Zhouyayan Li

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Google Scholar | LinkedIn | GitHub

Personal Profile

I am a Ph.D. candidate at the University of Iowa majoring in Civil Engineering. I have 4 years of experience in GIS modeling, analytics, and visualization with large-scale geospatial and Remote Sensing datasets. I also have 3 years of experience working with advanced deep-learning models and techniques on computer vision problems, such as classification, semantic segmentation, and image synthesis.

Skills

- Programming and Analyzing: Python (PyTorch, TensorFlow, Sklearn), R, SPSS, MATLAB, JavaScript, Excel
- Geo-Software and Packages: ArcGIS, ArcGIS Pro, Erdas Imagine, ArcPy, QGIS, GDAL, Rasterio
- Data Processing and Visualization: SQL, PostgreSQL, BigQuery, Tableau, Observable, D3, Google Maps API
- Cloud Platforms and Repositories: Amazon Web Services, Google Cloud, Google Earth Engine, GitHub

Selective Academic Research Projects

Multimodal Flood Mapping and Geomorphic-Based Correction for Vegetation's Blocking Jan. 2023 – Now

- Investigated the efficacy of using multimodal & multi-spatiotemporal Remote Sensing imageries from Sentinel 2, SAR, and PlanetScope for flood mapping, to take advantage of improved data availability and complementary image properties for better predictions.
- Proposed a simple Quantile-based Filling & Refining (QFR) approach to resolve the blocking effect of dense vegetation on water extent, given the optical and C-band radar signals are not able to penetrate the crown canopy. QFR improves the accuracy of predictions by more than 50 % in densely vegetated areas.
- Conducted an in-depth quantitative comparison between flood maps generated from Sentinel 2, SAR, and PlanetScope and came up with generalizable guidance for large-scale flood mapping and result refinement with multimodal Remote Sensing data.

Flood Inundation Mapping and Analyzing using Deep Learning and GIS Dec. 2021 – Dec. 2022

- Identified the most decisive variables to the Earth's short-term surface conditions by investigating the relevance and significance of dozens of potential physical variables, such as rainfall and land use, using statistical approaches, such as multi-collinearity tests and the VIF score.
- Created automated data preprocessing, post-processing, and result evaluation pipelines using ArcPy, ArcGIS, ArcGIS Pro, Google Earth Engine, and Python geospatial analyzing libraries, such as Rasterio and GDAL.
- Developed classification models using CNN-based structures (e.g., U-Net, DeepLab, MA-Net, and EfficientNet). Successfully classified pixels in radar images into flood areas, permanent water pixels, and background (dry) areas with higher accuracy than state-of-the-art benchmark models and datasets.
- Conducted image synthesis with ConvLSTM, Deep CNN, and Transformer to project the combination of physical factor information to backscatter values in satellite images that describe the Earth's surface conditions.

Selective Publications

- **Li, Z**., Duque, F.Q., Grout, T., Bates, B., Demir, I., 2023. Comparative analysis of performance and mechanisms of flood inundation map generation using Height Above Nearest Drainage. Environ. Model. Softw. 159, 105565. https://doi.org/10.1016/J.ENVSOFT.2022.105565
- **Li, Z**., Demir, I., 2023. U-net-based semantic classification for flood extent extraction using SAR imagery and GEE platform: A case study for 2019 central US flooding. Sci. Total Environ. 869. https://doi.org/10.1016/j.scitotenv.2023.161757
- **Li, Z**., Demir, I., 2022. A comprehensive web-based system for flood inundation map generation and comparative analysis based on height above nearest drainage. Sci. Total Environ. 828. https://doi.org/10.1016/j.scitotenv.2022.154420

Education

Ph.D. in Civil Engineering, The University of Iowa, GPA 3.87 Aug. 2020 –May 2024 (expected)

B.S. in Water and Hydropower Engineering, Hohai University, GPA 3.77 Sep. 2013 – Jun. 2018