Minho Kim

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Scholar | RG | Twitter | ORCID

Research Interests

- **Geospatial Analysis:** Remote Sensing, Computer Vision, GIScience, Network Science
- **Machine Learning:** Deep Learning, GeoAI, Explainable AI
- **Environmental Planning:** Risk & Resilience, Natural Hazards, Sustainable Development

Education

University of California, Berkeley **Sep 2021 – Present**
Ph.D. Environmental Planning
Topic: Data-Driven Planning for Resilience Against Natural Hazard Risks
Advisors: Marta Gonzalez, John Radke

Seoul National University **Mar 2017 – Feb 2021**
M.S. Civil & Environmental Engineering
Thesis: Local Climate Zone Classification Using Multi-Scale Convolutional Networks
Advisor: Yongil Kim

Seoul National University **Sep 2012 – Feb 2017**
B.S. Civil & Environmental Engineering
Thesis: North Korea's 4th Nuclear Test Site with Sentinel-1A Data Using DInSAR
Advisor: Yongil Kim

Research Experience

Graduate Student Researcher (River Lab, Funded by CalTrans) **May 2023 – present**
Advisors: Mathias Kondolf, John Radke *UC Berkeley*

- Burn severity potential mapping using deep CNN models in *TF/PyTorch* with sub-pixel uncertainty quantification in North California [W4].
- Post-fire debris flow prediction using ML models from multi-modal geospatial datasets [W3].
- Network science analysis of post-fire debris flow risk on critical transportation infrastructure

Graduate Student Researcher (HuMNet Lab, Funded by C3.AI) **Jan 2022 – present**
Advisor: Marta Gonzalez, Mentor: Cristobal Pais *UC Berkeley*

- Trained physics-based, semi-empirical data computed in *R* with ML models (*scikit-learn, XGBoost, AutoGluon, PyTorch*) to integrate into a cellular automata simulator (ported into *C++*) to conduct fire spread simulations at global scales with state-of-the-art accuracy [W2].
- Built convolutional autoencoders (i.e., semantic segmentation) using *TF* & *PyTorch*) to map surface fuels and vegetation at high spatio-temporal resolution. [C10].

Research Assistant (SPINS-RS Lab) **Mar 2019 – Feb 2021**
Advisor: Yongil Kim *Seoul National University*

- Urban Remote Sensing: Generated high resolution Local Climate Zone classification maps multi-scale CNNs (∼80% accuracy) [C7] and multi-scale, multi-level attention CNNs (∼90% accuracy) trained with multitemporal Sentinel-2 images and multi-modal GIS data (vectorized national land cover maps and OpenStreetMap) [P4]. DL models were built in *TF* & *PyTorch*.
- Renewable Energy: Predicted photovoltaic power of solar farms with high precision ($< 5\%$ Normalized MAE) using large-scale time series of multitemporal geostationary satellite images and multi-source meteorological data (up to 5TB) via ML/DL models *TF*) [C2], [C4], [P3].
- Image Fusion: Developed a spatiotemporal image fusion model in Matlab to produce disaggregated Landsat-8 thermal images in heterogeneous urban areas [C6].
- Change Detection/Monitoring: Applied radiometric calibration methods to help detect and monitor wildfire burn scars using change detection results from multitemporal Sentinel-2 and PlanetScope images [C3], [P2].

Undergraduate Research Assistant (SPINS-RS Lab) **Aug 2016 – Feb 2017**
Advisor: Yongil Kim *Seoul National University*

- Analyzed ground deformations in inaccessible, remote areas using dInSAR with Sentinel-1 SAR images.
- Carried out fieldwork and experiments using a ground-based hyperspectral imager to monitor crop health.

Research Assistant (Lawson Health Research Institute) **Sep 2011 – Jan 2012**
Advisor: Jeffrey Carson *London, Canada*

- Researched photoacoustic image reconstruction of a line source using multiple regularization percentages with the addition of maximum intensity projection using Matlab.

Work Experience

Geospatial Data Consultant **Sep 2022 – Dec 2022**
Investigative Reporting Program (School of Journalism) *UC Berkeley*

- Developed and managed multi-modal geospatial data (multispectral satellite images, nighttime light images, vector data related to census, parcels, etc.) to map deforestation and human activity in Brazil using Google Earth Engine (geemap & Javascript) and QGIS for J298 OSINT Seminar

Researcher at Institute of Construction & Env. Eng. **Mar 2021 – Aug 2021**
Advisor: Yongil Kim *Seoul National University*

- Developed high resolution land cover maps of inaccessible areas using a semantic segmentation DL model in TF trained with very high resolution satellite imagery [C8].

PR Manager **Mar 2021 – Aug 2021**
Education & Research Program (InfraSPHERE) *Seoul National University*

- Promoted and coordinated the Brain Korea 21 Seminar Series (New Frontiers of InfraSPHERE).
- Designed the main website for Brain Korea Infrasphere (hosted by Dept. of Civil and Environmental Engineering) and maintained their Youtube channel.

Lab Manager **Mar 2021 – Aug 2021**
SPINS-RS Lab *Seoul National University*

- Organized lab's surveying equipment (GPS/GNSS, total stations, etc) and software licenses.

Honors & Awards

ICE-KSCE Master's Thesis Award **July 2021**
Institution of Civil Engineers (UK) & Korean Society of Civil Engineers

Best Student Paper Award at ISRS2021 **May 2021**
Korean Society of Remote Sensing and Gaia3D

Environmental Geospatial Data Idea Contest (Excellence Award) **Nov 2020**
Ministry of Environment, South Korea

SPINS Lab (Outstanding Research Award) **Mar 2020**
Seoul National University

Student Competition using Meteorological Satellites (Research Award) **Jan 2019**
Korean Meteorological Administration

Scholarships

Beatrix C. Farrand Memorial Fellowship **May 2023**
UC Berkeley (Dept. of Landscape Architecture & Environmental Planning)

Robert N. Colwell Memorial Fellowship **Feb 2023**
The American Society for Photogrammetry and Remote Sensing

Brain Korea 21 Plus Scholarship **2019 – 2021**
National Research Foundation of Korea

Merit-based Scholarship **2014–2017, 2019**
Seoul National University

National Scholarship for Science and Engineering **2013 – 2014**
Korea Student Aid Foundation

SNU Global Scholarship **2012 – 2013**
Seoul National University

Publications

* indicates equal contribution

Preprints & Working Papers

[W5] **Minho Kim**, Harrison Raine, John Radke, Marta Gonzalez. *Shared responsibility: A novel spatial metric for WUI planning and community resilience.*

[W4] **Minho Kim**, John Radke, Marta Gonzalez. *Burn severity potential prediction using deep learning with sub-pixel uncertainty quantification*

[W3] **Minho Kim**, John Radke, Marta Gonzalez. *Post-fire debris flow prediction using machine learning in North California.*

[W2] **Minho Kim**, Cristobal Pais, Marta Gonzalez. *Cell2FireML: Towards a Global Machine Learning-Based Fire Simulation Model.*

[W1] Cristobal Pais, **Minho Kim**, Yanyan Xu, John Radke, Marta Gonzalez. *An interdisciplinary data-science approach to managing natural hazards risk.* (**In Review**).

Peer Reviewed Journal Papers

[P4] **Minho Kim**, Jeong, D. & Kim, Y. (2021). *Local climate zone classification using a multi-scale, multi-level attention network,* ISPRS Journal of Photogrammetry and Remote Sensing, 181, (345-366). (***2022 IF:12.7**)

[P3] **Minho Kim**, Song, H. & Kim, Y. (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).

[P2] **Minho Kim**, Jung, M. & Kim, Y. (2019). *Histogram matching of Sentinel-2 spectral information to enhance Planetscope imagery for effective wildfire damage assessment,* Korean Journal of Remote Sensing, 35(4), (517-534).

[P1] Kim, Y., **Minho Kim**, Choi, J. & Kim, Y. (2017). *Image fusion of spectrally nonoverlapping imagery using SPCA and MTF-based filters,* IEEE Geoscience and Remote Sensing Letters, 14(12), (2295-2299).

Conference & Workshop Papers

[C11] Yao, X. & **Minho Kim**. (2023). *A Lidar-based Method for 3D Urban Forest Evaluation and Microclimate Assessment, a Case Study in Portland, Oregon, USA,* Accepted in AGU23. American Geophysical Union. Dec 11-25, 2023.

[C10] **Minho Kim**, Dronova, I. & Radke, J. (2023). *Semantic Segmentation of Enhanced Landform Maps Using High Resolution Satellite Images,* Accepted in IGARSS 2023 IEEE International Geoscience and Remote Sensing Symposium. IEEE. Pasadena, California, US., July 16-21, 2023. (*Attended as **Session Chair**)

[C9] Yao, X. & **Minho Kim** (2023). *Exploratory remote sensing data analysis and clustering of urban vegetation and land surface temperature in Portland, Oregon,* Accepted in IGARSS 2023 IEEE International Geoscience and Remote Sensing Symposium. IEEE. Pasadena, California, US., July 16-21, 2023.

[C8] **Minho Kim**, Kwak, T., Jung, J. & Kim, Y. (2021). *Mapping inaccessible areas using deep learning based semantic segmentation of VHR satellite images with OpenStreetMap data,* In Proceedings of the 2021 International Symposium of Remote Sensing, Virtual, May 26-28, 2021.(*Awarded **Best Student Paper**)

[C7] **Minho Kim**, Jeong, D., Choi, H. & Kim, Y. (2020). *Developing High Quality Training Samples for Deep Learning Based Local Climate Zone Classification in Korea,* arXiv preprint, Presented at **AI for Earth Sciences Workshop at NeurIPS 2020**, Virtual, arXiv:2011.01436.

[C6] **Minho Kim**, Cho, K., Kim, H. & Kim, Y. (2020). *Fusion of High Resolution Land Surface Temperature Using Thermal Sharpened Images from Regression-based Urban Indices,* ISPRS Annals of the Photogrammetry, Remote Sensing and Spatial Information Sciences, 3, (pp247-254).

[C5] Song, A., Kim, C., **Minho Kim** & Kim, Y. (2019). *Analysis of Geospatial Technology for Smart City Development: Case Study of South Korea,* In Proceedings of The 1st Tunisian Smart Cities Symposium, Tunisia, 2019.

[C4] Kim, G., Song, H., Kim, **Minho Kim** & Kim, Y. (2019). *Multimodal Merging of Satellite Imagery with Meteorological and Power Plant Data in Deep Convolutional Neural Network for Short-Term Solar Energy Prediction,* In Proceedings of the 40th Asian Conference on Remote Sensing, Daejeon, South Korea, Oct 14-18, 2019.

[C3] **Minho Kim** & Kim, Y. (2019). *Integration of Sentinel-2 Spectral Information with High Spatial Resolution Planetscope Imagery for Wildfire Damage Assessment,* In Proceedings of the 40th Asian Conference on Remote Sensing, Daejeon, South Korea, Oct 14-18, 2019.

[C2] Song, H., Kim, G., **Minho Kim** & Kim, Y. (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), Macao, (pp1-5).

[C1] **Minho Kim** & Kim, Y. (2019). *Monitoring the Catastrophic 2018 Mendocino Complex Wildfire Using the Sentinel Constellation,* In Proceedings of the 2019 International Symposium of Remote Sensing, Taiwan, April 14-17, 2019.

Invited Talks & Panels

[T3] "Exploring Research in the Environmental Field", UC Berkeley **Oct 2021**
Berkeley Environmental Economics and Policy Students

[T2] "Urban Remote Sensing", Seoul National University **April 2020**
Guest lecture for graduate course Satellite Image Processing

[T1] "Urban Remote Sensing", Seoul National University **Jan 2020**
2020 Summer Seminar for the Interdisciplinary Program in Landscape Architecture

Patents & Software

Song, H., Kim, Y., **Minho Kim**, Kim, K. *Convolutional neural networks for short-term photovoltaic forecast using satellite imagery, meteorological data, and power station data.* Patent, South Korea, 2021.

Teaching

🎓 UC Berkeley

Lead Instructor (Course Link)

• GEOG/LDARCH C188: Geographic Information Systems (*Lead Instructor*) **Fall 2022**
- Teaching Effectiveness: **6.311/7** from **61/169** students (Dept. Average: 6.230/7)

Graduate Student Instructor

• LDARCH/ESPM 289: Applied Remote Sensing **Spring 2024**
• GEOG/LDARCH C188: Geographic Information Systems **Fall 2021**

🎓 Seoul National University

Teaching Assistant

• 457.542*: Advanced Surveying (*Head TA*) **Spring 2021**
• 457.205: Introduction to Geospatial Engineering (*Lab Tutor & Head TA*) **Spring 2021**
• 457.539*: Advanced Remote Sensing: VHR Imagery (*Head TA*) **Fall 2020**
• 457.402: Remote Sensing (*Lab Tutor & Head TA*) **Fall 2020**
• 457.544*: Satellite Image Interpretation (*Head TA*) **Spring 2020**
• Leadership for Civil Engineers (*TA*) **Spring 2020**
• 457.205: Spatial Informatics and Systems (*Lab Tutor & Head TA*) **Spring 2020**

*Graduate-level Courses

Mentored Students at UC Berkeley

• Stella Wing (*BS Conservation and Resource Studies & Minor in Data Science*) **Sep 2023 – Present**
• Harrison Raine (*Dual Masters in Environmental Planning & City Planning*) **Sep 2023 – Present**
• Zeff Fengze Lin (*ME Landscape Design at South China University of Technology*) **Jan 2023 – May 2023**
• Weixin Li (*MS Civil & Environmental Engineering*) **Sep 2022 – May 2023**
• Xihan Yao (*MLA Environmental Planning*) **Sep 2022 – Present**
• Madison Chi (*BS Environmental Science & Minor in Sustainable Design*) **Sep 2022 – May 2023**

Mentored Students at Seoul National University

• Hyoungwoo Choi (*BS Civil and Environmental Engineering*) **Sep 2020 – Feb 2021**

Services

Reviewer (Total: 34 reviews)

GISciences & Remote Sensing, Remote Sensing, Geo-Spatial Information Science, European Journal of Remote Sensing, International Journal of Digital Earth, ISPRS International Journal of Geo-Information, Geocarto International, Applied Sciences, Agronomy, Forecasting

Web of Science

Membership

- IEEE Geoscience and Remote Sensing Society **2023**
- American Society for Photogrammetry and Remote Sensing **2022**
- Korean-American Scientists and Engineers Association **2022**
- International Society for Photogrammetry and Remote Sensing Student Consortium **2020**
- Korean Society of Civil Engineers **2019**

Session Chair (Image Analysis for Land Cover Mapping), IGARSS 2023 **July 2023**

Ammunition Inspector, Republic of Korea Army **May 2017 – Jan 2019**

- Recorded ammunition transactions and composed ammunition inventory reports. After working hours, contributed to write-up on pan-sharpening image fusion research using Worldview images [P1].

General Education Peer Tutor, Seoul National University **Mar 2016 – June 2016**

- Tutored college-level English to undergraduate students for incoming freshmen

Section Editor, The SNU Quill - SNU's English Press **Sep 2013 – June 2015**

- SNU campus news section reporter and editor for 9 volumes; responsible for 6-8 journal reporters. Also coordinated English writing/composition workshops and orientations.

Skills

GitHub	https://github.com/minhokim93
Programming	Python, C/C++, CMake, Matlab, Javascript (Google Earth Engine), Git, Scripting (Bash), LaTeX
ML/DL	Tensorflow, Keras, PyTorch, Scikit-learn, Scikit-image, OpenCV
Remote Sensing	ENVI (SARscape), Google Earth Engine (Javascript/geemap), Python (Rasterio/GDAL)
GIS	ArcGIS, QGIS, Python (Geopandas, Shapely, Fiona, NetworkX), PostGIS
Languages	English (Native), Korean (Native), French (Fluent)

Certification

- Certificate in Teaching and Learning in Higher Education **Expected**
- Graduate Certificate in Geospatial Information Science and Technology **2022**

References

Dr. Prof. Marta Gonzalez
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