

# Cheolhee Yoo, PhD

Department of Land Surveying and Geo-Informatics,  
The Hong Kong Polytechnic University, Hong Kong

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## Positions and Employment

- 2022/10 – Present**      **Research Assistant Professor** in Department of Land Surveying and Geo-Informatics, The Hong Kong Polytechnic University
- 2022/04 – 2022/09**      **Postdoc Fellowship** in Department of Land Surveying and Geo-Informatics, The Hong Kong Polytechnic University
- 2019/01 – 2019/03**      **Research Intern** in RIKEN Center for Advanced Intelligence Project (AIP), Japan
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## Education

### **Ph.D. in Environmental Science and Engineering**

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

Date of graduation: February, 2022

Advisor: Professor Jungho Im

Thesis Title: Urban climate characterization and heat risk assessment based on machine learning and remote sensing data

### **BS in Environmental Science and Engineering**

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

Date of graduation: February, 2017, Summa Cum Laude

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## Research Topics

Remote sensing

Urban climatology

Urban land use mapping

GIS and remote sensing applications

Artificial intelligence

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## Selected Publications (Relevant to Position)

1. **Yoo, Cheolhee**, Jungho Im, Seonyoung Park, and Lindi J. Quackenbush. "Estimation of daily **maximum and minimum air temperatures in urban landscapes** using MODIS time series satellite data." *ISPRS journal of photogrammetry and remote sensing* 137 (2018): 149-162. [150 citations]
2. **Yoo, Cheolhee**, Huijuan Xiao, Qing-wei Zhong, and Qihao Weng. "**Unequal impacts of urban industrial land expansion** on economic growth and carbon dioxide emissions." *Communications Earth & Environment* 5, no. 1 (2024): 203.
3. **Yoo, Cheolhee**, Jungho Im, Qihao Weng, Dongjin Cho, Eunjin Kang, and Yeji Shin. "**Diurnal urban heat risk assessment** using extreme air temperatures and real-time population data in Seoul." *Iscience* 26, no. 11 (2023): 108123.
4. Lee, Siwoo, **Cheolhee Yoo**<sup>†</sup>, Jungho Im<sup>†</sup>, Dongjin Cho, Yeonsu Lee, and Dukwon Bae. "A hybrid machine learning approach to **investigate the changing urban thermal environment by dynamic land cover transformation**: A case study of Suwon, republic of Korea." *International Journal of Applied Earth Observation and Geoinformation* 122 (2023): 103408. [corresponding author]
5. **Yoo, Cheolhee**, Jungho Im, Dongjin Cho, Yeonsu Lee, Dukwon Bae, and Panagiotis Sismanidis. "Downscaling MODIS **nighttime land surface temperatures in urban areas** using ASTER thermal data through local linear forest." *International Journal of Applied Earth Observation and Geoinformation* 110 (2022): 102827.

## Full List of Publications

(Google scholar total citation/h-index=1232/16)

### *Journal Papers (co-first authors are underlined)*

1. **Yoo, Cheolhee**, Huijuan Xiao, Qing-wei Zhong, and Qihao Weng. "Unequal impacts of urban industrial land expansion on economic growth and carbon dioxide emissions." *Communications Earth & Environment* 5, no. 1 (2024): 203.
2. Jia, Siqi, Qihao Weng, **Cheolhee Yoo**, Huijuan Xiao, and Qingwei Zhong. "Building energy savings by green roofs and cool roofs in current and future climates." *npj Urban Sustainability* 4, no. 1 (2024): 23.
3. Lee, Yeonsu, Dongjin Cho, Jungho Im, **Cheolhee Yoo**, Joonlee Lee, Yoo-Geun Ham, and Myong-In Lee. "Unveiling teleconnection drivers for heatwave prediction in South Korea using explainable artificial intelligence." *npj Climate and Atmospheric Science* 7, no. 1 (2024): 176.
4. Lee, Kyungil, **Cheolhee Yoo**, and Seonyoung Park. "Differences in LCZ composition according to urban planning and impacts on urban thermal environment." *Energy and Buildings* 314 (2024): 114272.
5. Jia, Siqi, Yuhong Wang, Tan Chun Liang, Qihao Weng, **Cheolhee Yoo**, Wu Chen, and Xiaoli Ding. "Multiscale Estimation of the Cooling Effect of Urban Greenspace in Subtropical and Tropical Cities." *Urban Forestry & Urban Greening* (2024): 128390.
6. Kang, Eunjin, Dongjin Cho, Siwoo Lee, Jungho Im, Dongwook Lee, and **Cheolhee Yoo** "An Explainable AI-based Framework for District-level Risk Factor Analysis: A Case Study of

- Spatiotemporal Cardiovascular Mortality in South Korea.” *GIScience & Remote Sensing*, (2024) (Under review)
7. Bae, Dukwon, Dongjin Cho, Jungho Im, **Cheolhee Yoo**, Yeonsu Lee, and Silo Lee. “Improved hourly all-sky land surface temperature estimation: Incorporating the temporal variability of cloud radiation interactions.” *Journal of Selected Topics in Applied Earth Observations and Remote Sensing*, (2024) (Under review)
  8. Jia, Siqi, Qihao Weng, **Cheolhee Yoo**, and James Voogt “Cooling and Energy-Saving Potentials of Green and Cool Roofs in Global 43 Megacities.” *Energy*, (2024) (Under review)
  9. **Yoo, Cheolhee**, Jungho Im, Qihao Weng, Dongjin Cho, Eunjin Kang, and Yeji Shin. "Diurnal urban heat risk assessment using extreme air temperatures and real-time population data in Seoul." *Iscience* 26, no. 11 (2023): 108123.
  10. Kang, Eunjin, Seonyoung Park, Miae Kim, **Cheolhee Yoo**, Jungho Im, and Chang-Keun Song. "Direct aerosol optical depth retrievals using MODIS reflectance data and machine learning over East Asia." *Atmospheric Environment* 309 (2023): 119951.
  11. Lee, Siwoo, **Cheolhee Yoo**<sup>†</sup>, Jungho Im<sup>†</sup>, Dongjin Cho, Yeonsu Lee, and Dukwon Bae. "A hybrid machine learning approach to investigate the changing urban thermal environment by dynamic land cover transformation: A case study of Suwon, republic of Korea." *International Journal of Applied Earth Observation and Geoinformation* 122 (2023): 103408. [**co-corresponding author**]
  12. Choo, Minki, **Cheolhee Yoo**, Jungho Im, Dongjin Cho, Yoojin Kang, Hyunkyung Oh, and Jongsung Lee. "Trend Analysis of Vegetation Changes of Korean Fir (*Abies koreana* Wilson) in Hallasan and Jirisan Using MODIS Imagery." *Korean Journal of Remote Sensing* 39, no. 3 (2023): 325-338.
  13. **Yoo, Cheolhee**, Daehyun Kang, and Seonyoung Park. "Identifying the Impact of Regional Meteorological Parameters on US Crop Yield at Various Spatial Scales Using Remote Sensing Data." *Remote Sensing* 14, no. 15 (2022): 3508.
  14. **Yoo, Cheolhee**, Jungho Im, Dongjin Cho, Yeonsu Lee, Dukwon Bae, and Panagiotis Sismanidis. "Downscaling MODIS nighttime land surface temperatures in urban areas using ASTER thermal data through local linear forest." *International Journal of Applied Earth Observation and Geoinformation* 110 (2022): 102827.
  15. Lee, Jaese, Sumin Park, Jungho Im, **Cheolhee Yoo**, and Eunkyo Seo. "Improved soil moisture estimation: Synergistic use of satellite observations and land surface models over CONUS based on machine learning." *Journal of Hydrology* 609 (2022): 127749.
  16. Cho, Dongjin, Dukwon Bae, **Cheolhee Yoo**, Jungho Im, Yeonsu Lee, and Siwoo Lee. "All-sky 1 km MODIS land surface temperature reconstruction considering cloud effects based on machine learning." *Remote Sensing* 14, no. 8 (2022): 1815.
  17. Cho, Dongjin, **Cheolhee Yoo**, Bokyung Son, Jungho Im, Donghyuck Yoon, and Dong-Hyun Cha. "A novel ensemble learning for post-processing of NWP Model's next-day maximum air temperature forecast in summer using deep learning and statistical approaches." *Weather and Climate Extremes* 35 (2022): 100410.

18. Jung, Sihun, **Cheolhee Yoo**, and Jungho Im. "High-resolution seamless daily sea surface temperature based on satellite data fusion and machine learning over Kuroshio Extension." *Remote Sensing* 14, no. 3 (2022): 575.
19. Park, Haemi, Junghee Lee, **Cheolhee Yoo**, Seongmun Sim, and Jungho Im. "Estimation of Spatially Continuous Near-Surface Relative Humidity Over Japan and South Korea." *IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing* 14 (2021): 8614-8626.
20. Kang, Eunjin, **Cheolhee Yoo**, Yeji Shin, Dongjin Cho, and Jungho Im. "Comparative Assessment of Linear Regression and Machine Learning for Analyzing the Spatial Distribution of Ground-level NO<sub>2</sub> Concentrations: A Case Study for Seoul, Korea." *Korean Journal of Remote Sensing*, 37(6\_1) (2021): 1739-1756.
21. Lee, Yeonsu, Siwoo Lee, Jungho Im, and **Cheolhee Yoo**. "Analysis of surface urban heat island and land surface temperature using deep learning based local climate zone classification: A case study of suwon and daegu, korea." *Korean Journal of Remote Sensing*, 37(5\_3) (2021), 1447-1460.
22. Yoo, Cheolhee, Yeonsu Lee, Dongjin Cho, Jungho Im, and Daehyeon Han. "Improving local climate zone classification using incomplete building data and Sentinel 2 images based on convolutional neural networks." *Remote Sensing* 12, no. 21 (2020): 3552.
23. Cho, Dongjin, **Cheolhee Yoo**, Jungho Im, Yeonsu Lee, and Jaese Lee. "Improvement of spatial interpolation accuracy of daily maximum air temperature in urban areas using a stacking ensemble technique." *GIScience & Remote Sensing* 57, no. 5 (2020): 633-649. [53 citations]
24. **Yoo, Cheolhee**, Jungho Im, Dongjin Cho, Naoto Yokoya, Junshi Xia, and Benjamin Bechtel. "Estimation of all-weather 1 km MODIS land surface temperature for humid summer days." *Remote Sensing* 12, no. 9 (2020): 1398.
25. Cho, Dongjin, Cheolhee Yoo, Jungho Im, and Dong-Hyun Cha. "Comparative assessment of various machine learning-based bias correction methods for numerical weather prediction model forecasts of extreme air temperatures in urban areas." *Earth and Space Science* 7, no. 4 (2020): e2019EA000740. [147 citations]
26. Park, Seonyoung, Daehyun Kang, **Cheolhee Yoo**, Jungho Im, and Myong-In Lee. "Recent ENSO influence on East African drought during rainy seasons through the synergistic use of satellite and reanalysis data." *ISPRS Journal of Photogrammetry and Remote Sensing* 162 (2020): 17-26.
27. Shin, Minso, Yoojin Kang, Seohui Park, Jungho Im, **Cheolhee Yoo**, and Lindi J. Quackenbush. "Estimating ground-level particulate matter concentrations using satellite-based data: A review." *GIScience & Remote Sensing* 57, no. 2 (2020): 174-189. [83 citations]
28. Lee, Juhyun, Cheolhee Yoo, Jungho Im, Yeji Shin, and Dongjin Cho. "Multi-task Learning Based Tropical Cyclone Intensity Monitoring and Forecasting through Fusion of Geostationary Satellite Data and Numerical Forecasting Model Output." *Korean Journal of Remote Sensing* 36, no. 5\_3 (2020): 1037-1051.

29. **Yoo, Cheolhee**, Jungho Im, Sumin Park, and Dongjin Cho. "Spatial downscaling of MODIS land surface temperature: Recent research trends, challenges, and future directions." *Korean Journal of Remote Sensing* 36, no. 4 (2020): 609-626.
30. **Yoo, Cheolhee**, Daehyeon Han, Jungho Im, and Benjamin Bechtel. "Comparison between convolutional neural networks and random forest for local climate zone classification in mega urban areas using Landsat images." *ISPRS Journal of Photogrammetry and Remote Sensing* 157 (2019): 155-170. [210 citations]
31. Park, Sumin, Haemi Park, Jungho Im, **Cheolhee Yoo**, Jinyoung Rhee, Byungdoo Lee, and ChunGeun Kwon. "Delineation of high resolution climate regions over the Korean Peninsula using machine learning approaches." *PLoS One* 14, no. 10 (2019): e0223362.
32. **Yoo, Cheolhee, Seonyoung Park**, Yeji Kim, and Dongjin Cho. "Analysis of thermal environment by urban expansion using KOMPSAT and Landsat 8: Sejong City." *Korean Journal of Remote Sensing* 35, no. 6\_4 (2019): 1403-1415.
33. Park, Seonyoung, Jungho Im, Seohui Park, **Cheolhee Yoo**, Hyangsun Han, and Jinyoung Rhee. "Classification and mapping of paddy rice by combining Landsat and SAR time series data." *Remote Sensing* 10, no. 3 (2018): 447. [158 citations]
34. **Yoo, Cheolhee**, Jungho Im, Seonyoung Park, and Lindi J. Quackenbush. "Estimation of daily maximum and minimum air temperatures in urban landscapes using MODIS time series satellite data." *ISPRS journal of photogrammetry and remote sensing* 137 (2018): 149-162. [150 citations]
35. **Yoo, Cheolhee**, Jungho Im, Seonyoung Park, and Dongjin Cho. "Thermal characteristics of Daegu using land cover data and satellite-derived surface temperature downscaled based on machine learning." *Korean Journal of Remote Sensing* 33, no. 6\_2 (2017): 1101-1118.

### **Book Chapters**

1. **Yoo, Cheolhee**, and Qihao Weng. "GeoAI for High-Resolution Urban Air Temperature Estimation and **Urban Heat Island Monitoring**." In *Handbook of Geospatial Approaches to Sustainable Cities*, pp. 139-158. CRC Press, 2024.
2. Chung, Lamuel Chi Hay, and **Cheolhee Yoo**<sup>†</sup>. "Recent Improvements in Supervised Pixel-Based LCZ Classification." In *Local Climate Zone Application in Sustainable Urban Development: Experience from East and Southeast Asian High-Density Cities*, pp. 53-75. Cham: Springer International Publishing, 2024.
3. Li, Zhiwei, **Cheolhee Yoo**, and Qihao Weng. "Urban Flooding Monitoring and Management in Geospatial Perspective: Data, Techniques, and Platforms." In *Handbook of Geospatial Approaches to Sustainable Cities*, pp. 44-57. CRC Press, 2024.
4. Chen, Haojie, **Cheolhee Yoo**, and Qihao Weng. "Comparisons of Deep Learning Models for Dynamic Local Climate Zone Mapping." In *Handbook of Geospatial Approaches to Sustainable Cities*, pp. 313-324. CRC Press, 2024.

## Presentations

1. **Cheolhee Yoo**, Qihao Weng, and Jungho Im. "Diurnal urban heat risk assessment using extreme air temperatures and real-time population data: A case study of Seoul, South Korea." In ISEE Conference Abstracts, vol. 2024, no. 1. 2024. **(Poster)**
2. **Cheolhee Yoo** and Weng, Qihao. Assessing the Impact of Urban Industrial Land Expansion on Economic Growth and CO2 Emissions Across Various Development Levels. Workshop on GeoAI and Big Data for Urban, Environment, and Sustainability cum Inauguration Ceremony for Research Centre for Artificial Intelligence in Geomatics, The Hong Kong Polytechnic University, Hong Kong., 2023 **(Oral)**
3. **Cheolhee Yoo** and Weng, Qihao. Assessing the Role of Industrial and Non-Industrial Urban Land Consumption in Economic Growth. In Proceedings of ISPRS Geospatial Week 2023, Arab Academy for Science, Technology & Maritime Transport, Cairo, Egypt., 2023 **(Poster)**
4. **Cheolhee Yoo** and Weng, Qihao. Industrial and Non-Industrial Urban Land Expansion: An examination of the complex relationship between economic growth and carbon emissions. Advanced Urban Remote Sensing Workshop (AURSW), The University of Hong Kong (HKU), Hong Kong. 2022 **(Oral)**
5. **Cheolhee, Yoo.** and Jungho, Im., Improving Local Climate Zone Classification Using Incomplete Building Data and Sentinel 2 Images Based on Convolutional Neural Networks, The Korean Association of Geographic Information Studies (KAGIS) Fall Conference 2020 **(Oral)**
6. **Cheolhee, Yoo.**, Jungho Im., Dongjin Cho., Naoto Yokoya., Junshi Xia. And Benjamin Bechtel., Estimating MODIS land surface temperature under clouds using air temperature observations in urban areas Estimation 1 km MODIS Land Surface Temperature under Cloudy Conditions for Humid Summer days, 40th Asian Conference on Remote Sensing, Daejeon, Korea, October., 2019 **(Oral)**
7. **Cheolhee, Yoo.**, Jungho Im., Dongjin Cho., Naoto Yokoya., Junshi Xia. And Benjamin Bechtel., Estimating MODIS land surface temperature under clouds using air temperature observations in urban areas, Living Planet Symposium, Milan, Italy, May., 2019 **(Poster)**
8. **Cheolhee, Yoo.**, Jungho Im., Benjamin Bechtel., Daehyeon Han. and Dongjin Cho., A New Approach for 'Local Climate Zones' Classification Using Remote Sensing Images Combining Neighborhood and Sub-Pixel Information, 10th International Conference on Urban Climate 2018, New York, USA, August., 2018 **(Oral)**
9. **Cheolhee, Yoo.**, Daehyeon Han. and Jungho Im., Local Climate Zone classification using remote sensing images with convolutional neural networks, International Symposium on Remote Sensing 2018, Pyeongchang, Korea, May., 2018 **(Oral)**
10. **Cheolhee, Yoo.** and Jungho, Im., Statistical Estimation of Urban maximum and minimum air temperatures using MODIS satellite data, Joint EUSTACE- GlobTemperature Workshop 2017, Lisbon, Portugal, November., 2017 **[Invited] (Oral)**

11. **Cheolhee, Yoo.** and Jungho, Im., Estimation of maximum and minimum air temperatures in urban areas using MODIS satellite data, European Geosciences Union (EGU) General Assembly 2017, Vienna, Austria, April., 2017 (**Oral**)
12. **Cheolhee, Yoo.** and Jungho, Im., Estimation of maximum and minimum air temperatures in urban areas using MODIS satellite data, GIS Association of Japan (GISA) 2016, Tokyo, Japan, April., 2017 (**Oral**)
13. **Cheolhee, Yoo.** and Jungho, Im., Estimation of daily maximum and minimum air temperature using MODIS multi-temporal data in urban areas, KOREAN SOCIETY OF REMOTE SENSING Fall Conference 2016 (**Oral**)
14. **Cheolhee, Yoo.** and Jungho, Im., Estimation of daily maximum and minimum air temperature using MODIS data based on machine learning approaches in urban areas, Korean Association of Geographic Information Studies Spring Conference 2016 (**Oral**)

## Honors / Awards / Fellowships

1. Highly Cited Paper Award from the Korean Society of Remote Sensing (2023)
2. Top 30 reviewers of the ISPRS Journal of Photogrammetry and Remote Sensing (PHOTO) for both 2021 and 2022.
3. Best Research Award from the Department of Urban and Environmental Engineering, UNIST (Feb. 2022)
4. 2020 Talent Award of Korea from Ministry of Education, South Korea (Dec. 2020)
5. Global PhD Fellowship from National Research Foundation of Korea (Mar.2018 – present , ~17,000 USD/year)
6. The Administrator of Korea Meteorological Administration's Award for 2019 The 5th Student Competition in Research using Meteorological Satellite
7. The Environment Minister's Award for 2017 Environmental Spatial Information Research Papers Competition
8. Excellent Oral Presentation Award at the conference of the Korean Association of Geographic Information Studies (KAGIS) (May, 2016)
9. Dean's Award for Academic Excellence from Ulsan National Institute of Science and Technology (UNIST) (Spring 2013, Fall 2014, Spring 2015, Fall 2015, Spring 2016, Fall 2016)
10. National Undergraduate Scholarship from Ministry of Science and Technology (Mar.2013 – Nov.2016, ~6,000 USD/year)

## Synergistic Activities

- **Editorial Board Member**, ISPRS Journal of Photogrammetry and Remote Sensing (IF: 12.7)
- **Editorial Board Member**, GIScience & Remote Sensing (IF: 6.7)
- **Session Chair**, Workshop on GeoAI and Big Data for Urban, Environment, and Sustainability cum Inauguration Ceremony for Research Centre for Artificial Intelligence in Geomatics, 2023
- **Invited Speaker**, Topics Webinar: EO&GEO Series: GIS in the Management of Sustainable and Smart Cities, March 09, 2023
- **Guest Editor** – Remote Sensing, List of Special Issues
- **THESIS ADVISOR**
  - Wong Ka Wing, MSc in Geomatics, PolyU Hong Kong, 2023
  - Lam Kwok Ching, MSc in Geomatics, PolyU Hong Kong, 2023
- **Participant in urban climate summer school** hosted by Research Institute of the University of Bucharest, Bucharest, Romania (21-26 August, 2017, 27-31 August, 2018)