

## **Introduction:**

This report describes a project that utilizes satellite imagery and image processing techniques to analyze environmental features surrounding a specified location. The goal is to identify and visualize areas of forest, grass, and other potential features of interest.

## **Methodology:**

### **1. Data Retrieval:**

- Satellite imagery APIs or public datasets were used to retrieve a high-resolution image of the target location.
- The center coordinates and a 1000-foot radius were specified for image retrieval.

### **2. Elevation Information:**

- Elevation APIs or datasets were utilized (e.g., Google Maps Elevation API) to retrieve the elevation of the specified location.
- The retrieved elevation value was stored for further analysis.

### **3. Image Processing and Segmentation:**

- The retrieved image was preprocessed to ensure consistency in resolution and format (350x350 pixels).
- An undirected graphical model was implemented to analyze the image and identify relevant environmental features like forests and grass.
  - Nodes represented image pixels, and edges captured spatial relationships.
  - Potential functions were incorporated to detect clusters based on color, texture, or shape features.
- Inference algorithms (e.g., belief propagation) were used to perform image segmentation, identifying regions corresponding to trees, grass, or other features.

### **4. Visualization of Environmental Features:**

- An edge was drawn from the specified location to the identified forest cluster using the graphical model.
- Color-coded boundaries were defined for detected forest regions based on distance from the location:
  - Blue circles around forests within a 200-foot radius.
  - Red circles around forests between 200 and 1000-foot radius.
- Similar color-coded boundaries were drawn for detected grassy areas.

### **5. Evaluation and Analysis:**

- The effectiveness of the image analysis and segmentation pipeline was evaluated for identifying features like forests and grasses.
- Results were compared with ground truth data or reference datasets, if available.
- The impact of different parameters and potential functions on segmentation performance was analyzed

**Conclusion:**

This project demonstrates the feasibility of utilizing satellite imagery and image processing techniques for environmental feature analysis. The developed pipeline can be further improved and applied to various applications in environmental monitoring and resource management.