# Ensemble learning based deep neural network model for face recognition

Face information processing provides a number of advantages, including a high safety coefficient, ease of data collecting, and widespread use in biometric feature recognition. Face recognition technology is beneficial in a variety of finance and security applications, including video surveillance and smart payments. It is currently one of the most popular areas of research in machine learning and computer vision. Face recognition is frequently utilized in unrestricted situations. Several environmental elements, including lighting, expression, and posture, have an impact on the photos captured. As a result, classical feature extraction is not an ideal solution for face recognition. They are used to obtain facial features for face identification where Histogram of Oriented Gradient (HOG) retains high invariance to optical and geometric distortion of the picture, and local binary patterns (LBP) has the advantages of grayscale invariance, insensitivity to lighting, and so on. A big number of face training data sets have surfaced, and deep learning has received a lot of attention. To achieve face recognition, the neural network model can analyze two-dimensional images, learn the features of the images from a large number of samples, and categories the two-dimensional images based on the learned characteristics. Machine-assisted feature extraction can help to avoid the overuse of subjective elements. Convolutional neural networks, on the other hand, are commonly used in face recognition applications due to its self-learning capabilities, parallel processing capabilities, fault tolerance, and generalization performance. The convolutional neural network can detect face features directly from an image, but it must first learn the noise in the images. HOG and LBP can both analyses face images and reduce noise interference, allowing the characteristics of the image to stand out more. Because HOG focuses on extracting the target's presentational and form aspects, but LBP can extract the target's texture features, LBP has a stronger effect on extracting facial features.

In our proposed system, LBP is utilized to detect facial texture characteristics in order to lessen the impact of lighting and expression, while CNN and skip connection are utilized for parallel convolution processing in order to reduce training time and enhance classification accuracy. Meanwhile, the diversity of the ensemble members is improved and the network's generalization capacity is boosted by adding the parallel ensemble learning approach and parallel connection of two or more convolutional neural networks with diverse architecture for face recognition. This study proposes a face recognition method based on parallel ensemble learning of LBP and CNN, which effectively enhances face identification accuracy. Two separate experiments are carried out in the experiment section. First, face data sets from ORL and Yale-B are used to assess the accuracy of our proposed CNN model in the face recognition problem. The experiment compares HOG-CNN, CNN, and the suggested technique in detail, with the result demonstrating that our method outperforms the others. Second, we use a hybrid model that combines our facial recognition algorithm with a CNN model for pedestrian identification. Our proposed face recognition model outperforms the existing state-of-art works for pedestrian identification with occlusion. Intuitively, a human face in a photograph is a little component of a human. As a result, even if half of a human is obscured, the pedestrian can be spotted as long as his or her face is visible.