# Assignment 1 - Histogram of Oriented Gradients (HOG)
## Summary

To calculate HOG descriptor of an image, following methods were implemented in the assignment.

1. **get_differential_filter** – It returns Sobel filters along x and y directions.
2. **filter_image** – It correlates the filter kernel with the padded image to get filtered image with same dimension
3. **get_gradient** – It calculates the differential gradient's magnitude ($\sqrt{I\_Dx^2 + I\_Dy^2}$) and direction ($\tan^{-1}\frac{I\_Dy}{I\_Dx}$).

   Results from step 1 to 3

| dI/dx | dI/dy | gradient_mag | gradient_orientation |
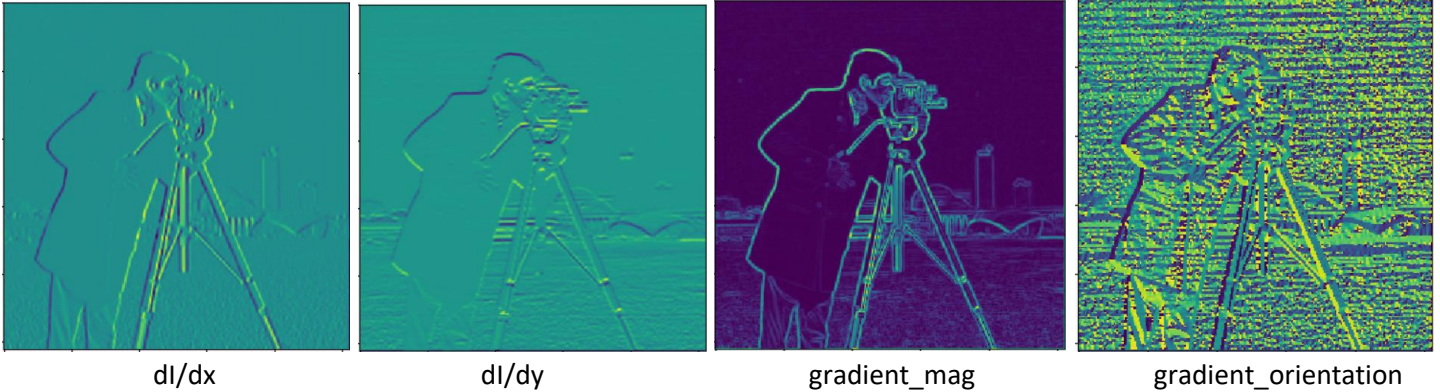
4. **build_histogram** – It takes the cell size, gradient magnitude and orientation as parameters and build histogram of gradient orientations. In this method, we increment the histogram's orientation cell with the weights of all gradients in that orientation range. Implemented get_bin_index, which computes bin index given the orientation.
5. **get_block_descriptor** – It takes histogram and block size, and L2 normalizes the histogram in each block. We do this to reduce the effect of changes in contrast between images of the same object. Then each of such normalized block is appended to form a one-dimensional HOG descriptor.

   Results from step 5 (cell size - 8, block size - 2)
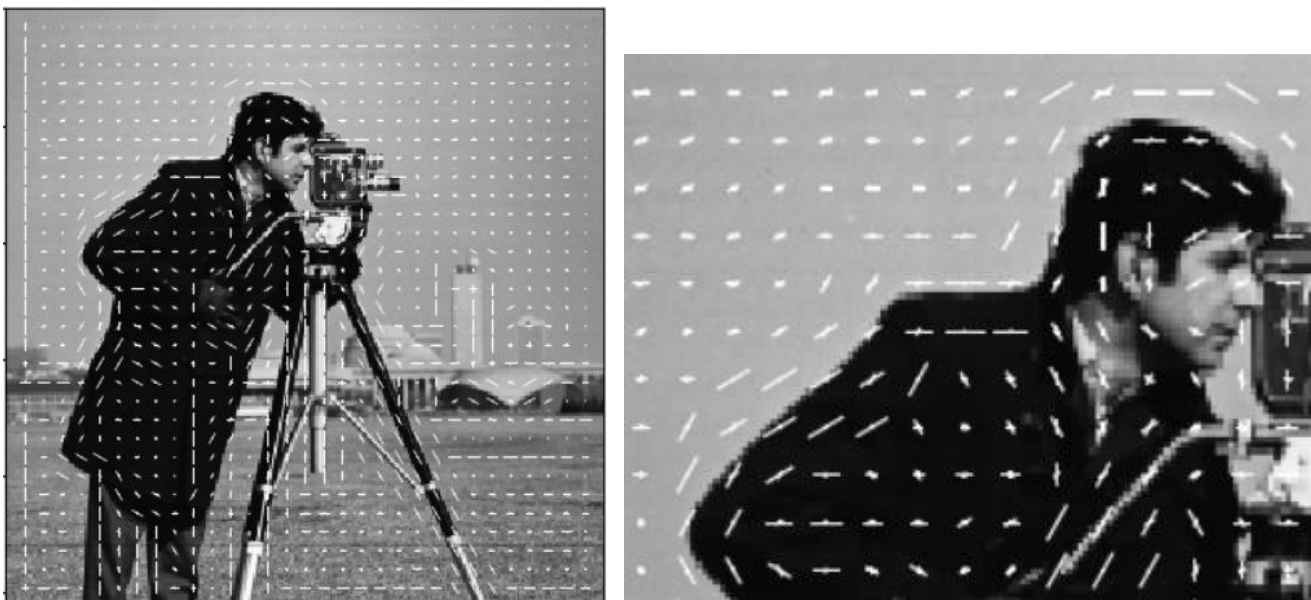
HOG features can be used to train a Support Vector Machine (SVM) model, that can be used for object detection.