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Summary of the Abstract

Synthetic aperture radar (SAR) falls within the rapidly expanding discipline of remote sensing. The ability to transform satellite data into useful information has been facilitated by developments in machine learning and artificial intelligence. SAR sensors record the electromagnetic waves returned from the earth's surface to monitor remote areas, hidden features, and even occurrences that the human eyes cannot detect. Before SAR images analysis some pre-processing steps like orbit file, radiometric calibration and speckle filtering must be applied.The research gives a detailed description of effective pre-processing steps for C-band Sentinel-1 Level-1 GRD (Ground Range Detected) SAR images. The suggested approach is novel in terms of the quantization of considerable improvement after the pre-processing workflow and orbit file rectification step.

The research aims to investigate image modelling and analysis for Synthetic Aperture Radar (SAR) images in terms of complicated amplitude image and backscattering data. In the current research work, multi-level fusion approach is developed for tree cover mapping done over a five-year period (2015-2019) utilizing temporal time-series of Sentinel-1 Ground Range detected band C images and MODIS tree cover mask. The mathematical analysis of co-polarized and cross-polarized bands is done to study the dependency of the coefficients for different land cover categories. Few classification models for surface area classification were trained in seven categories, out of which ensemble bagged trees model performed with accuracy of 95.3 percent on the test data.

SAR satellites can provide a speedy and cost-effective way to provide a quick first-hand reaction to a disaster occurrence in locations where topography is unknown. Flood extent mapping has been performed in some parts of worst-affected districts of West Bengal after the Amphan cyclone. It gives a timescale overview of the earth's surface changing by time series analysis and SAR backscattering coefficients. The current work encourages researchers to explore high-performance data access and management.