

## **Pei-Yi Wong (翁佩詒)**

Research Center for Environmental Changes (RCEC), Academia Sinica

No. 128, Sec. 2, Academia Rd., Nankang, Taipei, Taiwan 115

Office Tel: +886-2-2787-5994

Mobile:

Email: [peiyiwong@gate.sinica.edu.tw](mailto:peiyiwong@gate.sinica.edu.tw)

Lab website link: [www.rcec.edu.tw](http://www.rcec.edu.tw)

### **EDUCATION**

2020/09 – 2025/01 Ph.D. Department of Environmental and Occupational Health, National Cheng Kung University, Taiwan

2018/09 – 2020/06 M.S. Department of Environmental and Occupational Health, National Cheng Kung University, Taiwan

2014/09 – 2018/06 B.A. Department of Public Health, Kaohsiung Medical University, Taiwan

### **EMPLOYMENT**

2025/02 - present Postdoctoral Researcher RCEC, Academia Sinica, Taiwan

### **HONORS & AWARDS**

2019 41st Asian Conference on Remote Sensing (ACRS) - Best Paper Award

2020 Taiwan Geographic Information Society (TGIS) Annual Conference - Best Paper Publisher Award

2021 Conference on Indoor Environmental Quality Health , Infection Prevention and Intelligent Living in Asia (TSIEQ 2021) - Popularity Award

2021 National Cheng Kung University - Outstanding Doctoral Student Grant

2021 Professor Kun-Yen Huang Education Fund - Health Care Research Scholarship

2022 Taiwan Geographic Information Society Annual Conference - Best Paper Publisher Award

2022 Grand Review Doctoral and Postdoctoral Research Academic Competition - Doctoral Excellence Award

2022 NCKU Hospital Cheng-Hsing Medical Foundation - Outstanding Paper Award

2022 National Cheng Kung University - Outstanding Doctoral Student Grant

2022 Professor Kun-Yen Huang Education Fund - Health Care Research Scholarship

2022 ISEE-AC Educational Grant

2023 Grand Review Doctoral and Postdoctoral Research Academic Competition - Doctoral Excellence Award

2023 National Cheng Kung University - Outstanding Doctoral Student Grant

2023 Professor Kun-Yen Huang Education Fund - Health Care Research Scholarship

2024 ISEE-AWPC & ISES-AC - Travel Award

2024 Asia Conference on Innovative Approaches to Enhance Healthy Indoor Environment (TSIEQ 2024) Student Paper Competition Awards - First place  
2024 Grand Review Doctoral and Postdoctoral Research Academic Competition - Doctoral Outstanding Award

## PROFESSIONAL SERVICE

### ■ Journal article review

2023

- Journal article reviewer of *Process Safety and Environmental Protection* (IF=6.9; JIF%=87.4%)

2024

- Journal article reviewer of *Atmospheric Environment* (IF=4.2; JIF%=76.8%)
- Journal article reviewer of *Advances in Space Research* (IF=2.8; JIF%=79.8%)
- Journal article reviewer of *Journal of Hazardous Materials* (IF=12.2; JIF%=96.8%)
- Journal article reviewer of *Atmospheric Environment* (IF=4.2; JIF%=76.8%)
- Journal article reviewer of *Environmental Pollution and Management*

2025

- Journal article reviewer of *Journal of Hazardous Materials* (IF=12.2; JIF%=96.8%)
- Journal article reviewer of *Earth Science Informatics* (IF=2.7; JIF%=64.4%)

## RESEARCH INTEREST

My research interest focuses on exploring large-scale variations in air pollution concentrations. By collecting air quality monitoring data, satellite imagery, and land use/land cover information (LULC), I integrated geographic information systems (GIS), big data analysis, and machine learning algorithms to develop Geospatial-Artificial Intelligence (Geo-AI) models for estimating the spatiotemporal changes in air pollution concentrations. My current research targets key pollutants, including PM<sub>2.5</sub>, NO<sub>2</sub>, and CO. Additionally, I conducted field sampling using volumetric air sampler to collect outdoor fungal spore samples in Tainan City. These samples were analyzed through microscopic counting to estimate the total fungal spore concentrations in the ambient air. I also developed Geo-AI models to predict the spatial distribution of outdoor fungal spore concentrations in Tainan. I further used the estimated air pollution concentration to investigate the environmental health effects. Furthermore, I analyzed genetic polymorphisms in asthmatic children to understand the combined effects of PM<sub>2.5</sub>, fungal spores, and single nucleotide polymorphisms (SNPs) on childhood asthma.

## RESEARCH HIGHLIGHTS

## 1. Developing Geo-AI models for PM<sub>2.5</sub>, NO<sub>2</sub>, CO, and fungal spores to improve prediction accuracy and variable interpretability

By integrating GIS, remote sensing, LULC, and machine learning algorithms, I developed Geo-AI models that achieved approximately a 20% increase in prediction accuracy compared to conventional modelling approaches, such as land-use regression. For example, the Geo-AI models explained 94% of the variation in PM<sub>2.5</sub>, 91% for NO<sub>2</sub>, 85% for CO, and 96% for fungal spores. Furthermore, by utilizing Shapley Additive Explanations (SHAP) value, the key influential factors were clarified for each target air pollutant. By addressing machine learning interpretability while improving prediction ability, the estimated air pollution concentration can be further applied to investigate their health impacts in environmental epidemiological studies.

Reference: (Wong et al. 2021a,b,c; Wong et al. 2023; Wong et al. 2024a,b)

### REPRESENTATIVE PUBLICATIONS (\*: corresponding author)

1. **Wong, P. Y.**, C. Y. Hsu, J. Y. Wu, T. A. Teo, J. W. Huang, H. R. Guo, H. J. Su, C. D. Wu, John D. Spengler. 2021. Incorporating Land-Use Regression into Machine Learning Algorithms in Estimating the Spatial-Temporal Variation of Carbon Monoxide in Taiwan. *Environmental Modelling & Software* (SCI, IF=5.471, Water Resources, Rank 16/100, Q1, JIF Percentile 84.50%)
2. **Wong, P. Y.**, H. Y. Lee, Y. T. Zeng, Y. R. Chern, N. T. Chen, S. C. C. Lung, H. J. Su, C. D. Wu. 2021. Using a Land Use Regression Model with Machine Learning to Estimate Ground Level PM<sub>2.5</sub>. *Environmental Pollution* (SCI, IF=9.988, Environmental Sciences, Rank 28/279, Q1, JIF Percentile 90.14%)
3. **Wong, P. Y.**, H. J. Su, H. Y. Lee, Y. C. Chen., Y. P. Hsiao, J. W. Huang, T. A. Teo, C. D. Wu, John D. Spengler. 2021. Using land-use machine learning models to estimate daily NO<sub>2</sub> concentration variations in Taiwan. *Journal of Cleaner Production* (SCI, IF=11.072, Environmental Sciences, Rank 24/279, Q1, JIF Percentile 91.58%)
4. **Wong, P. Y.**, H. Y. Lee, L. J. Chen, Y. C. Chen, N. T. Chen, S. C. C. Lung, H. J. Su, C. D. Wu, Jose Guillermo Cedeno Laurent, Gary Adamkiewicz, John D. Spengler. 2022. An alternative approach for estimating large-area indoor PM<sub>2.5</sub> concentration – A case study of schools. *Building and Environment* (SCI, IF=7.093, Engineering, Civil, Rank 10/138, Q1, JIF Percentile 93.12%)
5. **Wong, P. Y.**, H. J. Su, S. C. C. Lung, C. D. Wu. 2023. An ensemble mixed spatial model in estimating long-term and diurnal variations of PM<sub>2.5</sub> in Taiwan. *Science of The Total*

Environment (SCI, IF=10.754, Environmental Sciences, Rank 26/279, Q1, JIF Percentile 90.86)

6. **Wong, P. Y.**, H. J. Su, S.C.C. Lung, W.Y. Liu, H.T. Tseng, G. Adamkiewicz, C. D. Wu. 2024. Explainable geospatial-artificial intelligence models for the estimation of PM<sub>2.5</sub> concentration variation during commuting rush hours in Taiwan. Environmental Pollution (SCI, IF=7.6, Environmental Sciences, Rank 37/358, Q1, JIF Percentile 89.8%)
7. **Wong, P.Y.**, H.J. Su, H.J. Chao, W.C. Pan, H.J. Tsai, T.C. Yao, W.Y. Liu, S.C.C. Lung, G. Adamkiewicz, C. D. Wu. 2024. An Innovative Geo-AI Approach in Estimating High-Resolution Urban Ambient Fungal Spore Variations. Earth Systems and Environment (SCI, IF=5.3, Geosciences, Multidisciplinary, Rank 26/254, Q1, JIF Percentile 90.0%)
8. **Wong, P. Y.**, Zeng, Y. T., Su, H. J., Lung, S. C. C., Chen, Y. C., Chen, P. C., Hsiao, T. C, G. Adamkiewicz, C. D. Wu. 2024. Effects of feature selection methods in estimating SO<sub>2</sub> concentration variations using machine learning and stacking ensemble approach. Environmental Technology & Innovation, 103996 (SCI, IF=6.7, Environmental Sciences, Rank 44/385, Q1, JIF Percentile 87.8%)
9. Asri, A. K., H. J. Tsai, **P. Y. Wong**, H. Y. Lee, W. C. Pan, Y. L. Guo, C. S. Wu, H. J. Su, C. D. Wu\*, John D. Spengler. 2022. Examining the benefits of greenness on reducing suicide mortality rate: A global ecological study. Frontiers in Public Health (SCI, IF=6.461, Public, Environmental & Occupational Health, Rank 18/182, Q1, JIF Percentile 90.38%)
10. Hsu, C. Y., H. X. Xie, **P. Y. Wong**, Y. C. Chen, P. C. Chen, C. D. Wu\*. 2022. A mixed spatial prediction model in estimating spatiotemporal variations in benzene concentrations in Taiwan. Chemosphere (SCI, IF=8.943, Environmental Sciences, Rank 33/279, Q1, JIF Percentile 88.35%)
11. Babaan, J., F. T. Hsu, **P. Y. Wong**, P. C. Chen, Y. L. Guo, S. C. C. Lung, Y. C. Chen, C. D. Wu\*. 2023. A Geo-AI-based ensemble mixed spatial prediction model with fine spatial-temporal resolution for estimating daytime/nighttime/daily average ozone concentrations variations in Taiwan. Journal of Hazardous Materials (SCI, IF=13.6, Environmental Sciences, Rank 10/274, Q1, JIF Percentile 96.5%)
12. Hsu, C. Y., T. W. Lin, J. Babaan, A. K. Asri, **P. Y. Wong**, K. H. Chi, T. H. Ngo, Y. H. Yang, W. C. Pan, C. D. Wu\*. 2023. Estimating the daily average concentration variations of PCDD/Fs in Taiwan using a novel Geo-AI based ensemble mixed spatial model. Journal of Hazardous Materials (SCI, IF=13.6, Environmental Sciences, Rank 10/274, Q1, JIF Percentile 96.5%)
13. Hsu, C. Y., **P. Y. Wong**, Y. R. Chen, S. C. C. Lung, C. D. Wu\*. 2023. Evaluating long-term variation of WBGT with a high spatiotemporal resolution in large areas through land-use based

- machine learning model. *Journal of Exposure Science and Environmental Epidemiology* (SCI, IF=6.371, Toxicology, Rank 10/94, Q1, JIF Percentile 89.89%)
14. Asri, A. K., H. Y. Lee, Y. L. Chen, **P. Y. Wong**, C. Y. Hsu, P. C. Chen, S. C. C. Lung, Y. C. Chen, C. D. Wu\*. 2024. A machine learning-based ensemble model for estimating diurnal variations of nitrogen oxide concentrations in Taiwan. *Science of the Total Environment* 916: 170209 (SCI, IF=10.8, Environmental Sciences, Rank 26/279, Q1, JIF Percentile 90.86%)
  15. Hsu, C. Y., R. Q. Lee, **P. Y. Wong**, S. C. C. Lung, Y. C. Chen, P. C. Chen, G. Adamkiewicz. C. D. Wu\*. 2024. Estimating morning and dusk commute period O<sub>3</sub> concentration in Taiwan using a fine spatial-temporal resolution ensemble mixed spatial model with Geo-AI technology. *Journal of Environmental Management* 351: 119725 (SCI, IF=8.0, Environmental Science, Rank 34/358, Q1, JIF Percentile 90.6%)
  16. Babaan, J., **P. Y. Wong**, P. C. Chen, H. L. Chen, S. C. C. Lung, Y. C. Chen, C. D. Wu\*. 2024. Geospatial artificial intelligence for estimating daytime and nighttime nitrogen dioxide concentration variations in Taiwan: A spatial prediction model. *Journal of Environmental Management* (SCI, IF=8.0, Environmental Science, Rank 34/358, Q1, JIF Percentile 90.6%)
  17. Hsu, C. Y., W. T. Hsu, C. Y. Mou, **P. Y. Wong**, C. D. Wu, Y. C. Cheng\*. 2024. Exposure estimates of PM<sub>2.5</sub> using the land-use regression with machine learning and microenvironmental exposure models: validation and comparison. *Atmospheric Environment* 318: 120209 (SCI, IF=5.0, Meteorology & Atmospheric Science, Rank 21/94, Q1, JIF Percentile 78.2%)
  18. Hsiao, P. J., C. D. Wu, **P. Y. Wong**, M. C. Chung, Y. W. Yang, L. Y. Wu, K. Y. Hsiao, C. J. Chung\*. 2024. APOE-ε4 alleles, time-varying PM<sub>2.5</sub> exposure and cognitive decline: Findings from a Community-based Longitudinal Study. *Journal of the American Geriatrics Society* 32(9): 1080-1092. (SCI, IF=6.3, Gerontology, Rank 4/37, Q1, JIF Percentile 90.5%)
  19. Cheng, W.C., **P. Y. Wong**, C. D. Wu, P. N. Cheng, P. C. Lee, C. Y. Li\*. 2024 Non-linear association between long-term air pollution exposure and risk of metabolic dysfunction-associated steatotic liver disease. *Environmental Health and Preventive Medicine* (SCI, IF=4.7, Public, Environmental & Occupational Health, Rank 37/180, Q1, JIF Percentile 79.7%)