**Histogram of Oriented Gradients (HOG):**

HOG is a feature extraction technique that is commonly used in object detection and recognition tasks. It works by computing histograms of gradients in localized portions of an image. These gradients capture information about the local intensity gradients and edge directions in the image.

1. **Gradients Computation**: First, the image is converted to grayscale to simplify the processing. Then, gradients in the x and y directions are computed using techniques like Sobel or Scharr operators. These gradients represent the local changes in intensity and direction of the image.
2. **Gradient Orientation Histograms**: The image is divided into small cells, and for each cell, histograms of gradient orientations are computed. These histograms represent the distribution of gradient orientations within each cell. This captures information about the local edge orientations and patterns.
3. **Block Normalization**: To improve the robustness of the features to variations in illumination and contrast, the histogram values are normalized within blocks of cells. This normalization process helps in making the features more invariant to changes in lighting conditions.
4. **Feature Vector Formation**: Finally, the histograms from all cells are concatenated to form a feature vector that represents the entire image. This feature vector is then used as input to a machine learning algorithm for classification or other tasks.

**Why HOG is Used:**

HOG features are popular in computer vision tasks for several reasons:

* **Invariance to Geometric and Photometric Transformations**: HOG features are robust to changes in image scale, rotation, and illumination, making them suitable for object detection tasks where objects may appear in different orientations and lighting conditions.
* **Localized Feature Representation**: By computing gradients and histograms locally, HOG captures detailed information about the local structure of objects in the image, enabling precise localization and recognition.
* **Efficient and Descriptive**: HOG features are relatively simple to compute and provide a compact yet informative representation of the image content, making them efficient for use in machine learning algorithms.

In that image classification task, I tried different feature extraction method but they not work properly and not able to classify.

Feature extraction method I used for that task:

1. Using color histogram but it gives very small number of accuracy (0.02287) score.
2. Using BOVW same for here it gives very small number of accuracy (0.02657) score.

So I choose HOG method which gives correct result and model build from that feature extraction method gave large number of accuracy score (0.804575)

**How to use Image classification app.**

**Steps:**

1. Click on choose file
2. Upload image
3. Click on upload button
4. After that it will redirect to result page and show (Classification Result: Forest) as a type of image.