1 Abstract

Synthetic Aperture Radar (SAR) and Interferometric SAR (InSAR) have proved useful in their ability for flood mapping due to their superior capabilities to be used in various weather and daylight conditions compared to optical sensors. Unfortunately, they are also much noisier acquisitions due to speckle noise. We trained U-Net and XGBoost pixel-wise segmentation models in various despeckling filter configurations utilizing 10m SAR data from the Sen1floods11. This dataset was additionally appended with the corresponding InSAR coherence data. The filters considered were a mean filter, Lee filter, Refined Lee filter, and the Frost filter.

We found that UNet water IoU performance in every training scenario had marginal changes in performance for all filters. For XGBoost, performance increases were consistent and substantial in all training scenarios, up to 11.2% for limited co-event intensity only training, and up to 2.9% for intensity and coherence training. In other words, despeckling lead to the greatest performance gains in the limited (intensity-only) training scenarios. In all models trained, the training scenario where pre and post flood event SAR intensity and InSAR coherence was available performed the best within their model and filter cohorts. We believe the disparity in model improvement is due to the spatial information utilized by CNN models that make them more robust to noisy SAR acquisitions. Additionally for XGBoost, the smallest increase in performance when despeckling was used was for the intensity and coherence training scenario. This seems to hint that the addition of coherence makes tree based models more robust to the speckle noise of individual SAR acquisitions.