## ****Requirements Gathering****

This section outlines the necessary components for the project.

### ****Data Requirements****

* **Satellite Imagery**: Sentinel-2 images in GeoTIFF format.
* **Ground Truth Labels**: Shapefiles containing labeled land types.
* **Spectral Bands Used**: Red, NIR, SWIR, and Coastal bands for classification.

### ****Software & Libraries****

| **Library/Tool** | **Purpose** |
| --- | --- |
| **GDAL** | Reads and processes geospatial data in raster and vector formats |
| **Folium** | Creates interactive maps for land classification results |
| **GeoPandas** | Handles vector-based geospatial data like shapefiles |
| **Rasterio** | Reads, writes, and manipulates raster data (GeoTIFF) |
| **Fiona** | Reads and writes vector data formats (Shapefiles, GeoJSON) |
| **TensorFlow/PyTorch** | Develops deep learning models for classification |

### ****Stakeholder Needs & Expected Outcomes****

* **Environmental Researchers**: Land classification insights for deforestation studies.
* **Urban Planners**: Identify urban expansion and land-use patterns.
* **Agricultural Analysts**: Assess vegetation health using NDPI.

### ****Performance Metrics****

* **Accuracy**: Measures overall correctness of classification.
* **IoU (Intersection over Union)**: Evaluates model's ability to differentiate land types.
* **Precision & Recall**: Ensure correct land classification without excessive misclassification.