Zheng Wang, PhD

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EDUCATION

Newcastle University, *UK*
PhD in Earth Observation 2015 – 2019
The Best Doctoral Thesis of 2019 awarded by the UK's Remote Sensing and Photogrammetry Society.

Wuhan University, *China*
Master of Engineering in Photogrammetry and Computer Vision 2012 – 2015
Bachelor of Engineering in Remote Sensing 2008 – 2012

WORK EXPERIENCE

Senior Data Scientist, *Catalyst Earth, Markham, On, Canada* Oct 2023 - Present

- Designed a cutting-edge satellite-based Interferometric Synthetic Aperture Radar (InSAR) analysis pipeline for measuring millimeter displacements in the Earth's surface.
- Established Python coding and testing standards and devised an architecture of the SAR interferometry software systems on both local and cloud based High-Performance Computing (HPC) clusters.

Scientific Developer II, *3vGeomatics Inc., Vancouver, BC, Canada* Jul 2022 - Sep 2023

- Led the full lifecycle of self-supervised deep learning projects as an OKR team leader.
  - Proposed an innovative random masked autoencoder approach to perform self-supervised learning (prior to Meta's masked autoencoders) for InSAR phase denoising and SAR image despeckling.
  - Implemented a Mixture Density Network to efficiently learn probability distributions of residuals/noises rather than signals, optimizing the model's learning process.
  - Initiated the adoption of the lightning-hydra-template AutoML framework on a local HPC cluster and automated model training with a robust multi-node and multi-GPU training pipeline.
  - Deployed models to the company's operational environment, contributing to the creation of over 100 monthly product deliveries to contracted clients.
  - Demonstrated the superiority of the proposed approach over SOTA approaches through experiments on synthetic and real-world data. Presented the work orally at the IEEE GARSS 2023 conference.
- Developed general InSAR coherence change detection and SAR amplitude change detection pipelines by integrating the AI denoising models. Created proof-of-concept products enabling near-real-time monitoring of wildfire and flooding events.

Data Scientist, *3vGeomatics Inc., Vancouver, BC, Canada* Jul 2019 - Jun 2022

- Led the collaboration initiatives with the MRC lab at the University of Alberta as a mentor of junior researchers, applying AI techniques to address challenges in the remote sensing field.
  - Conceptualized three research projects in SAR image analysis, focusing on semantic segmentation for water/land classification, phase unwrapping, and the development of a Deep Generative Model for deformation map simulation. Published peer-reviewed journal papers from each project.
  - Optimized waterbody data labeling by transitioning from a traditional local cluster-based pipeline to Google Earth Engine (GEE), resulting in a remarkable 99% reduction in overall time cost (from one week to just five minutes for a 3000 km^2 site).
- Automated a quality control pipeline by creating ~50 anomaly detection metrics to inspect critical operational InSAR data analysis steps.
- Developed models and tools to characterize seasonal displacement signals in the Arctic, driving the first industry InSAR permafrost degradation monitoring product template.
- Developed a global snow coverage detection tool by leveraging optical MODIS imagery for radar data selection, resulting in a 15% reduction in the company's commercial data costs.

SKILLS & EXPERTISE

Programming languages: Python, C++, Matlab, HTML5.
Frameworks: PyTorch, Lightning-Hydra-Template, CUDA, OpenCV, Multiprocessing, GEE.
Certifications: Machine Learning, Deep Learning, AWS Fundamentals, Kubernetes on AWS, GAN.
Research interests: Earth Observation, Geohazards Mapping, SAR Interferometry, Computer Vision.
Other Skills: Linux, HPC Cluster, Jenkins, Git, Modelling, Anomaly Detection, Time Series Analysis.