

## FACE RECOGNITION IN IMAGES

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Face recognition is of great importance nowadays. Security systems, forensic expertise, real-time photo effects – these are uses of face recognition technology. This technology combines two directions – computer vision for detecting faces in the image and machine learning to teach the program to understand the image in the same way as a person. In complexity, this area is equivalent to the creation of artificial intelligence in general. Already, the machine knows how to distinguish faces better than us. It much more accurately determines the age of a person, nationality, the machine works much faster and does not know how to forget [3].

The most effective method for detecting faces is the Viola-Jones method, which is used in real time. This method allows you to determine the face even at large angles of rotation. It works on Haar signs – black and white rectangular masks that overlap the image (Fig. 1). The system totals up the brightness values of the pixels that are under the mask and calculates the difference in values. After that, the system compares the results with the database and, in case of coincidence, goes to the next step: the program looks for reference points on the face, which make up the facial features. These include the distance between the eyes, the length of the nose, lips, the shape of the forehead, chin, etc [2]. If such points exist and correspond to the database, the system determines the image as a face.



Figure 1 – Haar masks

In order to find the right one from the set of faces, the program uses the features of the face that were found when it was detected – the shape, size of the face elements, the distance between them. However, if there are distortions in the image, different lighting, a different angle, the facial features are distorted and a simple comparison does not give the desired result. To solve this problem, neural networks are used that have such a property as the ability to self-learn. The neural network compares various images of faces, independently drawing conclusions whether it is one person or not. In case of an error, the person indicates this and the network adjusts its comparison methods [1]. Thus, by trial and error, the network itself learns to correctly recognize faces with different angles and conditions.

The accuracy and efficiency of face recognition continues to grow. The system determines the identity faster and more accurately, avoiding erroneous identification. When used correctly, it will help increase public safety and maximize the potential and resources of users.

### References

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