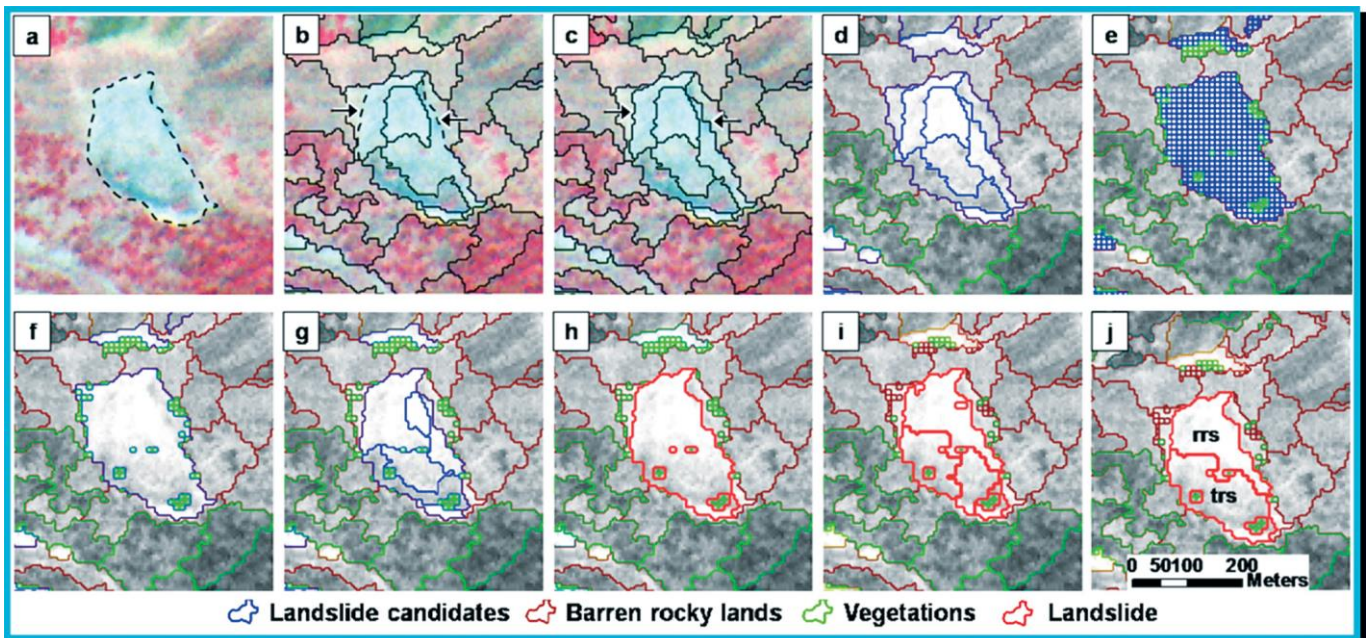


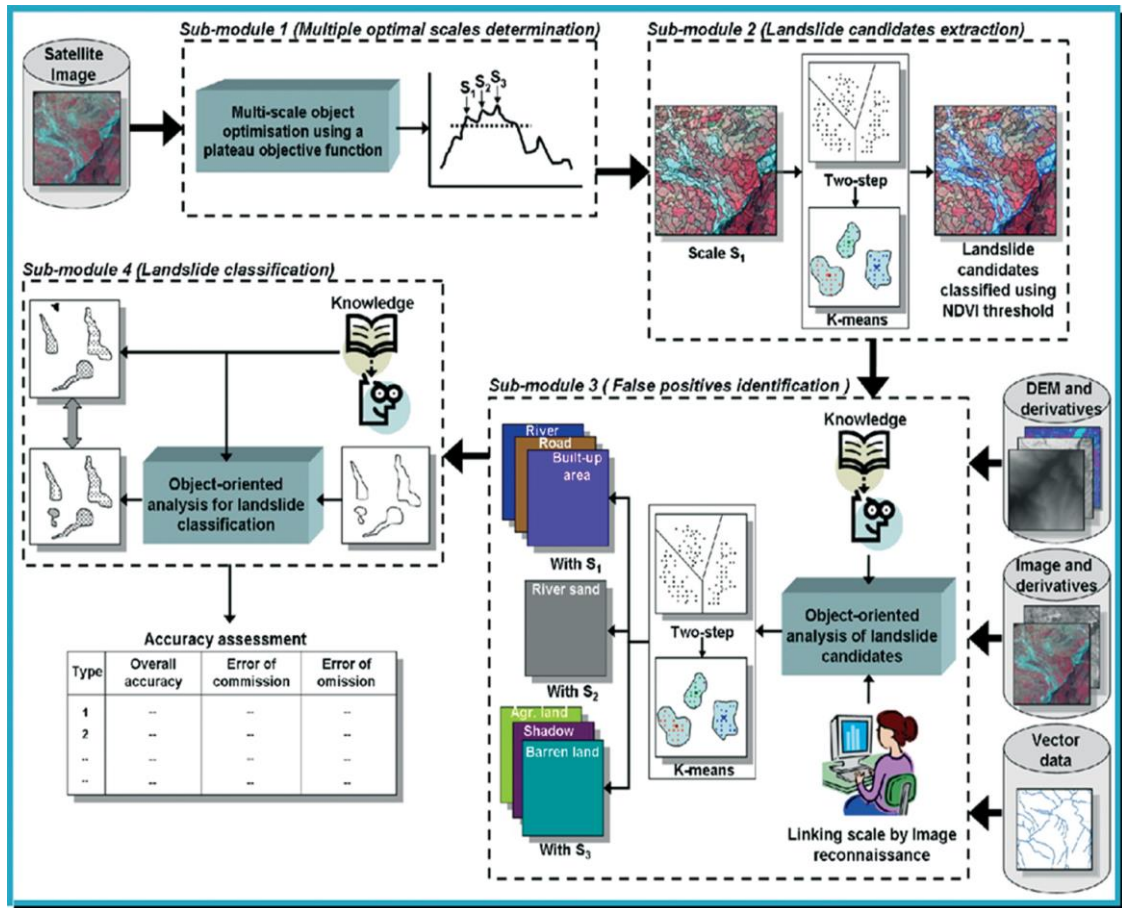
# Detection of Landslides from High Resolution Optical Satellite Data

Landslide is a geomorphic phenomenon; therefore, its identification is difficult to address in spectral domain alone using satellite/aerial datasets. The common noticeable feature after occurrence of landslides is the loss of vegetation and exposure fresh rock and soil. This unique property of a landslide in combination with its relationship with slope related parameters is used to create a generic routine in a COTS s/w, and is implemented through the following four sub-modules.

All the characteristic features of landslides derived from satellite data (e.g. NDVI, brightness) and DEM (e.g. slope, relief, curvature) were fused together in a series of steps comprising of controlled segmentation,

merging, classification, thresholding etc. To increase the robustness and transferability of the landslide, a data driven thresholding approach using K-means algorithm was employed. The knowledge-based approach was further strengthened by utilising change detection technique that increased the landslide detection accuracy from 76.4 % to 96.7%. The minimum size of the landslide that can be detected using this method depends upon the resolution of the satellite data. However, using 5.8 m resolution data, a landslide of 774 sq. m was detected. The object-based landslide detection technology developed to detect landslides from segmentation to classification.





## Salient features:

- This technique requires only high resolution optical satellite data. The technique combines spectral, shape, texture, morphometric and contextual information derived from high resolution Indian satellite data and DEM for the preparation of new as well as historical landslide inventories.
- The main innovative aspect lies in the selection of landslide diagnostic parameters and their use in the comprehensive characterization of different types of landslides, a concept which is addressed for the first time for detection of landslides in an object-based environment. Towards the development of a robust data driven methodology, a new POF was developed that was helpful in the multi-scale analysis of a terrain. Together with POF, and applying a change detection method using archived satellite data, a maximum landslide detection accuracy of 96.7% in Okhimath area of the Uttarakhand state could be achieved. The method has been validated in other mountainous terrains of India that has a different geological and geomorphological setup.

## APPLICATIONS

- This technology will be used to create routine landslide inventor i.e e.g., on monthly or annual basis for large Himalayan region in India. This technology can also be used for land cover classification or vegetation change detection after suitable adaptation, since few land cover units such as barren land, agricultural land has already been identified as false positives to landslides.