



SMART INDIA HACKATHON

2023

SIH PROJECT

GeekChains

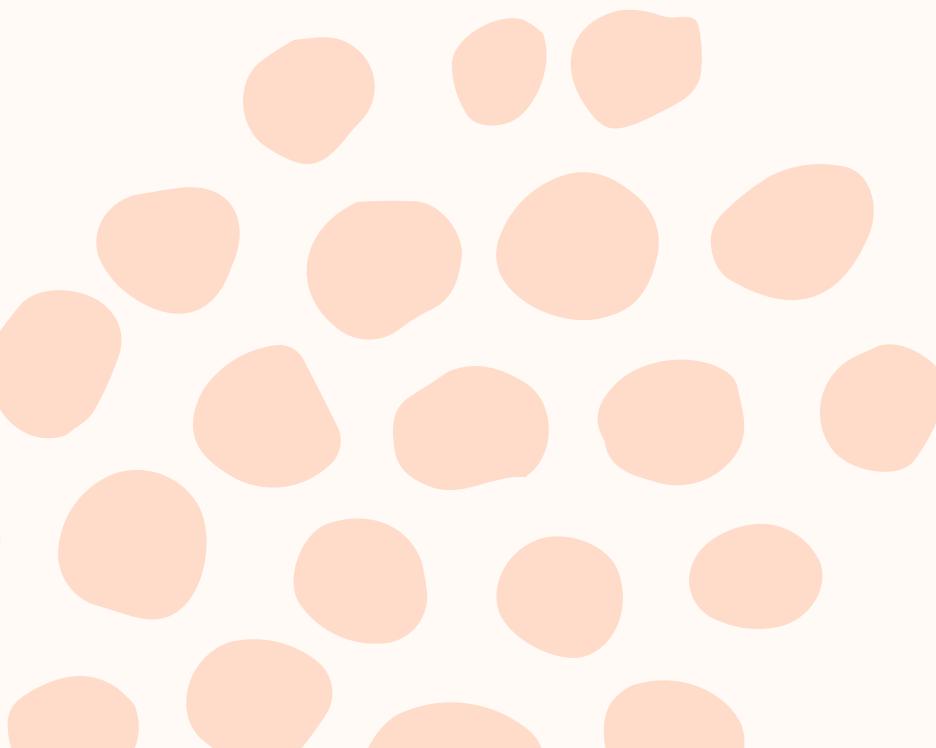
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Introduction



PROBLEM STATEMENT

SIH-1518

Change detection due to human activities.

Using satellite imagery, create an automated system for detecting change related only to human activities from satellite imagery. i.e. Develop AI/ML based model for change detection of only man-made objects like vehicles, buildings, roads, aircraft etc. from remote sensing images Data: Sentinel-2, LISS-4

SOLUTION

PROJECT GOALS

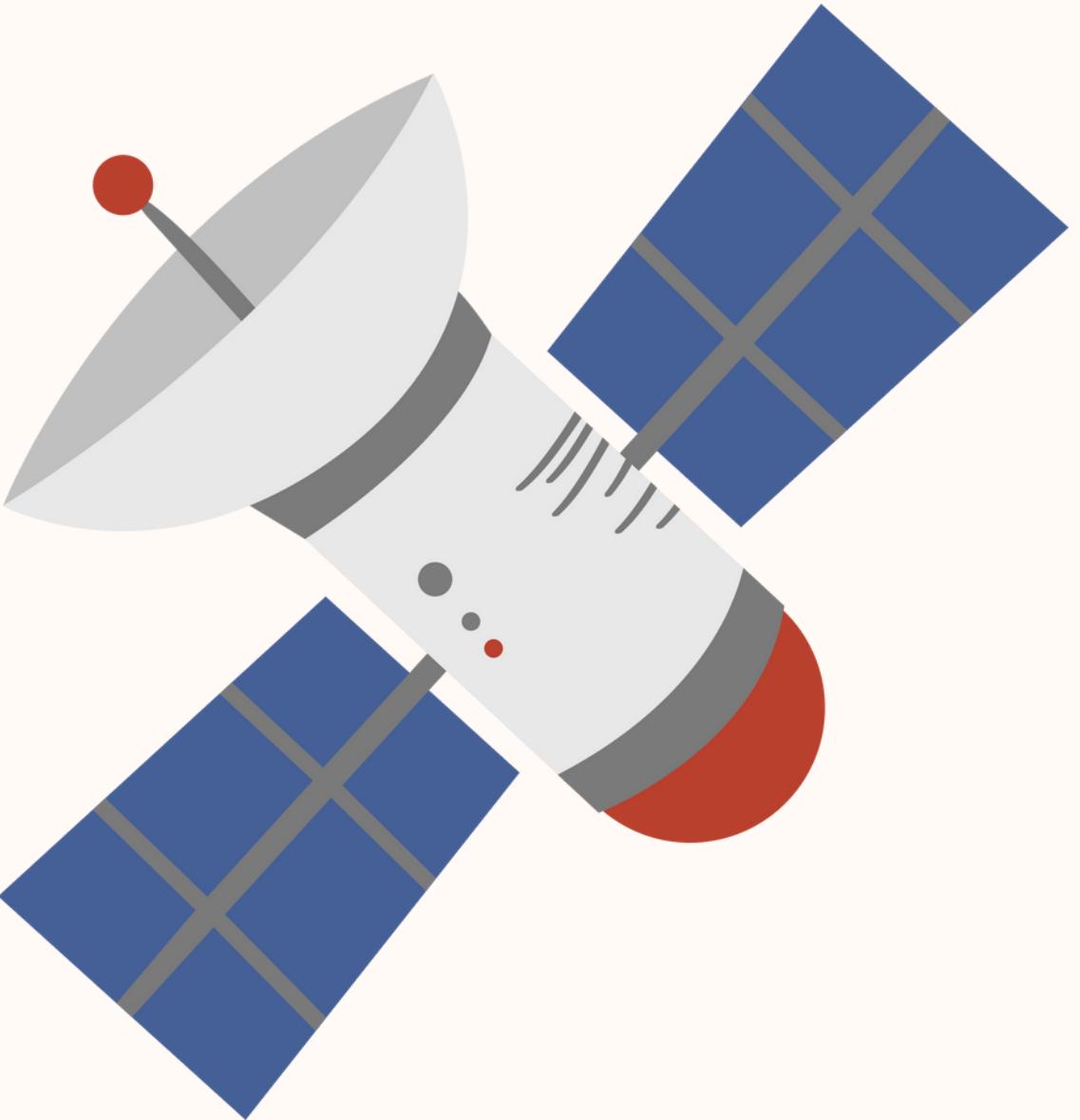
Team GeekChain's solution for change detection using satellite imagery involves several key steps:

Preprocessing:

Spatial and temporal alignment of satellite images to ensure they correspond to the same locations and times. Noise removal to eliminate interference caused by atmospheric and sensor noise. Cloud cover removal to make the land surface visible.

Change Detection:

1. Pixel classification to classify pixels as man-made or natural objects, using methods like SVMs, RFs, or deep learning techniques.
2. Change identification by comparing pixel labels in different images to detect changes from natural to man-made and vice versa.
3. Visualization and quantification of change results using color highlighting or metrics.



CHANGES DETECTION

A. PRE-PROCESSING

Spatial and temporal alignment: The satellite images from Sentinel-2 and LISS-4 must be aligned spatially and temporally to ensure that the pixels in the images correspond to the same locations on the ground at the same time. This can be done using a variety of image registration techniques.

Noise removal: Satellite images can be noisy due to factors such as the atmosphere and the sensor itself. This noise can interfere with the change detection process, so it is important to remove it before proceeding. This can be done using a variety of noise reduction techniques.

Cloud cover removal: Cloud cover can obscure the underlying land surface in satellite images, making it difficult to detect change. Therefore, it is important to remove cloud cover from the images before proceeding. This can be done using a variety of cloud detection and removal techniques.

CHANGE DETECTION

B. CHANGE DETECTION

Pixel classification: The pixels in the preprocessed images must be classified as either man-made or natural objects. This can be done using a variety of supervised classification methods, such as support vector machines (SVMs) and random forests (RFs). More recently, deep learning methods such as convolutional neural networks (CNNs) have been shown to achieve state-of-the-art results for pixel classification.

Change identification: Once the pixels in the images have been classified, the pixels that have changed from natural to man-made or vice versa can be identified by comparing the pixel labels between two images taken at different times. This can be done by performing a simple pixel-wise comparison or by using more sophisticated methods such as temporal segmentation.

Visualization and quantification: The change detection results can be visualized by highlighting the changed pixels in different colors on the original images or by creating a binary image that shows only the changed pixels. Alternatively, the changes can also be quantified by calculating some metrics such as the percentage of area or number of pixels that have changed.

WSGS

MILITARY

The system would allow for the tracking of enemy forces, identification of new construction, and assessment of damage caused by military operations



AGRICULTURE

Tracking changes in crop yields, irrigation patterns, and other agricultural activities can help farmers to improve their efficiency and productivity.

WSES

DISASTER RESPONSE

Tracking the spread of wildfires, floods, and other natural disasters can help emergency responders to coordinate their efforts and provide assistance to affected communities.



ENVIRONMENTAL MONITORING

Detecting changes in deforestation, land cover, and other environmental factors can help scientists to track the impact of human activities on the environment.



PROBLEMS

- Access to High-Quality Satellite Imagery
- Labelled data of man-made objects to train the model
- Computational Resources for model training
- Software and Frameworks: PyTorch , SNAP, PlosarPro
- Lack of Quality Training Data
- Model Performance and Generalization
- Accuracy and False Positives
- Ethical Considerations

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Thank
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