Basic Details of the Team and Problem Statement

Ministry/Organization Name/Student Innovation: Indian Space Research Organisation (ISRO)

PS Code: SIH1518

Problem Statement Title: Change detection due to human activities.

Team Name: Fuzion 2.0

Team Leader Name: Dhruba Jyoti Das

Institute Code (AISHE): U-0052

Institute Name: Gauhati University

Theme Name: MedTech / BioTech / HealthTech

Overview:
Our project, focused on 'Change Detection due to Human Activities,' leverages AI and satellite imagery to automatically detect and monitor human-induced changes. This innovation holds great potential for diverse domains, from urban planning to disaster management, revolutionizing the way we interpret changes in our world.

Idea/Approach Details

Vision

Our vision is to harness cutting-edge AI and satellite technology to empower real-time monitoring and understanding of human-driven changes in our environment. By providing accurate, automated, and insightful solutions, we aim to contribute to sustainable development and improved decision-making on a global scale.

Idea/Solution/Prototype:

1. One-Dimensional vs. Two-Dimensional Data:

- In our project, we primarily work with two-dimensional data, which preserves spatial relationships within the images. This approach is crucial for accurately detecting changes caused by human activities like buildings, roads, and vehicles.

2. CNN Architecture Selection

- We adopt well-established CNN architectures like VGGNet, CaffeNet, SegNet, UNet, InceptionNet, and ResNet, tailoring them to our specific change detection needs.

3. Adaptive Layer Integration:

- Our system integrates key CNN layers, including convolutional layers for feature extraction, pooling layers for dimension reduction, activation functions, and fully connected layers for classification. These layers are carefully adapted to our change detection tasks

4. Enhanced Techniques:

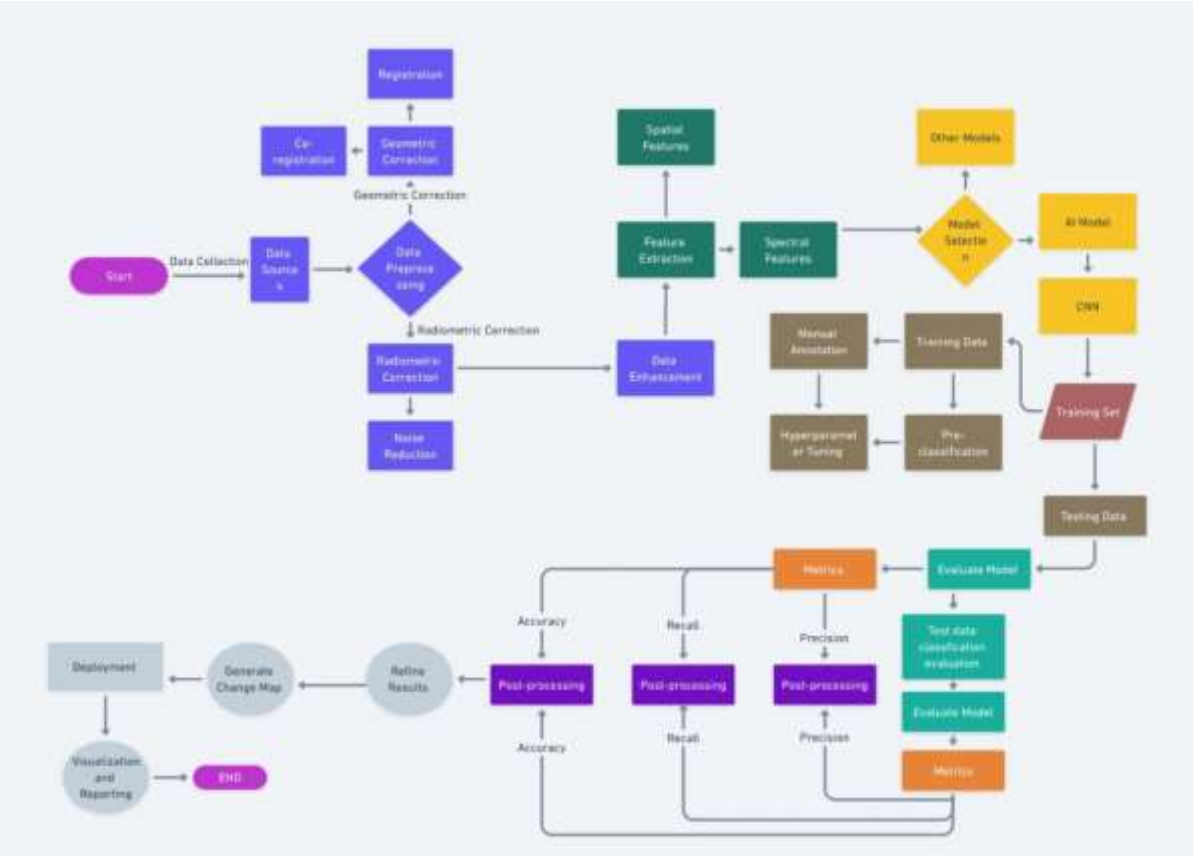
- We employ advanced techniques such as Region CNN (R-CNN) modifications for precise object region prediction and PCANet for noise reduction in SAR images. Additionally, we utilize kernel PCA convolution for extracting spatial-spectral features from remote sensing images in an unsupervised manner.

5. User-Friendly Interface:

- We've designed our solution with a user-friendly interface, allowing nontechnical users to access and interpret the data effectively. It empowers professionals from various backgrounds to utilize our technology.

CNNs are the backbone of our solution, enabling us to automatically and accurately identify changes related to human-made objects in satellite imagery. While they have significantly advanced change detection technology, we continue to explore innovative ways to design and train CNNs for remote sensing applications, ensuring our solution remains at the forefront of this field

Process Flow



Technology stack:

TensorFlow
PyTorch
OpenCV
scikit learn
GDAL
SQLite
Fiona
django

Idea/Approach Details

Use Cases

1. **Urban Expansion Monitoring**
2. **Disaster Response and Recovery**
3. **Environmental Conservation:.**
4. **Infrastructure Development.**
5. **Agricultural Monitoring**
6. **National Security:**

Dependencies

1. **High-Dimensional Datasets:**
   - The proliferation of platforms and sensors has introduced high-dimensional datasets with features like high spatial resolution and hyperspectral information.
   - These complex data structures, characterized by nonlinear and overlapping distributions, present challenges in terms of robust feature extraction and classification.

2. **Data Acquisition for Supervised Learning:**

• Supervised AI methods rely on large volumes of training samples, which are typically obtained through time-consuming and labour-intensive processes.

3. **Choosing Efficient AI Models:**

•While a variety of efficient and accurate AI models and frameworks are available, the continuous evolution of new AI-based change detection approaches poses the challenge of selecting the most suitable model for specific applications

Target Audience

1. Environmental Agencies and NGOs
2. Urban Planners and Municipal Authorities
3. Disaster Management Agencies
4. Agriculture and Land Management
5. Remote Sensing and GIS Professionals
6. Research Institutions and Academia
7. Government Agencies and Geospatial Authorities
8. Commercial Enterprises
9. General Public and Community Activists
10. AI and Data Science Enthusiasts

Team Member Details

Team Leader Name: Dhruba Jyoti Das

Branch: BTECH Stream: ECE Year: IV

Team Member 1 Name: Anushuya Ghatak

Branch: BTECH Stream: BET Year: IV

Team Member 2 Name: Tonuj Pritam Deka

Branch: BTECH Stream: ECE Year: IV

Team Member 3 Name: Subarna Saikia

Branch: BTECH Stream: CSE Year: II

Team Member 4 Name: Anubhav Dey

Branch: BTECH Stream: ECE Year: IV

Team Member 5 Name: Gautam Hazarika

Branch: BTECH Stream: CSE Year: II

Team Mentor Name: Apurba Bikash Kalita

Category: Academic Expertise: IoT, Embedded Sytems

Team Mentor Name: Anjan Kumar Talukdar

Category: Academic Expertise: Computer Vision