Junyoung Park

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RESEARCH INTERESTS

- Structural condition assessment from field measurements to support maintenance decisions
- Inverse problems and parameter estimation in structural systems
- Probabilistic modeling of uncertainty in structural measurements and models
- Long-term field monitoring of in-service structures (bridges, pavements, ports, precast members)

EDUCATION

Chung-Ang University **2022 – 2024**
M.S. in Civil Engineering (Structural Engineering) · Seoul, Republic of Korea
- Thesis: A Scalable Bridge Health Monitoring System using an IoT Sensor and Cloud Computing
- Advisor: the late Prof. Jong-Woong Park · GPA 4.39 / 4.5

Chung-Ang University **2017 – 2022**
B.S. in Civil Engineering & B.S. in Mathematics (Double Degree) · Seoul, Republic of Korea
- GPA 4.20 / 4.5 (summa cum laude)

RESEARCH EXPERIENCE

Researcher | UDNS Co., Ltd., R&D Division **2024 – Present**
Industrial Technical Personnel Program (R&D-based alternative to military service) · Republic of Korea

Plate-type high-speed weigh-in-motion (HS-WIM) system development and field validation (MOLIT) 2024 – Present
- Co-designed the multi-channel signal acquisition PCB for the load cells
- Developed signal-processing algorithms that extract axle load, gross weight, speed, and vehicle dimensions from raw sensor signals, combining automatic load-segment detection with FIR-filtered dynamic weight estimation
- Conducted on-road field tests with loaded trucks to reduce estimation error across vehicle class, speed, and payload

HS-WIM signal analysis and accuracy improvement (MOLIT) 2024 – Present
- Developed deep-learning-based fault-tolerant reconstruction of multi-channel HS-WIM signals
- Analyzed paired HS-WIM and on-board mass signals toward auto-calibration without a reference scale
- Analyzed traffic patterns from a year of continuous HS-WIM measurements, characterizing vehicle class and gross weight by time of day and season

On-board mass (OBM) system for real-time heavy-vehicle load monitoring 2024 – Present
- Improved dynamic weight estimation accuracy by estimating payload from multi-channel suspension sensors and compensating vehicle dynamic effects with IMU signals
- Conducted environmental, EMC, and ingress-protection testing for TCA Category B type approval
- Defined the communication protocol between the network module and the mobile application, and modified the Android application accordingly

Graduate Researcher | Smart Infrastructure Technology Laboratory **2019 – 2024**
Chung-Ang University · Seoul, Republic of Korea

Long-term monitoring of in-service bridges (Seoul Metropolitan Government; M.S. thesis) 2020 – 2024
- Designed JANET, a low-power IoT sensor: 24-bit three-axis accelerometer, eight strain channels, 0.34 mA standby, direct LTE Cat-1 communication
- Instrumented Seongsan, Paldang, Seosomun, and Jamsu bridges and collected over one year of continuous data under live traffic at 1 kHz across eight channels (3-axis acceleration, four strain, temperature)
- Built and operated a scalable data pipeline and dashboards serving all four bridges from a single cloud back end
- Tracked natural frequencies over a year, where seasonal temperature variation dominated the observed shifts
- Validated sensor-fusion displacement estimation against a laser displacement sensor reference, achieving under 1% error

Bridge load testing and load-carrying capacity evaluation (MOLIT) 2020 – 2024
- Developed a portable multimetric sensing system (JANET) and web-based document automation for capacity evaluation
- Devised an automatic load-event interval recognition method for continuous load-carrying capacity assessment

Monitoring of precast members during transportation and construction (MOLIT) 2020 – 2024
- Developed a portable gateway-and-JANET system for real-time safety monitoring of prefabricated members in transit
- Monitored acceleration, tilt, strain, and temperature throughout lifting, loading, and transport, with chatbot anomaly alerts

Strain visualization module with E-paper QR display (MOLIT) 2021 – 2024
- Developed an ultra-low-power multi-channel module that records strain history from fabrication to service and holds it on an embedded E-paper display that remains readable with no power
- Built a chatbot-based QR acquisition pipeline and automated reporting

Smart port berthing monitoring (MOLIT) 2021 – 2023
- Developed a wireless sensing system for long-term monitoring of caisson-type quay walls, integrating a high-sensitivity accelerometer with tilt, temperature, camera, and rangefinder modules
- Triggered vibration measurement on vessel berthing and unberthing, with an AI classifier to identify quay-wall events

Self-stress sensing circuit for ultra-high-performance concrete (NRF) 2020 – 2021
- Designed a low-cost multi-channel wireless sensing circuit that infers the loading state of self-sensing concrete from resistance change

Low-cost IoT seismic sensor (NRF) 2019
- Designed an ultra-low-power seismic sensor built for under $50 per unit
- Developed a two-phase detection algorithm: STA/LTA screening in the time domain, then classification by spectral content

Visiting Researcher | University of Hawaii at Manoa 2022
Dept. of Civil, Environmental and Construction Engineering · Honolulu, HI, USA · two-week visit hosted by Prof. DoSoo Moon
- Implemented GPS-based time synchronization on JANET for multi-point road-surface vibration measurement
- Configured and demonstrated the measurement setup for the host lab, and gave a lab seminar on the sensing platform

JOURNAL PUBLICATIONS

Peer-reviewed
- Khan, S., **Park, J.**, Park, J. W., Kim, I. H., & Won, J. (2026). Low-Power Multi-Channel Strain Sensing and QR-Enabled Shape Visualization for Digital-Twin-Enabled Structural Health Monitoring. *Journal of Civil Structural Health Monitoring*, 16, 106.
- **Park, J.**, Jho, Y., & Kim, J. W. (2026). Performance Comparison of Cloud and Local LLMs in a Hybrid Question-Answering System for WIM Operational Data Retrieval. *Journal of the Korean Society of Civil Engineers* (accepted). (in Korean)
- Kim, Y., Jung, H., **Park, J.**, Lee, Y., Jung, Y., Kim, J. W., & Yoon, I. (2026). Analysis of Freight Vehicle Operation Restriction Violations and Improvement of the Enforcement System Based on Real-World Road Data. *The Journal of the Korea Institute of Intelligent Transport Systems* (accepted). (in Korean)
- **Park, J.**, Kim, J. W., Jho, Y., & Jung, Y. (2026). YOLO-Based Automatic Load Segment Detection for High-Speed Weigh-in-Motion Systems. *Journal of the Korean Society of Civil Engineers*, 46(1), 95–104. (in Korean)
- Shin, J., **Park, J.**, Won, J., Park, J. W., & Min, J. (2024). Development of AI-Based Multisensory System for Monitoring Quay Wall Events. *Journal of Marine Science and Engineering*, 12(11), 1902.
- **Park, J.**, Kim, J. S., Kim, J. W., & Jho, Y. (2024). Stabilization of Dynamic Weight Estimation Systems for Commercial Vehicles during Driving. *Journal of the Korean Society of Mechanical Technology*, 26(5), 1041–1046. (in Korean)
- Khayam, S. U., Ajmal, A., **Park, J.**, Kim, I. H., & Park, J. W. (2023). Tendon Stress Estimation from Strain Data of a Bridge Girder Using Machine Learning-Based Surrogate Model. *Sensors*, 23(11), 5040.
- Khayam, S. U., Won, J., Shin, J., **Park, J.**, & Park, J. W. (2023). Monitoring Precast Structures during Transportation Using a Portable Sensing System. *Automation in Construction*, 145, 104639.
- Won, J., Park, J. W., **Park, J.**, Shin, J., & Park, M. (2021). Development of a Reference-Free Indirect Bridge Displacement Sensing System. *Sensors*, 21(16), 5647.
- Le, H. V., Kim, T. U., Khan, S., **Park, J.**, Park, J. W., Kim, S. E., … & Kim, D. J. (2021). Development of Low-Cost Wireless Sensing System for Smart Ultra-High Performance Concrete. *Sensors*, 21(19), 6386.
- Khan, S., Won, J., Shin, J., **Park, J.**, Park, J. W., Kim, S. E., … & Kim, D. J. (2021). SSVM: An Ultra-Low-Power Strain Sensing and Visualization Module for Long-Term Structural Health Monitoring. *Sensors*, 21(6), 2211.
- **Park, J.**, Shin, J., Won, J., Park, J. W., & Park, M. (2021). Development of a Low-Power IoT Sensor and Cloud-Based Data Fusion Displacement Estimation Method for Ambient Bridge Monitoring. *Journal of the Computational Structural Engineering Institute of Korea*, 34(5). (in Korean)
- Won, J., **Park, J.**, Park, J. W., & Kim, I. H. (2020). BLESeis: Low-Cost IoT Sensor for Smart Earthquake Detection and Notification. *Sensors*, 20(10), 2963.

Under review
- **Park, J.**, Shin, J., & Won, J. Development of a Portable Multimetric Sensing System for Bridge Load Testing and Load-Carrying Capacity Evaluation. *Measurement*, 2026.
- **Park, J.**, Jho, Y., & Kim, J. W. Continuous Calibration of a Load-Cell High-Speed Weigh-in-Motion System Using Repeated Vehicle Passes. *The Journal of the Korea Institute of Intelligent Transport Systems*, 2026. (in Korean)

In preparation
- **Park, J.**, Jho, Y., & Kim, J. W. Fault-Tolerant Reconstruction of Multi-Channel Weigh-in-Motion Signals Using Deep Learning.

CONFERENCE PRESENTATIONS (FIRST AUTHOR)

International
- **Park, J.**, Shin, J., & Park, J. W. (2023). Cloud-Based Ambient Bridge Monitoring using Strain and Acceleration Measurements. *Korea Institute of BIM*, Korea.
- **Park, J.**, Shin, J., Jang, H., & Park, J. W. (2022). Development of an IoT Sensor System and Web-Based Document Automation for Bridge Load-Bearing Capacity Evaluation. *CONVR*, Korea.

Domestic
- **Park, J.**, & Kim, J. W. (2026). AI-WIM-Based Detection of Suspected Overweight Vehicles at Highway Speeds: Real-Road Validation and Performance Evaluation. *KSCE*.
- **Park, J.**, Kim, J. H., & Kim, J. W. (2025). Development of a Cloud-Based Integrated Platform for Autonomous Enforcement. *KSCE*.
- **Park, J.**, Shin, J., & Park, J. W. (2023). A Scalable Framework for Ambient Bridge Monitoring using IoT Sensor and Cloud Computing. *KSMI*. **— Best Paper Award**
- **Park, J.**, & Park, J. W. (2023). IoT Sensor and Cloud Computing based Long-Term Bridge Monitoring. *KIBSE*.
- **Park, J.**, Park, J. W., & Shin, J. (2023). Bridge Monitoring System using an IoT Sensor and a Cloud Server. *KSNVE*.

- **Park, J.**, Shin, J., Park, J. W., & Park, M. (2022). Optimization of an Acceleration–Strain Displacement Estimation Method Considering Bridge Boundary Conditions. *COSEIK*. (also presented at KSNVE, 2022)
- **Park, J.**, Shin, J., Kang, S., Won, J., & Park, J. W. (2021). Cloud-Based Long-Term Bridge Monitoring System. *KSMI*.
- **Park, J.**, Shin, J., Won, J., Park, J. W., & Jang, Y. (2021). Estimation of a Bridge's Damaged Cable Using Deep Learning. *KSMI*.
- **Park, J.**, Shin, J., Won, J., Park, J. W., & Park, M. (2021). Cloud-Based Bridge Displacement Monitoring System. *COSEIK*.

Accepted

- **Park, J.**, Song, M., Jho, Y., & Kim, J. W. Cross-Analysis of WIM and OBM Signals for Dynamic Load Assessment and Measurement Error Correction. *10th International Conference on Weigh-In-Motion (ICWIM-10) / HVTT-19*, May 2027.

PATENTS

Granted

- Kim, J. W., Jho, Y., & **Park, J.** *Real-Time Correction of Dynamic Operating Weight of Freight Vehicles Based on an FIR Filter.* KR 10-2951213 (2026).
- Park, J. W., **Park, J.**, & Shin, J. *Automatic Recognition and Analysis of Load-Occurrence Intervals Using IoT Sensors for Structural Load-Carrying Capacity Assessment.* KR 10-2853678 (2025).
- Park, J. W., Kim, K. H., & **Park, J.** *Concrete Crack Trajectory Monitoring Using a Resistive Touchpad and Long-Term Measurement History Visualization.* KR 10-2892584 (2025).
- Park, J. W., Won, J., **Park, J.**, & Shin, J. *Cloud-Based Preprocessing of Smart IoT Sensor Data and Deep-Learning Automated Anomaly Detection for Structural Monitoring.* KR 10-2705761 (2024).
- Park, J. W., **Park, J.**, Shin, J., & Lee, J. *IoT Sensor-Based Integrated Monitoring System for Precast Transportation.* KR 10-2558124 (2023).
- Park, S., Shin, J., & **Park, J.** *Citizen-Participatory Smart City System Using Sensor Measurement and Data Visualization.* KR 10-2389222 (2022).
- Park, J. W., & **Park, J.** *Smart IoT Earthquake Sensor Unit and Notification Method.* KR 10-2353297 (2022).

Pending

- Kim, J. W., Jho, Y., **Park, J.**, & Song, M. *Method and Apparatus for Estimating Combined Container Weight Information Using an On-Board Mass System and a Weigh Station.* KR 10-2026-0199549 (2026).
- Kim, J. W., Jho, Y., Jung, Y., & **Park, J.** *Method and Apparatus for Vehicle Recognition Using a LiDAR Sensor.* KR 10-2026-0209028 (2026).
- Kim, J. W., Jho, Y., Jung, Y., & **Park, J.** *Vehicle Specification Measurement System and Method.* KR 10-2026-0101228 (2026).
- Kim, J. W., Jho, Y., & **Park, J.** *System and Method for Continuous Evaluation of Bridge Load-Carrying Capacity.* KR 10-2026-0218117 (2026).

AWARDS & HONORS

Awards

- **Best Paper Award**, Korea Institute for Structural Maintenance and Inspection (KSMI) **2024**
- **Gold Prize** (NRF Chairman's Award), 2nd X-Corps Plus Festival, Korea Future Talent Festival **2022**
- **Innovation Award** (Korea National Railway Chairman's Award), Smart Construction Challenge 2021 **2021**
- **Excellence Award**, 12th LH Land Development Technology Competition, Korea Land & Housing Corporation **2021**
- **Excellence Award** (Ministry of Environment), 8th Water Environment Policy & Technology Competition **2021**
- **Top Excellence Award**, National Infrastructure Safety Competition, Korea Infrastructure Safety Corporation **2020**
- **Top 8 Finalist**, Bentley Systems Digital Infrastructure Student Idea Challenge **2020**
- **Grand Prize** (Minister of the Interior and Safety Award), Smart Earthquake Response Idea Contest **2019**
- **Grand Prize** (KIAT President's Award), AI Object Detection Hackathon, Engineering Festival **2018**
- **Dean's Awards**, College of Engineering, Chung-Ang University **2020, 2021**

Scholarships

- **CAU Graduate Research Scholarship** (full graduate tuition), Chung-Ang University **2022 – 2023**
- **SeAH Haiam Scholarship** (full undergraduate tuition), SeAH Haiam Scholarship Foundation **2020 – 2021**
- **Academic Excellence Scholarship**, Chung-Ang University **Fall 2018, Spring 2019**

MENTORING

- Mentored two undergraduate research projects, Undergraduate Research Program (URP), Chung-Ang University
- *Long-term monitoring of quay walls with wireless sensors* (Junsik Shin, 2023) — high-sensitivity accelerometers with AI-based vessel detection; later developed into a peer-reviewed paper
- *Vision-based long-term 6-DOF monitoring of bridge bearings* (Gunhee Kim, 2022)

SKILLS & LANGUAGES

Programming: Python, MATLAB, C, JavaScript / Node.js
Machine learning: PyTorch, scikit-learn, pandas, NumPy
Hardware & design: Altium Designer, SolidWorks, LabVIEW
Software & data: Web dashboards, Android app modification, PyQt (desktop GUI), AWS, Docker, MySQL, InfluxDB, Grafana
Languages: English (TOEFL iBT 100/120, C1, 2026), Korean (native)

REFERENCES

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