SNS COLLEGE OF TECHNOLOGY

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Types of Digital Data in Remote Sensing

Multispectral Imagery: Captures data across multiple wavelengths of light, including visible, infrared, and ultraviolet. Commonly used for land cover classification and vegetation analysis.

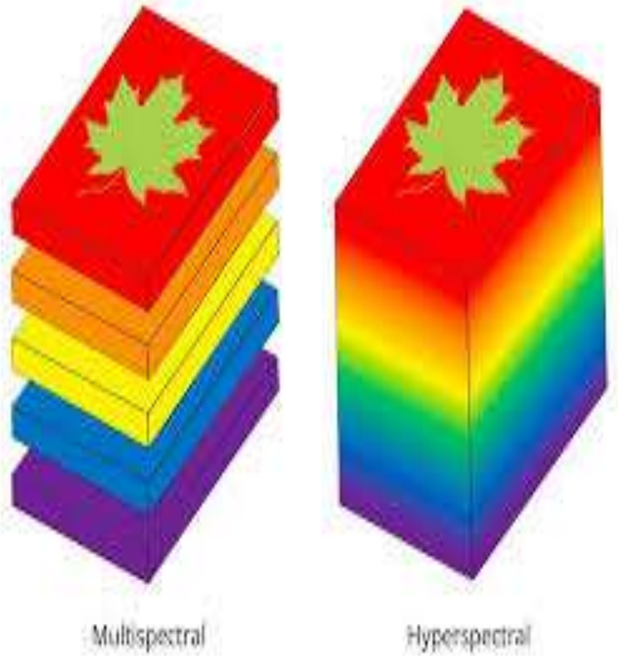
Hyperspectral Imagery: Acquires data in many narrow spectral bands, providing detailed spectral information for material identification and monitoring.

Radar Data: Uses microwave signals to gather information regardless of weather conditions. Useful for topographic mapping and surface deformation analysis.

Lidar Data: Uses laser pulses to measure distances and create high-resolution topographic maps, often employed in forestry and urban planning.

- Multispectral Imagery:

Multispectral imaging involves capturing image data at specific wavelengths across the electromagnetic spectrum. Unlike standard cameras, which typically capture only visible light (RGB), multispectral sensors collect data in multiple bands, including infrared, which provides additional information about the materials and features in the scene.

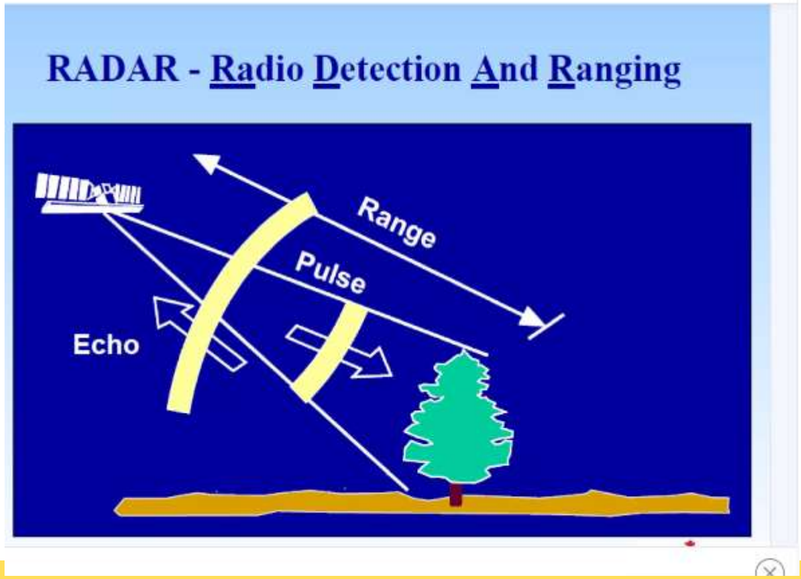


Radar Data

Radar (Radio Detection and Ranging) data is collected using active sensors that emit radio waves and analyze the reflected signals to gather information about objects and surfaces. Unlike optical sensors, radar can capture data in various weather conditions and during nighttime.

What is RADAR?

- Radio Detection and Ranging
- Radar is a ranging instrument
- (range) **distances** inferred from time elapsed between **transmission of a signal and reception of the returned signal**



LIDAR:

- Acronym for Light Detection And Ranging (sometimes Light Imaging, Detection, And Ranging).
- The LASER system, employed for monitoring the nature of environment is called LIDAR.
- It is an active remote sensing technology that measures distance by illuminating a target with a laser and analyzing the reflected light.
- Similar to RADAR, but uses laser light pulses instead of radio waves.
- LIDAR uses ultraviolet rays , visible rays and near infrared rays to image object.
- By illuminating the target using laser beam ,a 3-D point cloud of the target and it's surrounding can be generated.
- Three types of information can be obtained:
  a) Range to target (Topographic LIDAR, or Laser Altimetry)
  b) Chemical properties of target (Differential Absorption LIDAR)
  c) Velocity of target (Doppler LIDAR)

Rating Scales in Remote Sensing

- In remote sensing, rating scales are often used to evaluate and classify features based on specific criteria.

- These scales help in quantifying observations, making it easier to interpret data and derive meaningful insights.

- **Purpose of Rating Scales**

- **Quantification**: To convert qualitative observations into numerical values, making data analysis more objective.

- **Classification**: To categorize features based on specific criteria, facilitating the identification of patterns and trends.

- **Assessment**: To evaluate conditions (e.g., vegetation health, land use intensity) and support decision-making processes.

- **Applications in Image Interpretation**

- **Vegetation Indices**:
  - **Normalized Difference Vegetation Index (NDVI)**: Used to assess vegetation health.
  - **Scale Interpretation**: NDVI values range from -1 to 1, with higher values indicating healthier vegetation.

- **Land Cover Classification**:
  - Remote sensing images can be classified into categories (e.g., urban, agricultural, forest) using rating scales to express confidence levels in classifications.
  - Each class might have an associated score indicating the certainty of its identification.

- **Quality Assessment**:
  - Rating scales can evaluate the quality of imagery (e.g., clarity, cloud cover) or the accuracy of classifications.
  - A simple scale might range from 1 (poor quality) to 5 (high quality).

Image processing in remote sensing involves analyzing satellite or aerial imagery to extract meaningful information about the Earth's surface. Here are some key aspects:

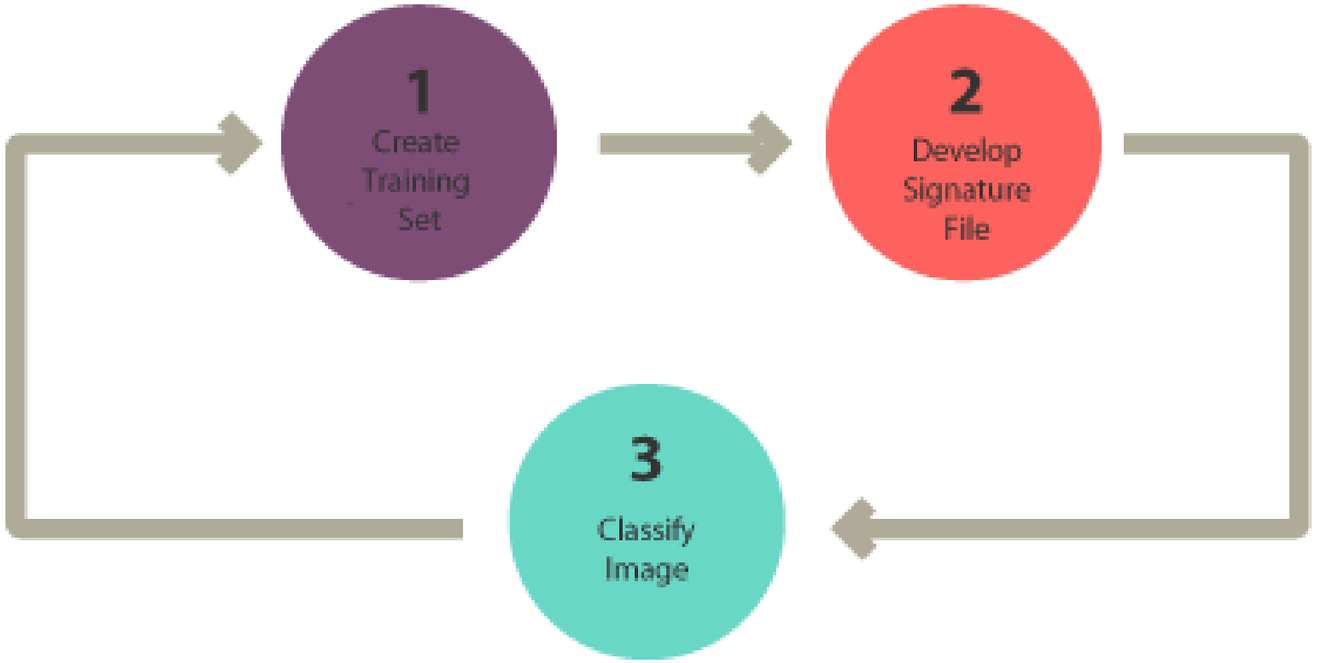
- **Techniques Used**
- **Image Enhancement**: Improving the visual quality of images through contrast adjustment, histogram equalization, or filtering to highlight features.
- **Image Classification**: Categorizing pixels into land cover classes (e.g., water, vegetation, urban) using supervised or unsupervised methods, such as decision trees, support vector machines, or neural networks.
- **Change Detection**: Identifying differences in images taken at different times to monitor changes in land use, deforestation, or urban expansion.
- **Image Segmentation**: Dividing an image into meaningful segments for easier analysis, often using algorithms like k-means or region growing.
- **Feature Extraction**: Identifying and quantifying specific features, such as roads or rivers, often using techniques like edge detection or morphological analysis.

Supervised Classification in Remote Sensing

•In supervised classification, you select training samples and classify your image based on your chosen samples. Your training samples are key because they will determine which class each pixel inherits in your overall image.

When you run a supervised classification, you perform the following 3 steps:

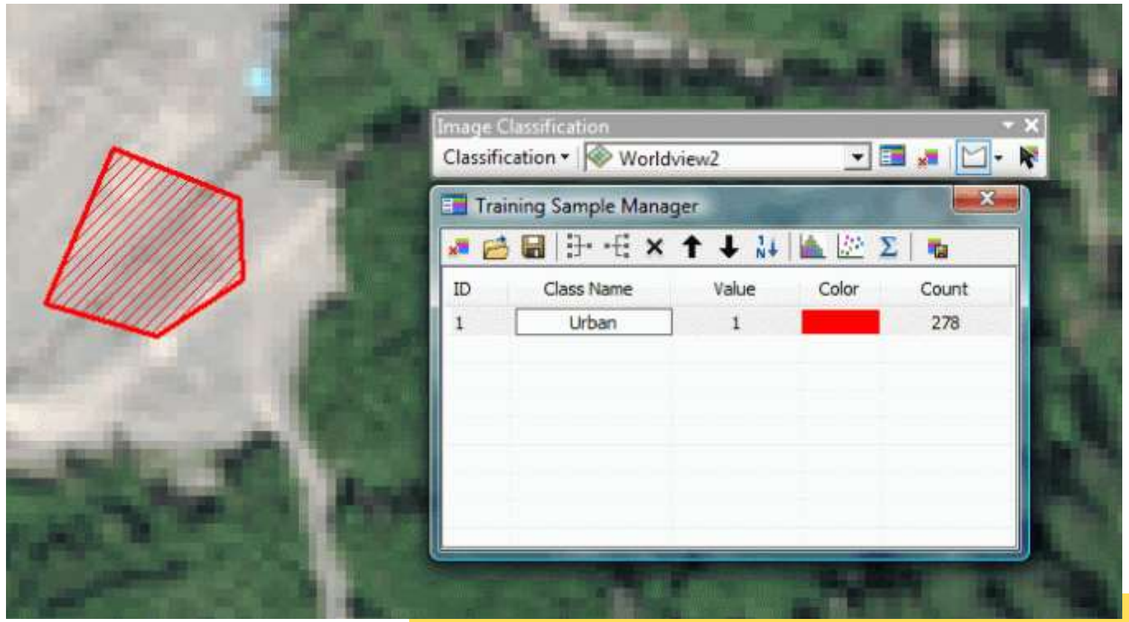
Select training areas
Generate signature file
Classify



Select training areas

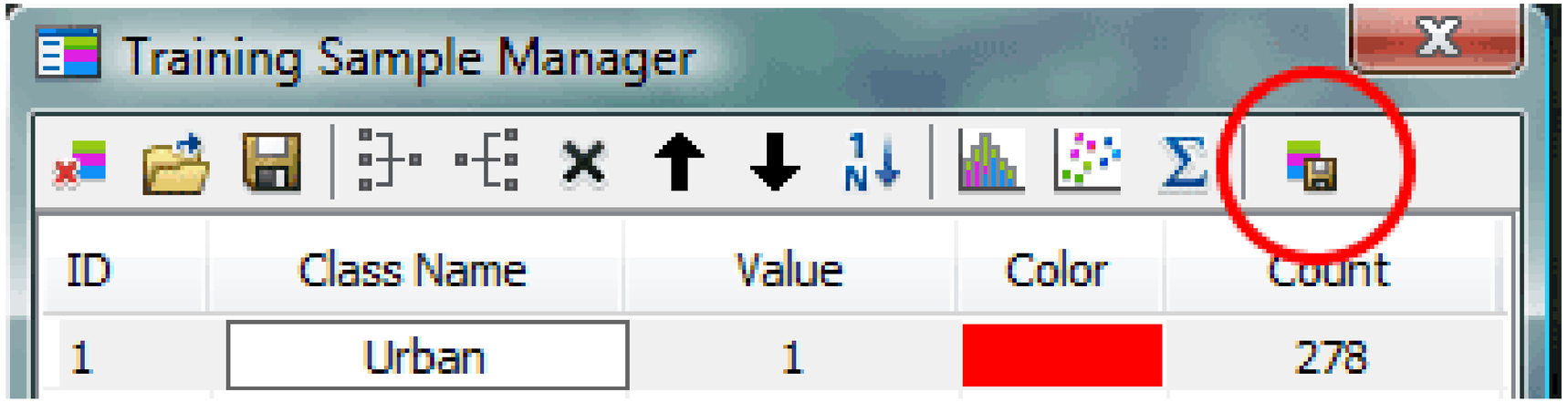
In this step, you find training samples for each land cover class you want to create. For example, draw a polygon for an urban area such as a road or parking lot. Then, continue drawing urban areas representative of the entire image. Make sure it's not just a single area.

Once you have enough samples for urban areas, you can start adding training samples for another land cover class. For example, you can add polygons over treed areas for the "forest" class.



Generate signature file

At this point, you should have training samples for each class. The signature file is what holds all the training sample data that you've collected up to this point. It's a way to save your samples for you to work on at a later time.



Unsupervised Classification in Remote Sensing

Unsupervised classification generates clusters based on similar spectral characteristics inherent in the image. Then, you classify each cluster without providing training samples of your own.