

Hyperspectral Imaging data

1. Load the dataset using pandas library.
2. Applying some preprocessing steps like checking outliers and removing the duplicated rows.
3. To check the perfect size of the image:
 - Check if it's a square → Try square root of 448 , which is 21.16, not a perfect square.
 - Try rectangular shapes:
 - Possible factors of 448: (28, 16), (16, 28), (14, 32), (32, 14)
4. Detecting the outliers using IQR(Inter Quantile Range) .
5. Applying standardization like StandardScaler (Mean=0, Std Dev=1).
6. Visualizing Spectral bands:

HeatMap for sample comparisons
7. Use .values to convert to Numpy Array.
8. Use the Box Plot:
 - It visualizes the distribution of pixel values across all spectral bands.
 - Each box represents the spread of pixel intensities for a given spectral band.
 - Helps identify outliers and value distributions in the dataset.
9. Apply PCA
 - PCA (Principal Component Analysis) reduces dimensions while preserving variance.

- Extract the top principal components and analyze the variance explained.

10. Apply t-SNE

t-SNE (t-distributed Stochastic Neighbor Embedding) is a non-linear technique that helps visualize clusters in 2D or 3D.

11. CNN (Convolutional Neural Network)

It is Best if we are working with image-based tasks like classification, segmentation, or feature extraction.

12. Prepare the dataset: split data into training and testing sets.

13. Build & train a CNN Model.

14. Evaluate the Model.

15. Visualize predictions.

16. Save the model.

17. Using Streamlit for user interaction.