Hunsoo Song, Ph.D.

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RESEARCH INTERESTS

Geospatial Data Science, Urban Sustainability, Climate Change, etc.
Current focus: Analysis of infrastructure and environmental inequality in cities.

APPOINTMENTS

Postdoctoral Researcher, Yale University — Sept 2024 - Present
Hixon Center for Urban Sustainability & Seto Lab, Director: Dr. Karen Seto

Postdoctoral Researcher, Purdue University — June 2024 - Aug 2024
Geospatial Data Science Lab, Director: Dr. Jinha Jung

Graduate Researcher, Oak Ridge National Laboratory — May 2023 - Jul 2023
GeoAI group, Geospatial Science and Human Security Division

Graduate Research Assistant, Purdue University — Aug 2020 - May 2024
Geospatial Data Science Lab, Director: Dr. Jinha Jung

Graduate Research Assistant, Seoul National University — Mar 2018 - Feb 2020
SPINS-RS Lab, Director: Dr. Yongil Kim

EDUCATION

Purdue University, West Lafayette, IN — Aug 2020 - May 2024
Ph.D. in Geomatics, Civil Engineering
Concentration in Computational Engineering
Dissertation: Transparent and Scalable Knowledge-based Geospatial Mapping Systems for Trustworthy Urban Studies

Seoul National University, Seoul, Korea — Mar 2018 - Feb 2020
M.S. in Civil and Environmental Engineering

Seoul National University, Seoul, Korea — Mar 2012 - Feb 2018
B.S. in Civil and Environmental Engineering

SCHOLARSHIPS AWARDS

Podium Presentation Award (2nd place), 28th Environmental Engineering & Science Symposium, Champaign, IL, 2023.

GISCUP Winner (1st place), 30th ACM SIGSPATIAL, Seattle, WA, 2022.

Roland S. Corning II Fellowship, Purdue University, 2022.

Frederick N. Andrews Fellowship, Full Tuition & Stipend Coverage, Purdue University, 2020-2024.

Student Competition using Meteorological Satellites (2nd place), Korea Meteorological Administration, 2019.

Best Student Paper Award, International Symposium on Remote Sensing, 2019.

Merit-based Scholarship, Seoul National University, 2018.

Brain Korea 21 Plus Scholarship, National Research Foundation of Korea, 2018.

Certificate of Commendation, Korean Society of Survey, Geodesy, Photogrammetry, and Cartography, 2018.

Best Bachelor's Thesis Award (3rd place), Department of Civil and Environmental Engineering, Seoul National University, 2017.

National Scholarship for Science and Engineering, Full Tuition Coverage, Korea Student Aid Foundation, 2014-2017.

Merit-based Scholarship, Seoul National University, 2012-2013.

Refereed Journal Articles

[P6] **Hunsoo Song**, Anamika Shreevastava, Gaia Cervini, Jinha Jung (2024), "Reshaping Urban Landscape Factorization through 3D Landscape Clustering for Urban Climate Studies." *Sustainable Cities and Society.*

[P5] **Hunsoo Song**, Jinha Jung (2023), "An unsupervised, open-source workflow for 2D and 3D building mapping from airborne LiDAR data" *In IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing.*

[P4] **Hunsoo Song**, Jinha Jung (2023), "An object-based ground filtering of airborne LiDAR data for large-area DTM generation." *Remote Sensing*, 15, 4105.

[P3] **Hunsoo Song**, Lexie Yang, Jinha Jung (2022), "Self-filtered learning for semantic segmentation of buildings in remote sensing imagery with noisy labels." *In IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, 16, 1113-1129.

[P2] Minho Kim, **Hunsoo Song**, Yongil Kim (2020), "Direct short-term forecast of photovoltaic power through a comparative study between COMS and Himawari-8 meteorological satellite images in a deep neural network." *Remote Sensing*, 12(15), 2357.

[P1] **Hunsoo Song**, Yonghyun Kim, Yongil Kim (2019), "A patch-based light convolutional neural network for land-cover mapping using Landsat-8 images." *Remote Sensing*, 11, 114.

Refereed Conference Proceedings

[C10] **Hunsoo Song**, Lexie Yang (2024), "Efficient extraction of building elevation attributes for flood risk management using airborne LiDAR data." *In 2024 IEEE International Geoscience and Remote Sensing Symposium. IEEE.*

[C9] Chenying Liu, **Hunsoo Song**, Anamika Shreevastava, Conrad Albrecht (2024), "AUTOLCZ: Towards automatized local climate zone mapping from rule-based remote sensing." *In 2024 IEEE International Geoscience and Remote Sensing Symposium. IEEE.*

[C8] **Hunsoo Song**, Joshua Carpenter, Jon E. Froehlich, Jinha Jung (2023), "Accessible Area Mapper for inclusive and sustainable urban mobility: a preliminary investigation of airborne point clouds for pathway analysis." *In Proceedings of the 1st ACM SIGSPATIAL International Workshop on Sustainable Mobility*, Hamburg, Germany, Nov 13-16.

[C7] **Hunsoo Song**, Gaia Cervini, Jinha Jung (2023), "Assessment of local climate zone products via simplified classification rule with 3D building maps" *In 2023 IEEE International Geoscience and Remote Sensing Symposium. IEEE.* Pasadena, CA, Jul 16-21.

[C6] **Hunsoo Song**, Jinha Jung (2022), "Challenges in building extraction from airborne LiDAR data: ground-truth, building boundaries, and evaluation metrics" *In the 30th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems.*, Seattle, WA, Nov 1-4.

[C5] **Hunsoo Song**, Gwangjoong Kim, Minho Kim, Yongil Kim (2019), "Short-term forecasting of photovoltaic power integrating multi-temporal meteorological satellite imagery in deep neural network." In *2019 IEEE PES Asia-Pacific Power and Energy Engineering Conference (APPEEC)*. IEEE. Macau, China, Dec 1-4.

[C4] Gwangjoong Kim, **Hunsoo Song**, Minho Kim, Yongil Kim (2019), "Multimodal merging of satellite imagery with meteorological and power plant data in deep convolutional neural network for short-term solar energy prediction." in *Asian Conference on Remote Sensing 2019*, Daejeon, Korea, Oct 14-18.

[C3] **Hunsoo Song**, Anjin Chang, Junho Yeom, Jinha Jung, Yongil Kim (2019), "Domain adaptation for 2D/3D change detection in VHR imagery via calibration of convolutional neural network under prior probability shift." in *Asian Conference on Remote Sensing 2019*, Daejeon, Korea, Oct 14-18.

[C2] **Hunsoo Song**, Yongil Kim (2019), "Improving land-cover classification accuracy with a patch-based convolutional neural network: data augmentation and purposive sampling." In *2019 Joint Urban Remote Sensing Event (JURSE)*. IEEE. Vannes, France, May 22-24.

[C1] **Hunsoo Song**, Yongil Kim (2019), "A patch-based supervised approach for change detection in high resolution multispectral images." in *International Symposium on Remote Sensing 2019*, Taipei, Taiwan, Apr 17-19.

SUBMITTED/ WORKING MANUSCRIPTS

[S3] Arnav Goel, **Hunsoo Song**, Jinha Jung (2024), "Integrating sparse LiDAR and multi-sensor time series imagery from spaceborne platforms for deriving localized canopy height model" *IEEE Transactions on Geoscience and Remote Sensing — under review.*

[S2] **Hunsoo Song**, Jinha Jung (2024), "An unsupervised, scalable surface water mapping using 3D geometric properties from airborne LiDAR data" *GIScience & Remote Sensing — under review.*

[S1] Dennis Choi, Lindsay E Darling, Jaeyoung Ha, Jinyuan Shao, **Hunsoo Song**, Songlin Fei, Brady Hardiman (2024), The Influence of Vertical Urban Structures on Avian Diversity over Varying Spatial Scales." *International Journal of Applied Earth Observation and Geoinformation — under review.*

[W2] **Hunsoo Song**, Gaia Cervini, Jinha Jung (2024), "Unraveling the relationship between the landscape and urban heat intensity using deep learning and digital twin simulations."

[W1] Hansae Kim, **Hunsoo Song**, Jinha Jung (2024), "From cadastral to agricultural parcel: a deep learning approach using remote sensing imagery and GIS data."

RESEARCH GRANT ACQUISITION

Point Cloud Processing and Feature Extraction Algorithms for Terrain and 3D Building Mapping using Airborne LiDAR data — (Oak Ridge National Laboratory) Pending

- Played a pivotal role in securing the proposal
- Built upon my Graduate Research Program at ORNL

A Scalable and Sustainable Framework for a Geospatial Digital Twin — (National Geospatial-Intelligence Agency, $378,215) Jul 2023 - Jun 2025

- Played a pivotal role in acquiring the proposal — *led proposal writing*
- Serve as the primary researcher for this project

Punjab Urban Land Systems Enhancement Project — (Food and Agriculture Organization of the United Nations, Total $40,000) Mar - Jun 2022, Mar - Jun 2023

- Contributed to proposal writing and methodology development

Photovoltaic Power Estimation using Meteorological Satellite Imagery — (SK Telecom—Korea's largest mobile operator, ∼$59,000) Jul 2019 - Dec 2019

- Served as *project manager*, leading the proposal and final report writings, and directing the entirety of the research efforts
- Achievements include: 1 patent, 1 journal article, 2 conference proceedings

PATENTS

Hunsoo Song, Yongil Kim, Minho Kim, Gwangjoong Kim, "Method and Apparatus for Short-term Photovoltaic Power Prediction Based on Convolutional Neural Network", South Korea Patent Application No. 10-2021-0008489, filed Jan 21, 2021.

Hunsoo Song, Yongil Kim, "Apparatus and Method for Generating Land Cover Map", South Korea Patent Application No. 10-2019-0095402, filed Aug 6, 2019.

INVITED TALKS

"Physical Property-Driven 3D Terrain and Surface Water Mapping", The U. S. Geological Survey — CEGIS Annual Meeting, Rolla, MO Aug 2023

"Airborne LiDAR for Digital Twin: Advancing Scalable Urban Resilience Research", SI Analytics, Online seminar Aug 2023

TEACHING & MENTORING SERVICES

Academic Mentoring, Various periods, 2021 - Present

- Engaged in mentoring activities, offering academic support and guidance to students across various disciplines and academic levels

Teaching Assistant, CE203: Principles and Practice of Geomatics, Purdue University, Fall 2021 & Fall 2023 (Lead TA)

- Guided a class of +140 undergraduate students
- Delivered lecture/lab sessions, Assisted in course work developments

Volunteer Judge, Undergraduate Research Conference, Purdue University, Spring 2022, Summer 2022

- Evaluated and advised on undergraduate research projects

Young Engineers Honor Society, National Academy of Engineering of Korea, Nov 2016 - Aug 2020.

- Engineers selected by university heads from various majors
- Mentored diverse student bodies, volunteered to teach basic engineering courses, and engaged in academic exchanges and social contribution initiatives

Military Service, South Korea, Sept 2014 - Jun 2016.

REFERENCES

Jinha Jung, Purdue University
Associate Professor, Civil Engineering
jinha@purdue.edu

Karen Seto, Yale University
Frederick C. Hixon Professor of Geography and Urbanization Science

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Melba M. Crawford, Purdue University
Nancy Uridil and Frank Bossu Distinguished Professor, Civil Engineering
mcrawford@purdue.edu

Hsiuhan Lexie Yang, Ph.D., Oak Ridge National Laboratory
Nancy Research Scientist, GeoAI Group
yangh@ornl.gov

Songlin Fei, Purdue University
Professor, Forestry and Natural Resources
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