Classify modes: Night; Portrait; Landscape. Design features, use NN

K-Nearest Neighbor algorithm is a method for classifying objects based on the closest training examples in the feature space. KNN is a type of instance-based learning, or lazy learning where the function is only approximated locally and all computation is deferred until classification. The KNN algorithm is amongst the simplest of all machine learning algorithms: an object is classified by a majority vote of its neighbors, with the object being assigned to the class most common amongst its k nearest neighbors. K is a positive integer, typically small. If k = 1, then the object is simply assigned to the class of its nearest neighbor.

Night Mode: Night mode is the function of camera when photo is taken in lowlight situation or at night time.

Portrait Mode: Portrait mode is a function of the digital camera that is used when you are taking photos of a single subject. In our case, we confine the subject to human faces

Landscape Mode: It is a function of the camera that is used when you are taking photos of a scene, not a single object.

Assumptions:

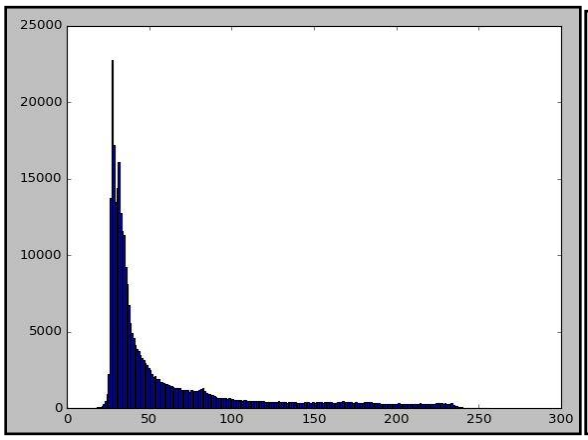
- Night mode consists of images taken at night under low light conditions.
- Portrait is the image where the subject/focus is human face.
- Landscape image is any outdoor scene for any time of the day except at night.

Features used:

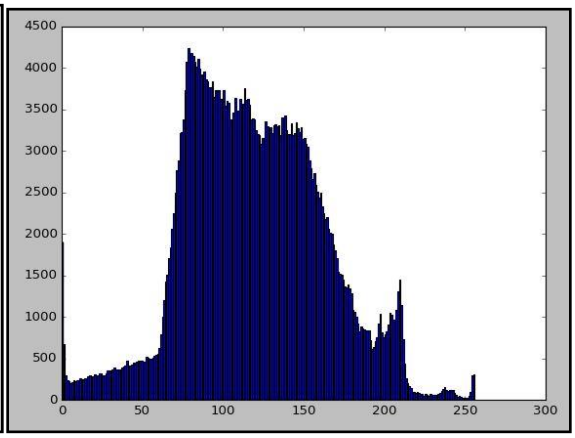
Darkness

Night mode and Landscape can be accurately differentiated by the number of dark pixels in the image. By studying various intensity histograms of the images, we found out that Intensity value<40 can be treated as threshold for darkness. So, we can now calculate:

%age darkness= (No. of pixels with Intensity<40) / (Total no. of pixels in image)



Night Mode: Histogram



Landscape Mode: Histogram

Amount of Skin present

We can differentiate Portrait from other modes by the amount of skin pixels present in the image. For this following steps are taken:

1. First, the image in RGB is converted to HSV, because it is more related to human colour perception
2. Now we classify pixel as skin by keeping **thresholds: 0<Hue<20 and 48<Saturation<255**
3. Noise or False Positives is reduced by applying erosion and dilation on the skin mask and then applying small amount of Gaussian blur.
4. Now the Amount of skin is calculated.

Depth of field

When taking photos in portrait mode, the camera automatically uses a large aperture to help keep the background out of focus by using a narrow depth of field so the subject being photographed is the only thing in focus. This causes blurriness of the background of the subject. The amount of blurriness can be calculated by taking a single channel of an image (grayscale) and convolving it with the **3 x 3 Laplacian kernel and then take its variance.**
The assumption here is that if an image contains high variance then there is a wide spread of responses, both edge-like and non-edge like, representative of a normal, in-focus image. But if there is very low variance, then there is a tiny spread of responses, indicating there are very little edges in the image. As we know, the more an image is blurred, the less edges there are.
Since the person can be standing anywhere in the image. To find the background blur we take blurriness of two patches from left and right of image. Whichever has least variance is more blurred and assumed to be blurriness of the background.

Output:

Few Predictions from the model:-

Image	Predicted Class
	Landscape
	Night

	Portrait
	Landscape
	Portrait
	Portrait

Observations:

- We found about 92% of accuracy for our dataset.
- Our model was correctly able to classify night and portrait because of darkness %age and skin amount.
- Misclassification occurred mostly with landscape image shot at sunset. This may be due to their similarity with portraits having dark background and false positive detection of skin in landscape mode due to light conditions.
- This can be further improved by removing false positives from skin colour detection feature. We can use the edges from any edge detection algorithm to see whether the skin is part of human body or some texture in the sky.