliability

Finite element analysis

PUBLICATIONS: INTERNATIONAL SCI(E)

Published

1. **Lee, J.**, Jeong, S., Lee, J., Sim, S.-H., Lee, K.-C.* , and Lee Y.-J.* (2022). Sensor Data-Based Probabilistic Condition Monitoring of Railway Bridges using Time-History Deflections Induced by High-Speed Trains, *Structural Health Monitoring*, 14759217211063424.
2. **Lee, J.**, Lee, Y.-J.* , and Shim, C.-S.* (2021). A Multi-Scale Framework for Probabilistic Structural Analysis of PSC Girders Considering Pit Corrosion of Prestressing Wires. *Engineering Structures*, 244, 112745.
3. **Lee, J.**, Lee, Y.-J.* , and Shim, C.-S.* (2020). Probabilistic Prediction of Mechanical Characteristics of Corroded Strands. *Engineering Structures*, 203, 109882.

4. **Lee, J.**, Lee, K.-C.* , Sim, S.-H., Lee, J., and Lee, Y.-J.* (2019). Bayesian Prediction of Pre-Stressed Concrete Bridge Deflection Using Finite Element Analysis. *Sensors*, 19(22), 4956.
5. **Lee, J.**, Lee, Y.-J.* , Sim, S.-J., and Cho, S. (2019). A New Framework for Structural System Fragility and Sensitivity Analysis of Concrete Gravity Dams. *KSCE Journal of Civil Engineering*, 23(8), 3592-3605.
6. **Lee, J.**, Lee, K.-C.* , and Lee, Y.-J.* (2018). Long-Term Deflection Prediction from Computer Vision Measured Data History for High-Speed Railway Bridges. *Sensors*, 18(5), 1488.
7. Kim, H., Sim, S.-H., **Lee, J.**, Lee, Y.-J.* , and Kim, J.-M. (2017). Flood Fragility Analysis for Bridges with Multiple Failure Modes. *Advances in Mechanical Engineering*, 9(3), 1-11.
8. **Lee, J.**, Lee, Y.-J.* , Kim, H., Sim, S.-H., and Kim, J.-M. (2016). A New Methodology Development for Flood Fragility Curve Derivation Considering Structural Deterioration for Bridges. *Smart Structures and Systems*, 17(1), 149-165.

Accepted/Under Review/Submitted

1. **Lee, J.**, Jeon, C.-H., Shim, C.-S., and Lee, Y.-J.* Bayesian Inference of Pit Corrosion in Prestressing Strands Using Markov Chain Monte Carlo Method, *Probabilistic Engineering Mechanics*, Accepted.
2. Lee, S., **Lee, J.***, Kim, M., and Lee, S. Deep Learning-Based Anomaly Detection in Acceleration Data of Long-Span Cable-Stayed Bridges, *Smart Structures and Systems*, Submitted.
3. Kim, M., **Lee, J.***, Lee, S., and Lee, S. Probabilistic Condition Assessment for Cable-Stayed Bridge Using Gaussian Mixture Model, *Smart Structures and Systems*, Submitted.

PATENTS & SOFTWARE

1. 이영주, Sreehari Ramachandra Prabhu, **이재범** (2019). 재료 파괴 특성 분석 장치 및 방법(Apparatus and Method for Analyzing Failure Characteristics of Material). 출원번호: 10-2017-0140450, 등록번호: 10-1982842.
2. 이영주, 이승준, **이재범** (2019). 페럼-마이더스(FERUM-MIDAS). 등록번호: C-2019-031996.
3. **이재범**, 이영주 (2016). 몬테카를로 아바쿠스(Monte Carlo ABAQUS). 등록번호: C-2016-005407.

INVITED TALKS

1. Seminar @ 서울과학기술대학교. “Artificial Intelligent with Uncertainty Quantification (AI with UQ).” November 2022. [초청자: 인공지능응용학과 박선영 교수님].
2. Seminar @ Ulsan National Institute of Science and Technology (UNIST; 울산과학기술원). “Artificial Intelligent with Uncertainty Quantification (AI with UQ).” October 2022. [초청자: 도시환경공학과 이영주 교수님].
3. Seminar @ Korea Railroad Research Institute (KRRI; 한국철도기술연구원). “토목구조물의 디지털 트윈 구축 및 활용: Digital Model to Digital Twin”. Uiwang-si, Gyeonggi-do, Korea. April 2022. [초청자: 정승후 박사님].
4. Seminar @ Korea Institute of Civil Engineering and Building Technology (KICT; 한국건설기술연구원). “토목구조물의 디지털 트윈 구축 및 활용: Digital Model to Digital Twin”. Online Zoom Seminar. November 2021. [초청자: 진승섭 박사님].

CONFERENCE PAPERS (INTERNATIONAL)

1. **Lee, J.**, Kim, H., Lee, S., Lee, H., and Kim, Y. (2023). Comparative Study on Optimization Methods in Finite Element Model Updating. *The 33rd European Safety and Reliability Conference (ESREL2023)*, Sep. 3–7, Southampton, United Kingdom.
2. Lee, S., **Lee, J.**, Yoon, S., and Lee, Y.-J. (2023). Efficient Finite Element Reliability Analysis Employing Surrogate Model for Seismic Fragility Curve Derivation. *14th International Conference on Application of Statistics and Probability in Civil Engineering (ICASPI4)*, Jul. 9–13, Dublin, Ireland.
3. **Lee, J.**, Jeon, C.-H., Shim, C.-S., and Lee, Y.-J. (2022). Probabilistic Estimation of Pit Corrosion in Prestressing Strands for Prestressed Concrete Bridges. *The 32nd European Conference on Safety and Reliability Conference (ESREL2022)*, Aug. 28–Sep. 1, Dublin, Ireland.
4. **Lee, J.**, and Kim, H. (2022). Probabilistic Finite Element Model Updating by Data Fusion of Acceleration and Angular Velocity. *11th International Conference on Structural Health Monitoring of Intelligent Infrastructure (SHMII-11)*, Aug. 8–12, Montreal, QC, Canada.
5. **Lee, J.**, Shim, C.-S., and Lee, Y.-J. (2022). Probabilistic finite element modeling of PSC beam considering pit corrosion. *The 13th International Conference on Structural Safety and Reliability (ICOSSAR 2021-2022)*, June 20-24, Shanghai, China.
6. **Lee, J.**, Jeon, C.-H., Shim, C.-S., and Lee Y.-J. (2022). Probabilistic Estimation of Pit Corrosion in Prestressing Strands for Prestressed Concrete Bridges, *The 32nd European Safety and Reliability Conference (ESREL2022)*, Aug. 28-Sep. 1, Dublin, Ireland.

7. **Lee, J.**, Jeong, S., Lee, J., Sim, S.-H., Lee, K.-C., and Lee Y.-J. (2021). Time-History Deflection Monitoring of Railway Bridges Using Gaussian Process Regression, *The 2nd ZHITU Symposium on Advances in Civil Engineering*, Sep. 29-29, Ulsan, Korea.
8. **Lee, J.**, Jeong, S., Lee, J., Sim, S.-H., Lee, K.-C., and Lee Y.-J. (2021). Time-History Deflection Monitoring of Railway Bridges Subjected to High-Speed Trains, *Asia Pacific Conference of the Prognostics and Health Management 2021 (PHMAP 2021)*, Sep. 8-11, Jeju, Korea.
9. **Lee, J.**, Shim, C.-S., and Lee, Y.-J. (2020). Probabilistic Inference on Corrosion Configurations Based on Tensile Test Results of Corroded Strand, *The 2020 World Congress on Advances in Civil, Environmental, & Materials Research (ACEM20)/The 2020 Structures Congress (Structures20)*, Aug. 25-29, Seoul, Korea.
10. **Lee, J.**, Lee, K.-C., Sim, S.-H., Lee, J., and Lee, Y.-J. (2019). Vertical Deflection Prediction of PSC Bridge in Construction Stage Using Gaussian Process Regression, *2019 International Symposium on Sea-Crossing*, Oct. 24-25, Seoul, Korea.
11. **Lee, J.** and Lee, Y.-J. (2019). Bayesian Prediction of Deflection Based on Measurement Data for Cable-Stayed Bridges, *2019 International Symposium on Sea-Crossing Bridges*, Oct. 24-25, Jeollanam-do, Korea.
12. **Lee, J.**, Lee, Y.-J., and Shim, C.-S. (2019). Probabilistic Prediction of Ultimate Strength and Strain of Corroded Steel Strands, *29th European Safety and Reliability Conference (ESREL 2019)*, Sep. 22-26, Hannover, Germany.
13. **Lee, J.**, Shim, C.-S., and Lee, Y.-J. (2019). Probabilistic Range Prediction of Ultimate Strength of Corroded Seven-Wire Strands, *The 2019 World Congress on Advances in Structural Engineering and Mechanics (ASEM19)*, Sep. 17-21, Jeju, Korea.
14. **Lee, J.**, Lee, K.-C., Sim, S.-H., and Lee, Y.-J. (2019) Probabilistic Prediction of Vertical Deflection for Bridges using Gaussian Process Regression, *9th International Conference on Structural Health Monitoring of Intelligent Infrastructure (SHMII-9)*, Aug. 4-7, St. Louis, MO, USA.
15. **Lee, J.**, Lee, K.-C., and Lee, Y.-J. (2019). Probabilistic Prediction of Vertical Deflection for High-Speed Railway Bridges using a Gaussian Process, *13th International Conference on Applications of Statistics and Probability in Civil Engineering (ICASPI3)*, May 26-30, Seoul, Korea.
16. Lee, Y.-J., **Lee, J.**, and Lee, S. (2018). Probabilistic Fatigue Life Prediction Employing an Advanced Crack Propagation Model, *The 9th International Conference on Bridge Maintenance, Safety and Management (IABMAS 2018)*, July 9-13, Melbourne, Australia.
17. **Lee, J.**, Lee, Y.-J., Kim, H., and Sim, S.-H. (2017). Finite Element Reliability Analysis for Deriving Flood Fragility Curve of Deteriorated Bridges Considering Scour, *The 12th International Conference on Structural Safety and Reliability (ICOSSAR12)*, Aug. 6-10, TU Wein, Vienna, Austria.

18. **Lee, J.**, Lee, Y.-K., Kim, H., and Sim, S.-H. (2016). Flood Fragility Analysis for Multiple Failure Modes of Bridges by Finite Element System Reliability Analysis, *2016 World Congress on Advances in Civil, Environmental, and Materials Research (ACEM16)*, Aug. 28-Sep. 1, Jeju, Korea.