

Kinam Kim

Ph.D. Candidate

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I. RESEARCH INTEREST

My research interests aim to advance automated systems for interactive, informative, and connected environments in entire construction phases through the use of multidisciplinary methods. By using emerging technologies such as Artificial Intelligence (AI), Internet of Things (IoT), computer vision, and wearable device systems, automation of acquiring, processing, interpreting, and sharing useful information can be achieved so that various stakeholders of construction projects can obtain the information effectively and efficiently, and ultimately make a decision. In this context, I have conducted research on IoT-enabled proximity warning systems with different sensing modalities and information delivery methods. I have researched automated recognition of construction worker's behavior and productivity using deep learning approaches as my Ph.D. thesis. I conducted research on visualizing a crane operation on a real time basis to improve its safety in blind lifts.

II. EARNED DEGREES

Ph.D. in Civil Engineering

Dissertation: *Automated Prediction of Behavior and Productivity for Construction Workers by using Wearable Motion Sensors with Deep-learning Approaches*

Date: May 2022 (Expected)

Advisor: Dr. Yong K. Cho

Georgia Institute of Technology, Atlanta, GA

M.S. in Civil and Environmental Engineering

Thesis: *Image-based Construction Hazard Avoidance System using Augmented Reality in a Wearable Device*

Date: June 2016

Advisor: Dr. Hyoungkwan Kim

Yonsei University, Seoul, South Korea

B.S. in Civil and Environmental Engineering

Date: February 2014

Yonsei University, Seoul, South Korea

III. EMPLOYMENT HISTORY

Graduate Research Assistant	School of Civil and Environmental Engineering Georgia Institute of Technology, Atlanta, GA	<i>Aug. 2017 - present</i>
Research Associate	School of Civil and Environmental Engineering Yonsei University, Seoul, South Korea	<i>Sept. 2016 - July 2017</i>
Graduate Research Assistant	School of Civil and Environmental Engineering Yonsei University, Seoul, South Korea	<i>Mar. 2014 - Aug.2016</i>
Research Intern	School of Civil and Environmental Engineering Yonsei University, Seoul, South Korea	<i>Sept. 2013 - Feb.2014</i>
Research Intern	Korea Railroad Research Institute (KRRI), Uiwang, South Korea	<i>Aug. 2012</i>
Republic of Korea Army	Gyeryong, South Korea	<i>Jan. 2010 - Oct.2011</i>

IV. HONORS AND AWARDS

1. Graduate Research Assistantship (\$70k per year), 2017-present
School of Civil and Environmental Engineering, Georgia Institute of Technology
2. Best Paper Award at KSCE 2016 Convention, 2016
Korean Society of Civil Engineers, South Korea
3. Brain Korea 21 Plus Scholarship (\$3,600), 2016
Creative Human Resources Center for Resilient Infrastructure, Yonsei University, Seoul, South Korea

4. Graduate Teaching Assistantship (\$2,500), 2015
School of Civil and Environmental Engineering, Yonsei University, Seoul, South Korea
5. Graduate Research Assistantship (\$54k per year), 2014-2017
School of Civil and Environmental Engineering, Yonsei University, Seoul, South Korea
6. Best Paper Award at Korean Institute of Construction Engineering and Management 2014 Conference, 2014
Korean Institute of Construction Engineering and Management, South Korea
7. Academic Excellence Scholarship (\$1,500), 2012
College of Engineering, Yonsei University, Seoul, South Korea

V. RESEARCH, PUBLICATION, AND CREATIVE ACTIVITIES

A. RESEARCH EXPERIENCE

A.1. CONSTRUCTION WORK ZONE SAFETY

2019 - present: Development of hardware and software for IoT-driven safety management applications in a jobsite

Project(s)

- A Smart IoT Proximity Alert System for Highway Work Zone Safety funded by NCHRP IDEA program
 - Manufactured prototypes of the hardware system
 - Developed firmware and software of the IoT-driven communication infrastructure
 - Developed the proximity alert system
- PFI-TT: Smart Pose and Position Guidance System for Construction Worker's Safety and Productivity funded by National Science Foundation (NSF)
 - Manufactured prototypes of the hardware system
 - Developed firmware and software of the IoT-driven communication infrastructure
 - Developed the unsafe posture detection system using a motion recognition algorithm

2017 - present: Development and implementation of an IoT-driven proximity warning system with case studies

Project(s)

- Phase III: Smart Proximity Work Zone Safety Technology Deployment funded by Georgia Department of Transportation (GDOT)
 - Developed the proximity alert system
 - Conducted multiple case studies in construction sites
 - Evaluated qualitative and quantitative performance of the system
- AwareSite - Smart and Connected Construction Jobsite for Construction Safety and Productivity Improvement funded by Dysruptek
 - Developed the proximity alert system
 - Conducted multiple case studies in construction sites
 - Evaluated qualitative and quantitative performance of the system

2014-2017: Development of the image-based proximity warning system using augmented reality in a wearable device

Project(s)

- Intelligent Interactive InfoEcosystem for Automating and Optimizing On-site Safety/Construction, funded by National Research Foundation of Korea (NRF)
 - Developed the image-based proximity hazard detection and visualization system
 - Conducted multiple case studies in construction sites

A.2. CONSTRUCTION WORKER'S BEHAVIOR AND PRODUCTIVITY MONITORING

2019-present: Automated recognition of construction workers' motions and activities for monitoring their behavior and productivity using deep learning approaches

Project(s)

- PFI-TT: Smart Pose and Position Guidance System for Construction Worker's Safety and Productivity funded by National Science Foundation (NSF)
 - Developed automated motion and activity recognition algorithms for individual workers
 - Conducted multiple case studies in construction sites

2018 - 2019: Evaluation of the effectiveness of locations and quantity of motion sensors for machine learning algorithms

A.3. REAL-TIME CRANE OPERATION VISUALIZATION

2017-2018: Visualization of load sway to improve crane safety in blind lifts

Projects

- Advanced Blind Lift Safety using Crane Motion Sensors and Real-time Visualization funded by Chevron Energy Technology Company
 - Developed the visualization platform and user interface for monitoring the load sway of a crane using a 3D game engine

A.4. CLIMATE CHANGE ADAPTATION OF INFRASTRUCTURE

2014-2015: Economic assessment of climate change adaptation of infrastructure

Projects

- Proactive Adaptation Scenarios for Infrastructure under Climate Change using Probabilistic Life Cycle Cost Analysis funded by National Research Foundation of Korea (NRF)
 - Participated in developing probabilistic economic assessment of climate change adaptation of infrastructure

B. REFEREED PUBLICATION AND SUBMITTED ARTICLES

B.1. PUBLISHED AND SUBMITTED JOURNAL ARTICLES

- [1] Youjin Jang, **Kinam Kim**, Fernanda Leite, Steven Ayer, and Yong K. Cho, (2021). "Identifying the Perception Differences of Emerging Construction-Related Technologies between Industry and Academia to Enable High Levels of Collaboration" *Journal of Construction Engineering and Management*, [https://doi.org/10.1061/\(ASCE\)CE.1943-7862.0002156](https://doi.org/10.1061/(ASCE)CE.1943-7862.0002156).
- [2] **Kinam Kim** and Yong K. Cho (2021). "Automatic Recognition of Workers' Motions in Highway Construction by using Motion Sensors and Long Short-Term Memory (LSTM) Networks" *Journal of Construction Engineering and Management*, [https://doi.org/10.1061/\(ASCE\)CE.1943-7862.0002001](https://doi.org/10.1061/(ASCE)CE.1943-7862.0002001).
- [3] **Kinam Kim** and Yong K. Cho (2020). "Effective Inertial Sensor Quantity and Locations on a Body for Deep Learning-Based Worker's Motion Recognition." *Automation in Construction*, <https://doi.org/10.1016/j.autcon.2020.103126>.
- [4] Yihai Fang, Jingdao Chen, Yong K. Cho, and **Kinam Kim** (2018). "Vision-Based Load Sway Monitoring to Improve Crane Safety in Blind Lifts." *Journal of Structural Integrity and Maintenance*, <https://doi.org/10.1080/24705314.2018.1531348>.
- [5] Kyoungki Kim, Yong K. Cho, and **Kinam Kim**. (2018). "BIM-Based Decision-Making Framework for Scaffolding Planning." *Journal of Management in Engineering*, [https://doi.org/10.1061/\(ASCE\)ME.1943-5479.0000656](https://doi.org/10.1061/(ASCE)ME.1943-5479.0000656).

- [6] Kyoungki Kim, Yong Cho, and **Kinam Kim**. (2018). “BIM-Driven Automated Decision Support System for Safety Planning of Temporary Structures.” *Journal of Construction Engineering and Management*, [https://doi.org/10.1061/\(ASCE\)CO.1943-7862.0001519](https://doi.org/10.1061/(ASCE)CO.1943-7862.0001519).
- [7] **Kinam Kim**, Hongjo Kim, and Hyoungkwan Kim. (2017). “Image-Based Construction Hazard Avoidance System using Augmented Reality in Wearable Device.” *Automation in Construction*, <https://doi.org/10.1016/j.autcon.2017.06.014>.
- [8] Sooji Ha, Kyeongseok Kim, **Kinam Kim**, Hoyoung Jeong and Hyoungkwan Kim (2017). “Reliability Approach in Economic Assessment of Climate Change Adaptation of Infrastructure: A Debris Flow Barrier Example” *Journal of Management in Engineering*, [https://doi.org/10.1061/\(ASCE\)ME.1943-5479.0000530](https://doi.org/10.1061/(ASCE)ME.1943-5479.0000530)
- [9] Hongjo Kim, **Kinam Kim**, and Hyoungkwan Kim. (2016). “Data-Driven Scene Parsing Method for Recognizing Construction Site Objects in the Whole Image.” *Automation in Construction*, <https://doi.org/10.1016/j.autcon.2016.08.018>.
- [10] Hongjo Kim, **Kinam Kim**, and Hyoungkwan Kim. (2016). “Vision-Based Object-Centric Safety Assessment Using Fuzzy Inference: Monitoring Struck-By Accidents with Moving Objects.” *Journal of Computing in Civil Engineering*, [https://doi.org/10.1061/\(ASCE\)CP.1943-5487.0000562](https://doi.org/10.1061/(ASCE)CP.1943-5487.0000562).
- [11] Hongjo Kim, Changyoon Kim, Hoyoung Jeong, Sooji Ha, **Kinam Kim**, and Hyoungkwan Kim. (2015). “4D CAM Drawings based on Marker-Based Augmented Reality.” *Korean Journal of Construction Engineering and Management*, <https://doi.org/10.6106/KJCEM.2015.16.4.030>.

B.2. CONFERENCE PRESENTATION WITH PROCEEDINGS (REFERRED)

- [1] **Kinam Kim**, Jingdao Chen, and Yong K. Cho (2019). “Evaluation of Machine Learning Algorithms for Worker’s Motion Recognition using Motion Sensors.” *In Proceedings of the ASCE 2019 International Conference on Computing in Civil Engineering (i3CE)*, Atlanta, GA, USA, June 17-19, <https://doi.org/10.1061/9780784482438.007>.
- [2] Jingdao Chen, **Kinam Kim**, Yong K. Cho, Joo Sung Lee, Byeol Kim, Yong Han Ahn, and Junsuk Kang (2019). “Nuclear Power Plant Disaster Site Simulation using Rigid Body Physics.” *In Proceedings of the ASCE 2019 International Conference on Computing in Civil Engineering (i3CE)*, Atlanta, GA, USA, June, <https://doi.org/10.1061/9780784482421.069>.
- [3] Yong K. Cho, Youjin Jang, **Kinam Kim**, Fernanda Leite, and Steven Ayer (2019). “Understanding Different Views on Emerging Technology Acceptance between Academia and the AEC/FM Industry.” *In Proceedings of the ASCE 2019 International Conference on Computing in Civil Engineering (i3CE)*, Atlanta, GA, USA, June, <https://doi.org/10.1061/9780784482438.077>.
- [4] Yong K. Cho, **Kinam Kim**, Shaojun Ma, and Jun Ueda. (2018). “A Robotic Wearable Exoskeleton for Construction Worker’s Safety and Health.” *In Proceedings of ASCE Construction Research Congress (CRC) 2018*, New Orleans, LA, USA, April, <https://doi.org/10.1061/9780784481288.003>.
- [5] **Kinam Kim**, Hongjo Kim, and Hyoungkwan Kim. (2016). “Hazard Avoidance System using Augmented Reality in Wearable Device.” *In Proceedings of the 16th international Conference on Computing in Civil and Building Engineering (ICCCBE) 2016*, Osaka, Japan, July , http://www.see.eng.osaka-u.ac.jp/seeit/icccb2016/Proceedings/Full_Papers/196-290.pdf.
- [6] Sooji Ha, Hoyoung Jeong, **Kinam Kim**, Hongjo Kim, and Hyoungkwan Kim. (2015). “Valuation of Adaptation Technology to Climate Change Based on Target Classification.” *In Proceedings of the 32nd International Symposium on Automation and Robotics in Construction and Mining (ISARC) 2015*, Oulu, Finland, June, <https://doi.org/10.22260/ISARC2015/0124>.
- [7] **Kinam Kim**, Hoyoung Jeong, Hongjo Kim, Sangseom Jeong, and Hyoungkwan Kim. (2014). “Economic Assessment of Landslide Behavior Simulation Technology under Climate Change.” *In Proceedings of the 14th World Conference of Associated Research Centers for Urban Underground Space (ACUUS) 2014*, Seoul, Korea, Sept.

- [8] Hongjo Kim, **Kinam Kim**, Sungjae Park, Jihoon Kim, and Hyoungkwan Kim. (2014). “An Interactive Progress Monitoring System using Image Processing in Mobile Computing Environment.” *In Proceedings of the 31st International Symposium on Automation and Robotics in Construction and Mining (ISARC) 2014*, Sydney, Australia, July, <https://doi.org/10.22260/ISARC2014/0041>.
- [9] Hongjo Kim, **Kinam Kim**, Seongdeok Bang and Hyoungkwan Kim.(2016) “Reconstruction of Construction Entities from Images using Multi-View Stereo” *In Proceedings of the KSCE 2016 Convention*, Jeju, Korea, Oct.
- [10] Hongjo Kim, Hoyoung Jeong, **Kinam Kim**, Sungjae Park, Changyoon Kim, and Hyoungkwan Kim. (2014). “A Fuzzy Inference- and Computer Vision- based Safety Assessment System for Construction Site Entities.” *In Proceedings of the 14th Korean Institute of Construction Engineering and Management Conference 2014*, Seoul, Korea, Nov.
- [11] Hongjo Kim, **Kinam Kim**, Sungjae Park, Hoyoung Jeong, and Hyoungkwan Kim. (2014). “Applicability of the Kalman Filter for Multi-object Tracking in Construction Sites.” *In Proceedings of the KSCE 2014 Convention*, Daegu, Korea, Oct.

C. PATENTS

- [1] Hyoungkwan Kim, **Kinam Kim**, and Hongjo Kim. “Visualization of Safety Assessment System in Construction Site using Wearable Device.” Patent number 10-1715001, Mar., 4, 2017.
- [2] Hyoungkwan Kim, Hongjo Kim, **Kinam Kim**, and Hoyoung Jeong. “System for Assessment of Safety Level at Construction Site based on Computer Vision” Patent number 10-1674266, Nov., 2, 2016.

D. PRESENTATION

- [1] **Phase III: Smart Proximity Work Zone Safety Technology Deployment**
The 8th Annual GDOT/GTI Research Exposition (10/2020)
- [2] **Phase III: Smart Proximity Work Zone Safety Technology Deployment**
The 7th Annual GDOT/GTI Research Exposition (09/2019)
- [3] **An Integrated Construction Worker Monitoring System for Tracking Locations and Recognizing Motions of the Workers**
ASCE 2019 International Conference on Computing in Civil Engineering (i3CE) (06/2019)
- [4] **Evaluation of Machine Learning Algorithms for Worker’s Motion Recognition using Motion Sensors**
ASCE 2019 International Conference on Computing in Civil Engineering (i3CE) (06/2019)
- [5] **A Robotic Wearable Exoskeleton for Construction Worker’s Safety and Health**
ASCE Construction Research Congress (CRC) 2018 (04/2018)
- [6] **Hazard Avoidance System using Augmented Reality in Wearable Device**
The 16th international Conference on Computing in Civil and Building Engineering (ICCCBE) 2016 (07/2016)
- [7] **Economic Assessment of Landslide Behavior Simulation Technology under Climate Change**
the 14th World Conference of Associated Research Centers for Urban Underground Space (ACUUS) 2014 (09/2014)

E. TECHNICAL SKILLS

- Programming: Python, Matlab, Java, C++
- Software frameworks: Tensorflow, Pytorch, Scikit-learn
- Others: Embedded system for IoT application, HTML, Android studio, ArcGIS, 3D CAD

VI. TEACHING

A. GEORGIA INSTITUTE OF TECHNOLOGY

- **Construction Automation and Robotics (CEE4803C/8813L), Substitute Lecturer and Teaching Assistant, Fall 2021**
 - Lectured for several class modules involving AHP and IoT applications in construction
 - Held office hours and graded assignments and exams
- **Automation in Construction (CEE4803F/8813C,I), Substitute Lecturer and Teaching Assistant, Fall 2018, Fall 2019, Spring 2021**
 - Lectured for several class modules involving AHP and IoT applications in construction
 - Participated in course development
 - Held office hours and graded assignments and exams
- **Construction Industry Best Practices (CEE4803D/8813E,N) Teaching Assistant, Fall 2020, Fall 2021**
 - Managed remote synchronous class
 - Held office hours and graded assignments
- **Construction Operations (CEE4120A), Teaching Assistant, Fall 2020**
 - Held office hours and graded assignments and exams

B. YONSEI UNIVERSITY

- **Construction Management (CEE4408), Teaching Assistant, Spring 2016**
 - Held office hours and graded assignments and exams
- **Construction Economic Feasibility (CEE4412), Teaching Assistant, Fall 2014, Fall 2015**
 - Held office hours and graded assignments and exams
- **Mentoring experience, Fall 2016, Spring 2017**
 - Co-mentored two graduate students for CEE Master's thesis

C. PROFESSIONAL DEVELOPMENT IN TEACHING

- **Center for Teaching and Learning, Tech to Teaching Certificate, Spring 2022 (Expected)**
 - Participated in several graduate-level courses and seminars for preparing future faculty in pedagogy and course design

VII. SERVICE ACTIVITIES

A. PROFESSIONAL SERVICE ACTIVITIES

- Chief organizing assistant for ASCE 2019 International Conference on Computing in Civil Engineering (i3CE), 2018 - 2019

B. UNIVERSITY SERVICE ACTIVITIES

- President of the Georgia Tech Korean Civil and Environmental Engineers Association (GTKCEE), 2020 - 2021
- Vice President of the Atlanta Metropolitan Area Yonsei University Alumni Association, 2019 - 2021

C. OUTREACH SERVICE ACTIVITIES

- Volunteer for National Robotics Week 2018, 2019
- K-12 outreach activity that provided a high school student with an opportunity to participate in a research project, 2019